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Transport energy futures: long-term oil supply trends and projections

Report 117

Bureau of Infrastructure, Transport and Regional Economics

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long-term oil supply trends and projections
Report 117**

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Foreword

In 2007 the Bureau of Infrastructure, Transport and Regional Economics (BITRE) commenced a project to look in a strategic way at possible alternative transport energy futures.

This was driven by a perceived need to address two key challenges to 'business-as-usual' for Australian and world transport: oil depletion and global warming.

To examine the oil depletion issue, it was necessary to assemble large amounts of data over long periods of time (centuries in a large number of cases). BITRE has had long experience with assembling lengthy datasets from multiple and sometimes conflicting data sources, and then analysing their dynamics. This is what has been done here, to examine the oil production prospects of over 40 countries/regions around the world, as a preliminary to delineating the scope of the oil depletion challenge.

Recognising that the issue of the timing of oil depletion is a highly controversial area, where information can be contested and where there is a range of views and positions, comments are expressly invited on this report.

Future reports will examine 1) world oil demand/price relationships and 2) the kinds of responses to the twin challenges of oil depletion and global warming that may be possible in terms of alternative fuels and propulsion technologies.

This report has been compiled by Dr David Gargett.

Phil Potterton
Executive Director
Bureau of Infrastructure Transport, and Regional Economics
March 2009

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This report would not have been possible without huge amounts of data published in graphical form by Colin Campbell and Jean Laherrere.

In addition, production data from the Energy Information Administration of the US Department of Energy has been utilised extensively.

Many other authors have provided specific items of data and are listed in the Data Sources section at the end of the report.

At a glance

The trends in discovery of oil can be used to project similar trends in the subsequent production of oil. Using a method developed here, forecasts of future oil/liquids production for 40 countries/regions around the world have been produced.

The oil production prospects of different countries and regions vary immensely. However, on balance, when an aggregation is done across the globe, it is predicted that world production of *conventional* oil is currently just past its highest point (conventional oil is oil pumped from wells on land or in water less than 500 metres deep). A predicted shallow decline in the short run should give way to a steeper decline after 2016.

However, deep water and non-conventional oil production are growing strongly, turning a slight decline into a plateau for total crude oil (non-conventional oil is heavy and viscous or indeed tar-like oil). Given the growth in deep and non-conventional balancing the shallow decline in conventional production, it is predicted that we have entered about 2006 onto a slightly upward slanting plateau in potential oil production that will last only to about 2016—eight years from now (2008). For the next eight years it is likely that world crude oil production will plateau in the face of continuing economic growth. After that, the modelling is forecasting what can be termed ‘the 2017 drop-off’. The outlook under a base case scenario is for a long decline in oil production to begin in 2017, which will stretch to the end of the century and beyond. Projected increases in deep water and non-conventional oil, which are ‘rate-constrained’ in ways that conventional oil is not, will not change this pattern.

Importantly, these forecasts assume that world oil production is not constrained in the near term by reduced demand arising from lower world economic growth. Depending on the length of time before a return to more normal levels of world economic growth and resulting higher demand for oil, the dropoff is likely to be delayed.

The outlook is not really changed much if a scenario of increased Middle East oil production is played out. The result of that scenario is that oil production continues its growth for longer and then falls far more precipitously. Arguably, this could be a worse scenario, as far as the world being able to cope comfortably with the transition. The possible effect of higher prices in bringing forward production would have a similar effect. Higher prices might also stimulate exploration but are no guarantee of significant further discovery.

Thus at some point beyond 2017 we must begin to cope with the longer-term task of replacing oil as a source of energy. Given the inertias inherent in energy systems and vehicle fleets, the transition will be necessarily challenging to most economies around the world.

Coping with the supply reductions will be compounded by the fact that shrinking oil supply will interact with measures to reduce greenhouse gas emissions in order to address climate change. While there are opportunities for joint solutions, there will also be conflicting demands. For example, two of the more obvious sources of alternative motive energy are coal-to-liquids and gas-to-liquids. Both of these would involve increased emissions.

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Executive summary

The methodology used in this report is new and allows detailed patterns of future oil production to be forecast from past patterns in oil discovery, when the levels of the discovery data are adjusted to those indicated by past production data.

This adjustment of discovery data (usually upwards) results in higher assessments of possible future production than the so-called 'peak oil' analysts.

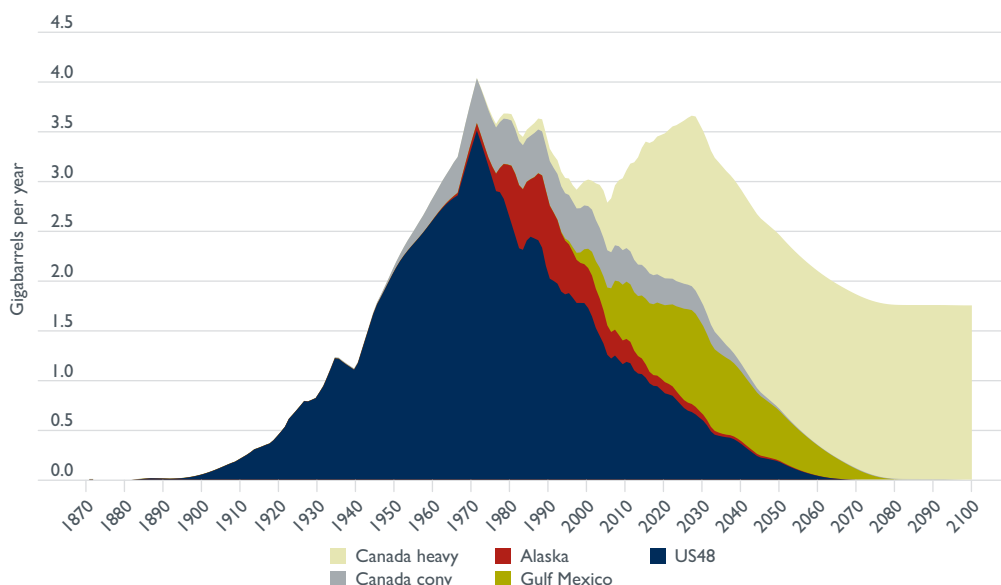
But it also results in lower forecasts than those from the 'cornucopians' as they may be called, who do not see the patterns of current production pointing to a plateau in oil production any time soon.

Using this paper's methodology, forecasts of future oil production for 40 countries/regions around the world have been produced.

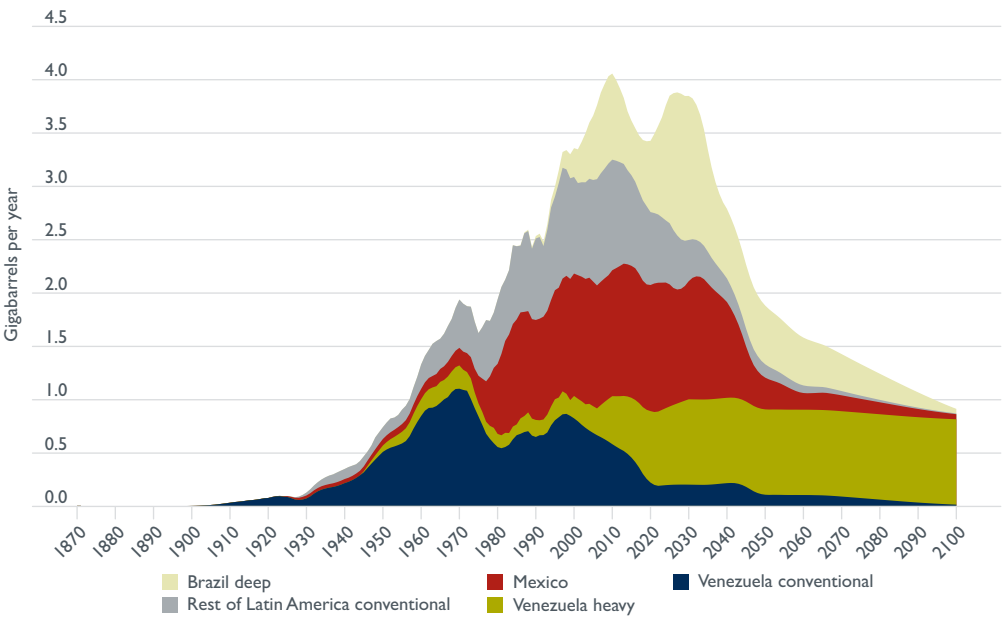
Production prospects of different countries and regions vary immensely.

North American production is set to rebound to 2035 under the impetus of large increases in Canadian heavy and Gulf of Mexico deep water oils.

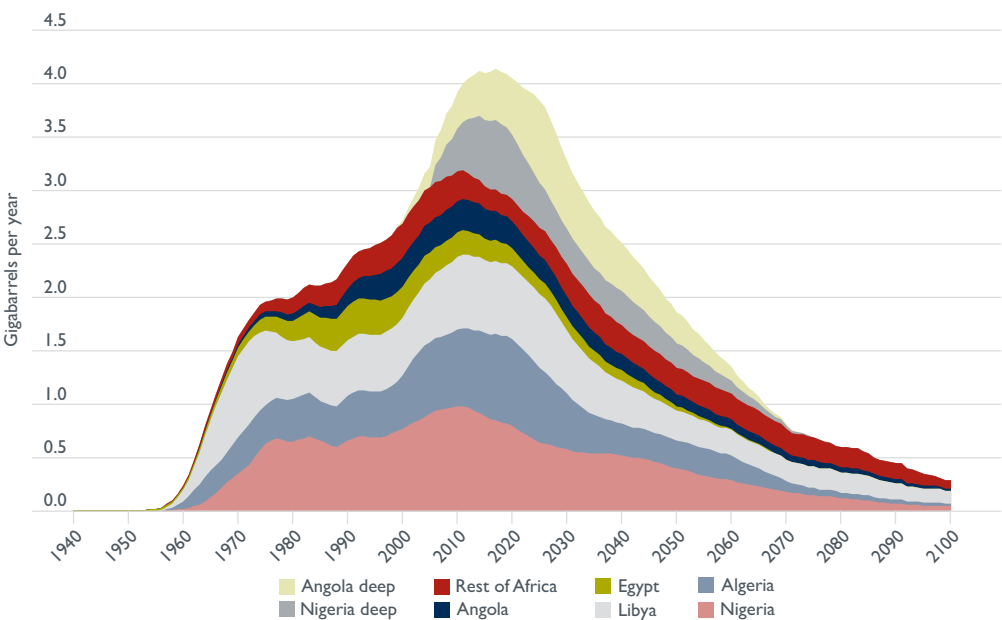
Figure ES.1 Components of North American crude oil production



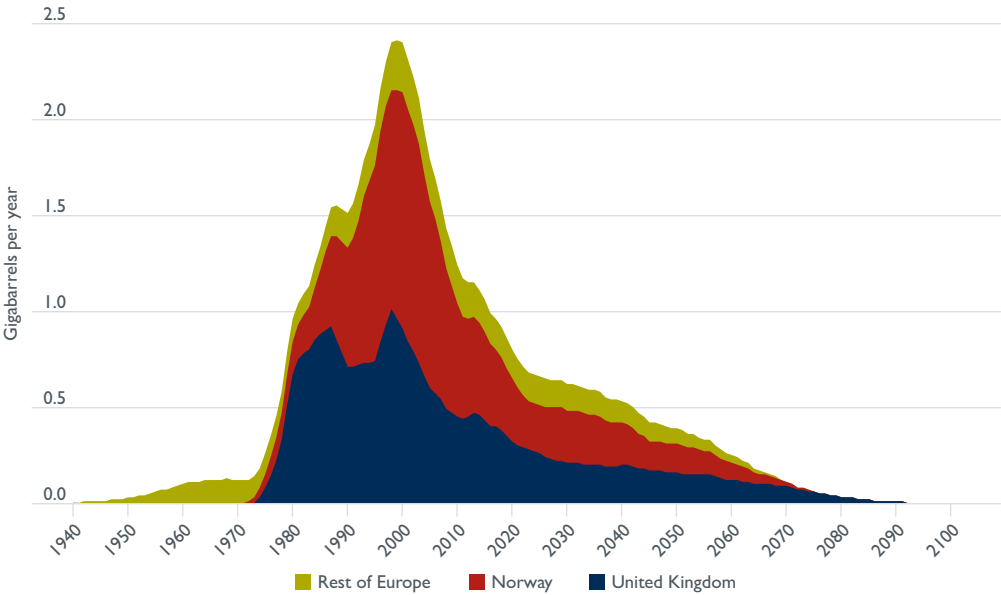
Latin American production is expected to have two peaks to 2035, after which production declines are predicted.



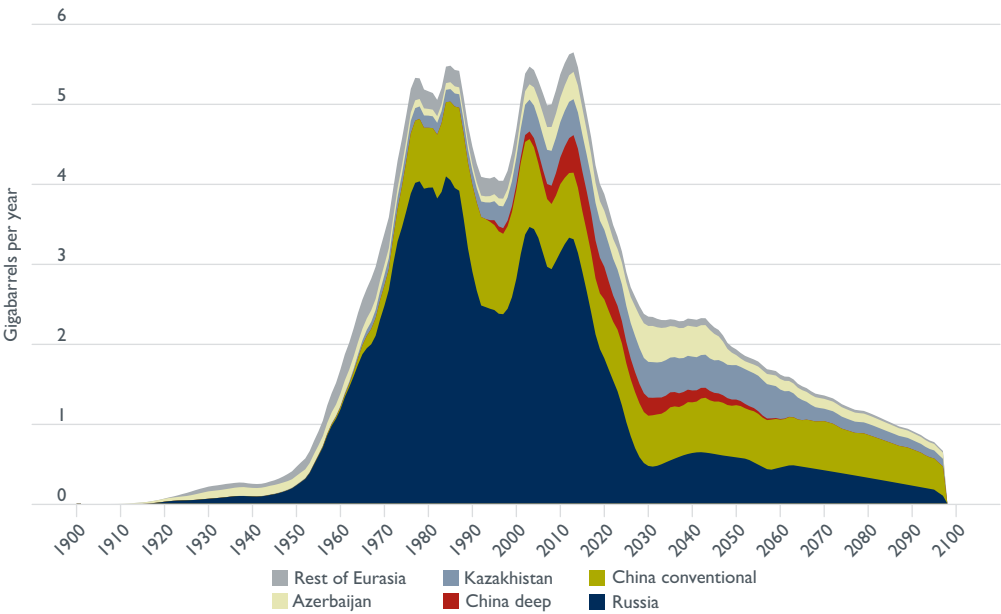
African production should continue to increase to 2020, thanks to large increases in deep water oil off-setting declines in conventional oil production.



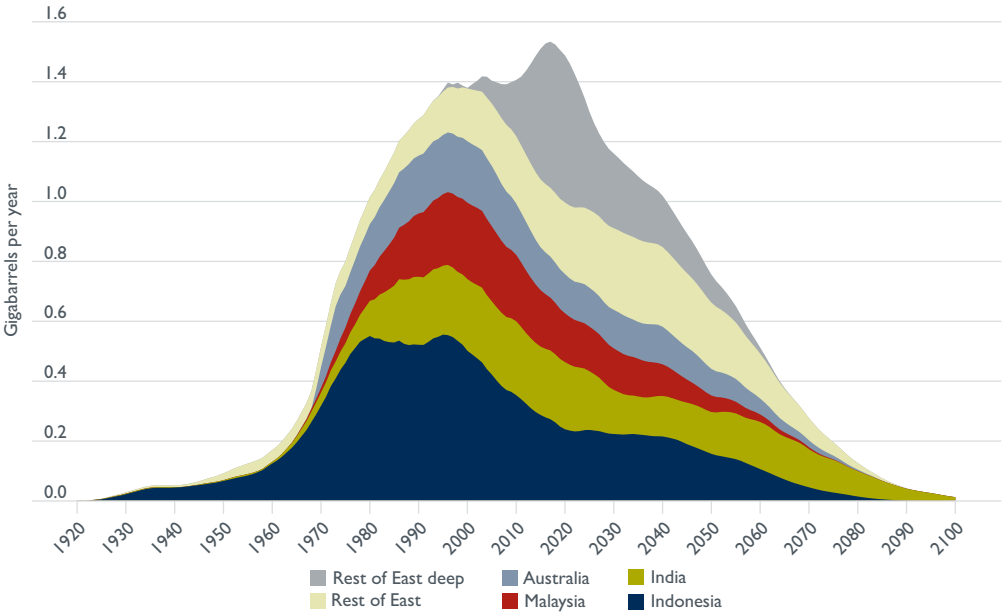
European oil production should continue to decline steeply.



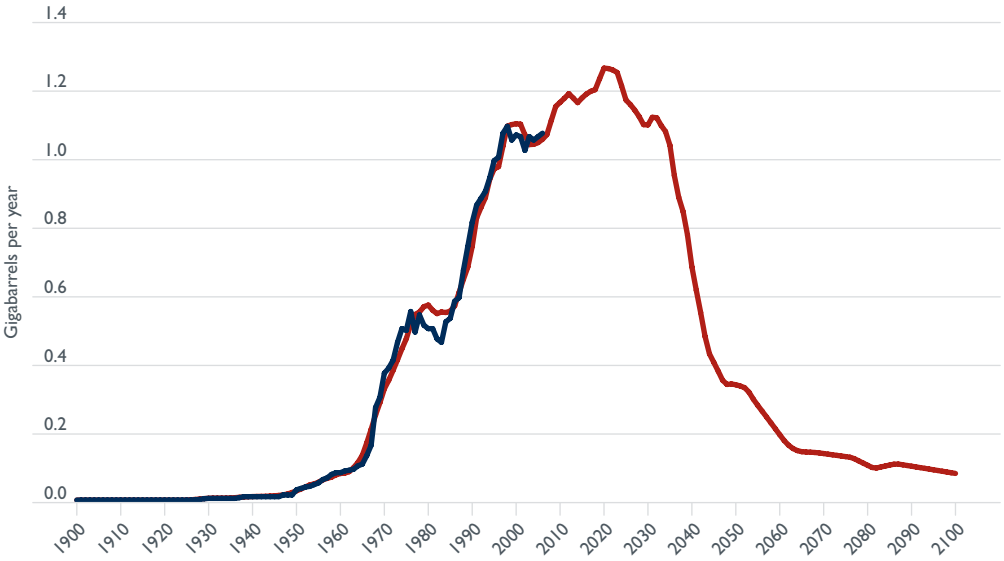
Eurasian production is set to fluctuate to about 2016, after which time a sharp decline should set in.



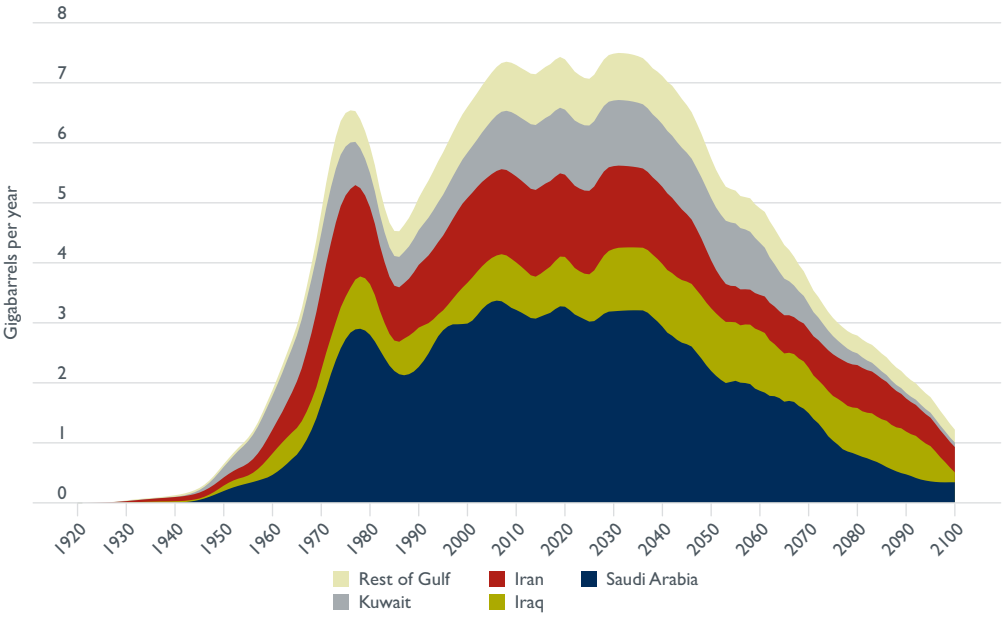
The East region should have increases in production to 2025, thanks to an expansion of deep water production.



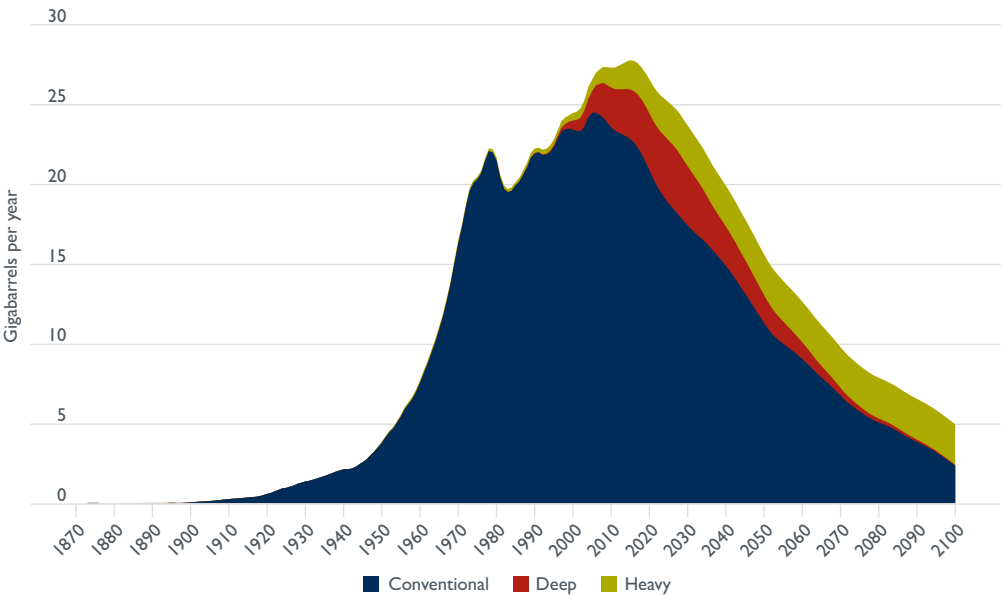
Production in the Middle East outside the Gulf region should rise somewhat to about 2025, after which production declines should set in.



Middle East Gulf production, under a business-as-usual outlook, should maintain current production levels to 2040, after which time declines should set in.



The oil production prospects of different countries and regions vary immensely. However, on balance, when an aggregation is done across the globe, it is predicted that world production of conventional oil is currently just past its highest point (conventional oil is oil pumped from wells on land or in water less than 500 metres deep). A predicted shallow decline in the short run should give way to a steeper decline after 2016. However, deep water and non-conventional oil production are growing strongly, turning a slight decline into a plateau for total crude oil (non-conventional oil is heavy and viscous, as in the Venezuelan deposits, or indeed tar-like, as in the Canadian tar sands).



Given the growth in deep and non-conventional balancing the shallow decline in conventional production, it is predicted that that we have entered about 2006 onto a plateau in potential world crude oil production that will last only to about 2016—eight years from now (2008). For the next eight years it is likely that potential world crude oil production will plateau (very little rise) in the face of continuing economic growth.

After that, the modelling is forecasting what can be termed ‘the 2017 drop-off’. The outlook under a base case scenario is for a long decline in oil production to begin in 2017, which will stretch to the end of the century and beyond. Importantly, these forecasts assume that world oil production is not itself constrained by lower demand arising from low economic growth. Depending on the length of time to return to more normal levels of world economic growth and resulting higher demand for oil, the ‘drop off’ is likely to be delayed.

Projected increases in deep water and non-conventional oil will not change this pattern, after the decline in conventional oil starts in earnest. This is because the production of non-conventional oil is constrained in two ways that conventional oil production is not.

Firstly, non-conventional oil is essentially ‘manufactured’ oil, and the manufacturing process is often ‘rate constrained’ due to limitations on the rate of utilisation of input resources, e.g. energy, water, capital, skills, et cetera.

Secondly, the production processes for non-conventional oil *use* energy to get energy. As such, their energy profitability is much less than conventional oil sources.

The world outlook for total crude oil production (conventional plus deep and non-conventional) is not really changed much if a scenario of increased Middle East oil production is played out. The result of that scenario is that oil production continues its growth for longer and then falls far more precipitously. Arguably, this could be a worse scenario, as far as the world being able to cope comfortably with the transition.

The conclusion of a drop-off is also true regardless of the path of world oil prices. Higher prices encourage exploration, which is a necessary condition for discovery. Higher prices mean more wells are drilled, but there are diminishing returns. Even a 50 per cent increase in historical drilling will only mean that the discovery of some of the remaining conventional oil might be brought forward slightly. Given the lags, this will not materially alter the forecast path of production. Higher prices might also bring forward a small proportion of production, but experience in the U.S has shown that this effect will probably be small. The main constraints on production are geological in nature.

Thus beyond 2017 we must begin to cope with the longer-term task of replacing oil as a source of energy.

Given the inertias inherent in energy systems and vehicle fleets, the transition will be challenging to most economies around the world.

If the prognosis for plateau and then decline of conventional petroleum liquids is accepted, the question arises as to how the world will cope with the prospect of one of its major and convenient energy sources being progressively withdrawn.

There are really three options:

1. Oil is replaced with other (equally rich and abundant) energy sources (opening the whole debate about alternative fuel sources, e.g. gas-to-liquids, coal-to-liquids, electricity, hydrogen).
2. Improved energy efficiency results in energy use per unit of GDP declining markedly to match the shortfall.
3. GDP declines to match the shortfall.

The first option opens the whole debate about alternative fuel sources. For example, coal-to-liquids and gas-to-liquids production in Australia and worldwide is set to begin in earnest at about the same time as foreseen here for the beginning of the decline in conventional petroleum liquids (about 2017). How much of the constant annual decline in production foreseen can be replaced by continually ramping up production from 'fungible' fossil fuels? What about the greenhouse gas implications? If electric vehicles begin to make inroads, what are the infrastructure requirements and lags, and what about the greenhouse gas implications of the electricity generation energy sources—coal or renewables?

The second option leads to consideration of necessary infrastructure changes to supply and support new energy-saving technologies, and the lags involved in this. Again, greenhouse gas issues are important.

Alternatives under options 1 and 2 will be the subject of a future BITRE report.

However, it would seem that, given the magnitude of the potential supply reductions, many adaptations in many areas will be required—the so-called 'wedges' approach (Lovins et al 2004, Hirsch et al 2005).

It should be noted that this report concentrates on the *long-run potential supply* of conventional petroleum liquids. In order to understand the dynamics of the oil market, not only potential supply, but also demand and price need to be considered. In the short run, the effects of the global economic slow down are likely to mean that lower demand, not limits on potential supply, will be the limiting factor for oil production. Thus lower GDP growth will be running the show in the short run, and the associated lower oil prices will in fact make it harder to progress options 1 and 2 to deal with the long-run trends. World oil demand/price dynamics are the subject of a second future BITRE report.

In conclusion, this paper indicates that although the oil production prospects of different countries and regions vary immensely, the prospects for potential world conventional liquids production can be summarised as 'flattish to slightly up for another eight years or longer (depending on the duration of the global economic slowdown) and then down'. In this short run, the effects of the global economic slowdown are likely to mean that curtailed demand, not potential supply, will be limiting factor on oil production. But, given the magnitude of the downturn foreseen for the rest of the century, and given the inertia inherent in our energy systems and transport vehicle fleets, the challenge for global transport will remain.

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Chapter 1

Oil



Chapter 1 Oil

The oil industry began in the 1870s and 1880s in the Caspian region and in the eastern United States. From humble beginnings, oil has grown symbiotically with generation after generation of vehicles, vessels and aircraft, until it is closely interwoven with trends in transport, trade, industry, agriculture, mobility, and even the structure of cities around the world.

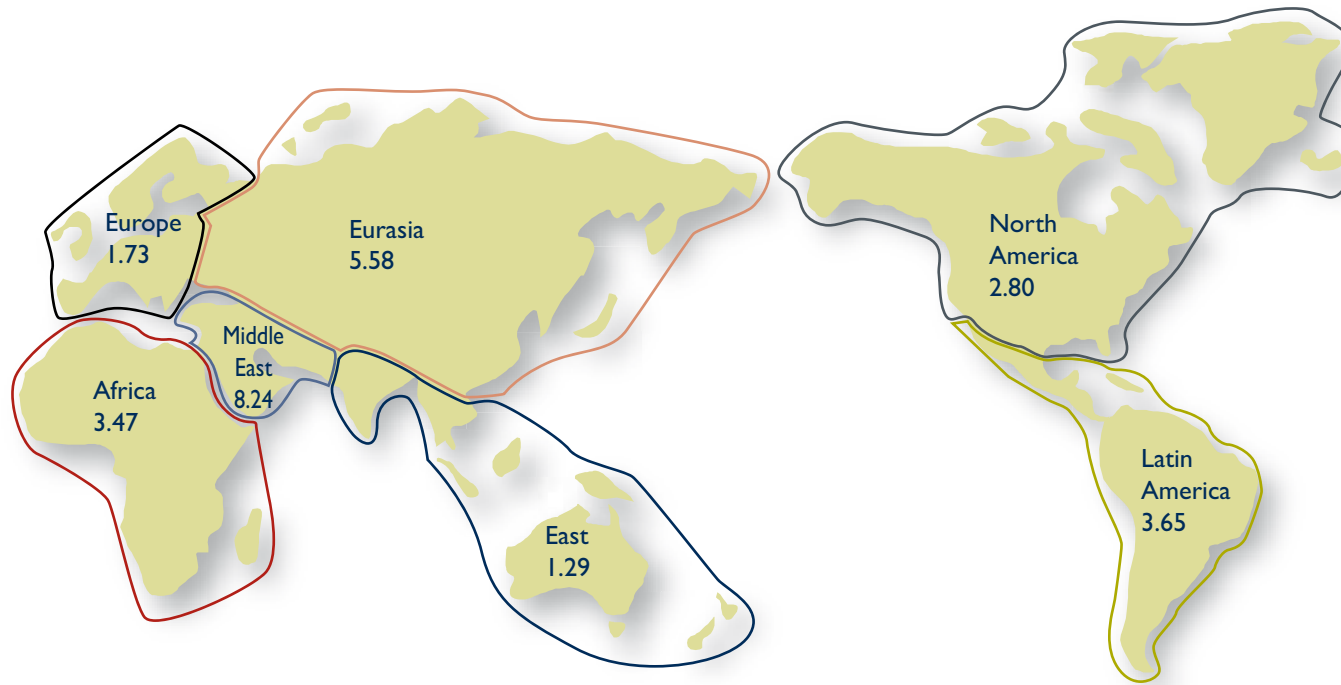
And yet, oil is a resource subject to depletion. Its production patterns are dependent on the size and time pattern of the discovery of the resource, as well as on the lag from the time of that discovery to its being pumped out of the ground.

The likely future path of these production patterns is clearly a matter of interest to mankind, given our dependence on oil, and given the inertias that exist in our energy systems and vehicle fleets.

In the past century, oil has supplied an abundant and rich source of energy, around which we have built much of our societies. In the current century, we will face the task of replacing this energy source.

The following publication outlines the likely path of potential oil production in about 40 countries/subregions around the world. Oil production forecasts rely on specifying the link between discovery of oil and its subsequent production. The following chapter examines that link.

Map 1.1 World oil producing regions, gigabarrels of crude oil per year, 2006



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Chapter 2

The link between oil discovery and production



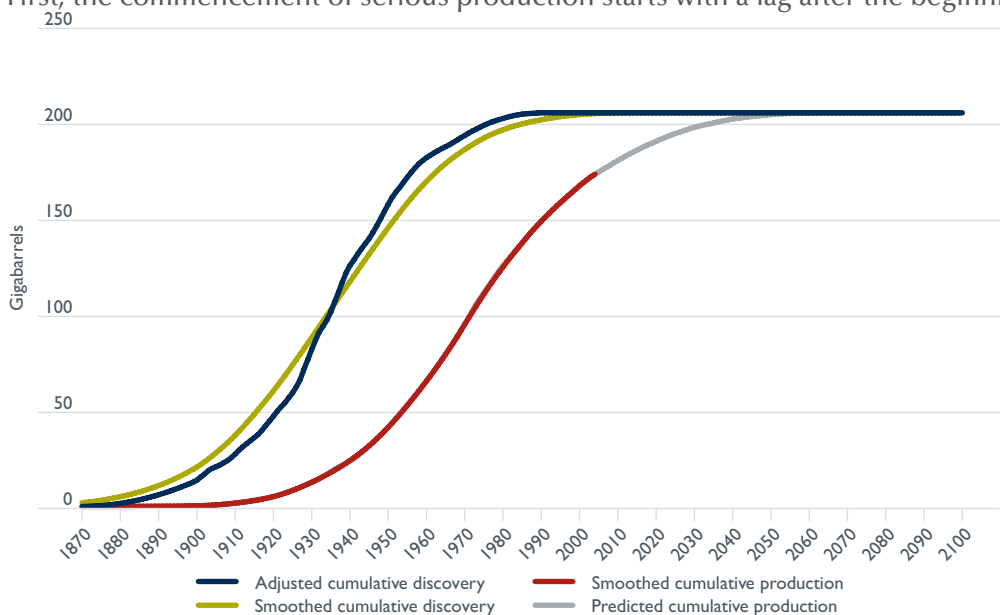
Chapter 2 The link between oil discovery and production

Oil production cannot be forecast without reference to earlier discovery. This chapter outlines both the difficulty and the necessity of making such a link. The rewards in terms of an understanding of the oil industry are worth the effort.

Figure 2.1 shows cumulative oil discovery (both raw and smoothed data) and production in the lower 48 states of the US in gigabarrels (billions of barrels). It illustrates two crucial factors in the production of oil.

Figure 2.1 Oil discovery and production in the lower 48 states

First, the commencement of serious production starts with a lag after the beginning



of major discovery. Secondly, the lag lengthens as the oil resource is produced over time. This 'stretch lag' function is common to all oil producing regions. If its patterns are understood, we can project the development of the lags, and then use the patterns of earlier discovery to project cumulative oil production over time, as has been done for the 48 states in Figure 2.1.

But it is not as simple as it looks in the figure.

Think of the two curves in Figure 2.1 as two buildings being built. The 'discovery tower' is built first. An industrial spy, looking on from outside the building site, has the task of specifying what the second 'production tower' will look like. He knows two things: (1) the second building will be some smoothed version of the first, and (2) it will be the same height as the first, but it will lean more than the first. But his task is made much harder, because there is a peculiar mist surrounding the first building that distorts its apparent height. To compensate, he also knows that there is a certain pattern to the rates of increase in the heights of the two buildings as they are being constructed.

Knowing the last item, he can solve the problem. First he estimates the final height of the production tower by matching its rate of building to the pattern (a key clue is that when the percentage increase in height each year falls below about 3 per cent of the already completed height, the halfway height has usually been reached). Applying the same pattern to the discovery tower, he can rough in the pattern of its completion and its 'apparent' height when finished. Then having estimated the actual height of the production building, he can correct for the distorting effects of the mist and estimate the actual height and final appearance of the discovery tower. Then, he can experiment with different smoothing assumptions and relative leans on the discovery tower, until he finds a combination that matches the finished part of the production tower. Applying these smoothing/lean assumptions, he can then forecast what the unbuilt part of the production tower will look like.

These are basically the methods used to forecast the cumulative production curve in Figure 2.1. Cumulative discovery data is indeed indeterminate in 'height', but it does give us the pattern of the discovery curve. Because discovery is usually close to completion in most oil regions of the world, the projection to completion is *relatively* straightforward. The pattern of growth in production in the US lower 48 can, because it is also closing on completion, be relatively simply projected to completion, and (keeping the 3 per cent rule in mind) can then serve as a guide to the likely ultimately recoverable resource in most other oil regions. When the cumulative discovery curve from the geologist's data is then adjusted (usually upward), the patterns of smoothing and slope can then be teased out, although this is usually the easy part.

The annual change in the resulting forecast cumulative production curves then yield predictions and forecasts of annual oil production, which can be compared to the actual experience. Such a forecast (derived from the US lower 48 cumulative production forecast of Figure 2.1) is shown in Figure 2.2.

Given that the patterns of growth in the production and discovery towers played such an important part in allowing our investigator to solve the puzzle, it is perhaps a good idea to illustrate these patterns.

Figure 2.2 Actual and forecast annual oil production in the lower 48 states

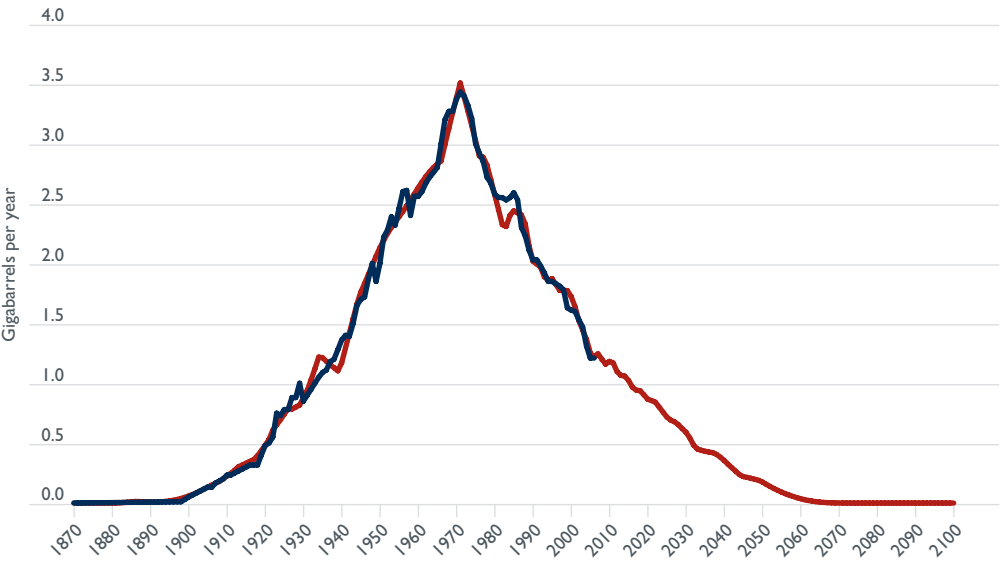
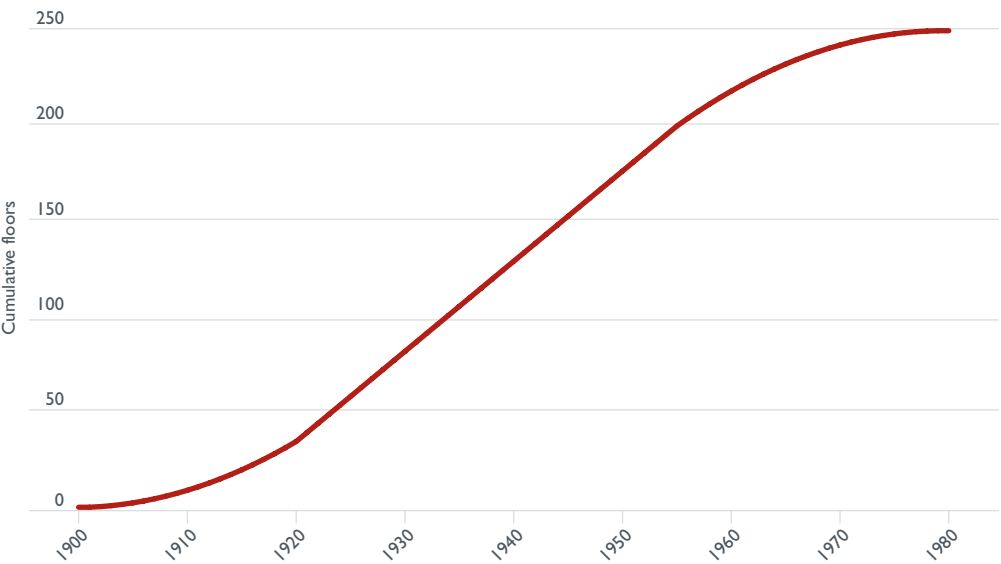


Figure 2.3 Simulated cumulative floor height curve



Suppose the discovery tower is completed, as in Figure 2.3. We know that it is two arcs of circles and a straight line between them. The speed of completion is proportional to the lean—the more the lean, the less quickly height is added. If we then graph the floors completed per year against the total number of floors already completed by the previous year, we get Figure 2.4.

Note that there is a declining curve at first, as the concave arc is built. Then there is a shift to much higher completion rates as the straight part of the building proceeds. But although the rate shifts higher initially, as a per cent it then continues its downward course, until the final building stage is reached—the convex arc. The rate then shifts down again and points toward the final building height in number of floors (250—a tall building).

Figure 2.4 **Simulated cumulative floor height growth curve**

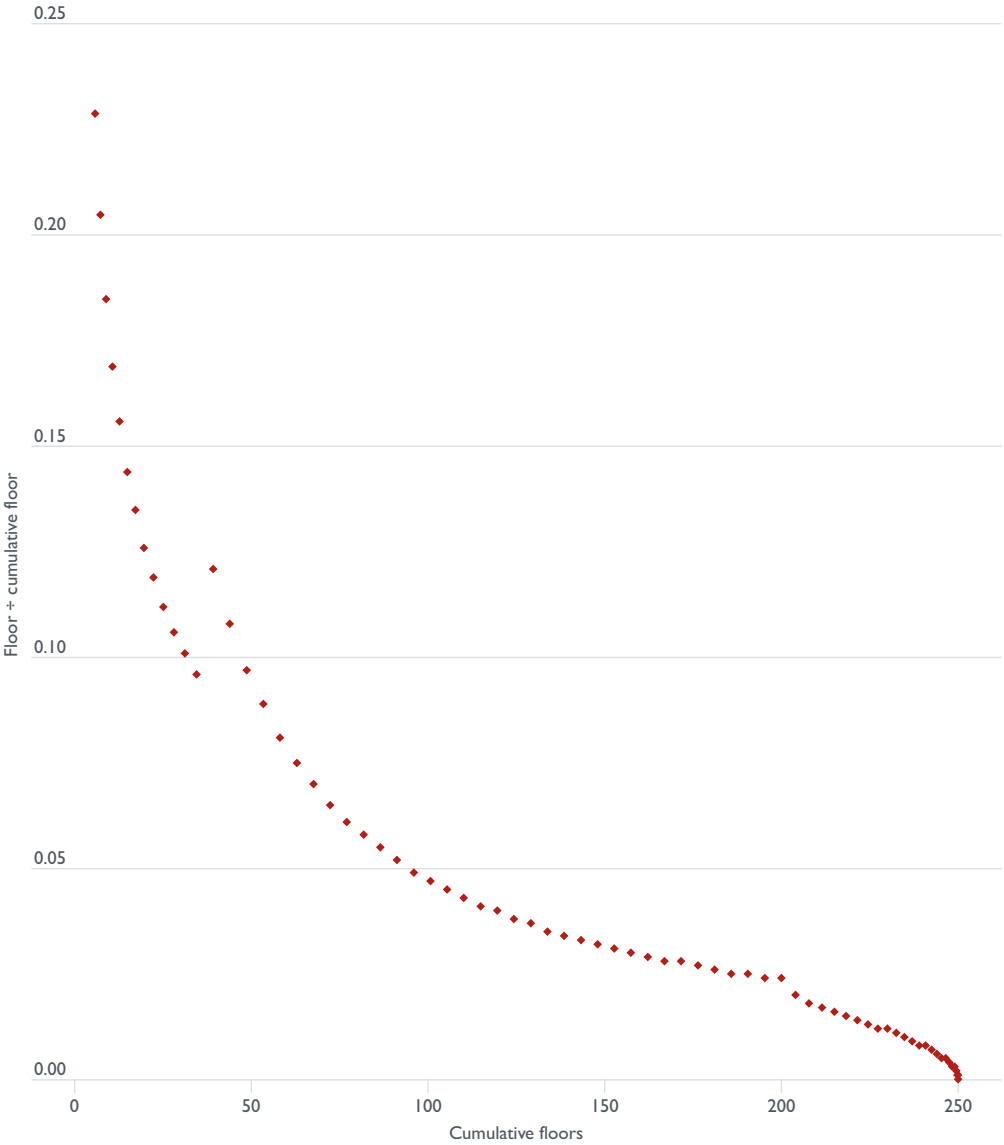


Figure 2.5 shows for the US lower 48 states, where discovery is essentially complete, that this simulation matches quite well data graphed from the world's premier oil province's discovery history. The three phases are apparent. Note that the ultimate discovery is about 165 gigabarrels. It is only after the trends in production are examined that any necessary adjustment to the discovery figures can be determined. It is to these trends we now turn.

Figure 2.5 Cumulative discovery growth curve for the lower 48 states

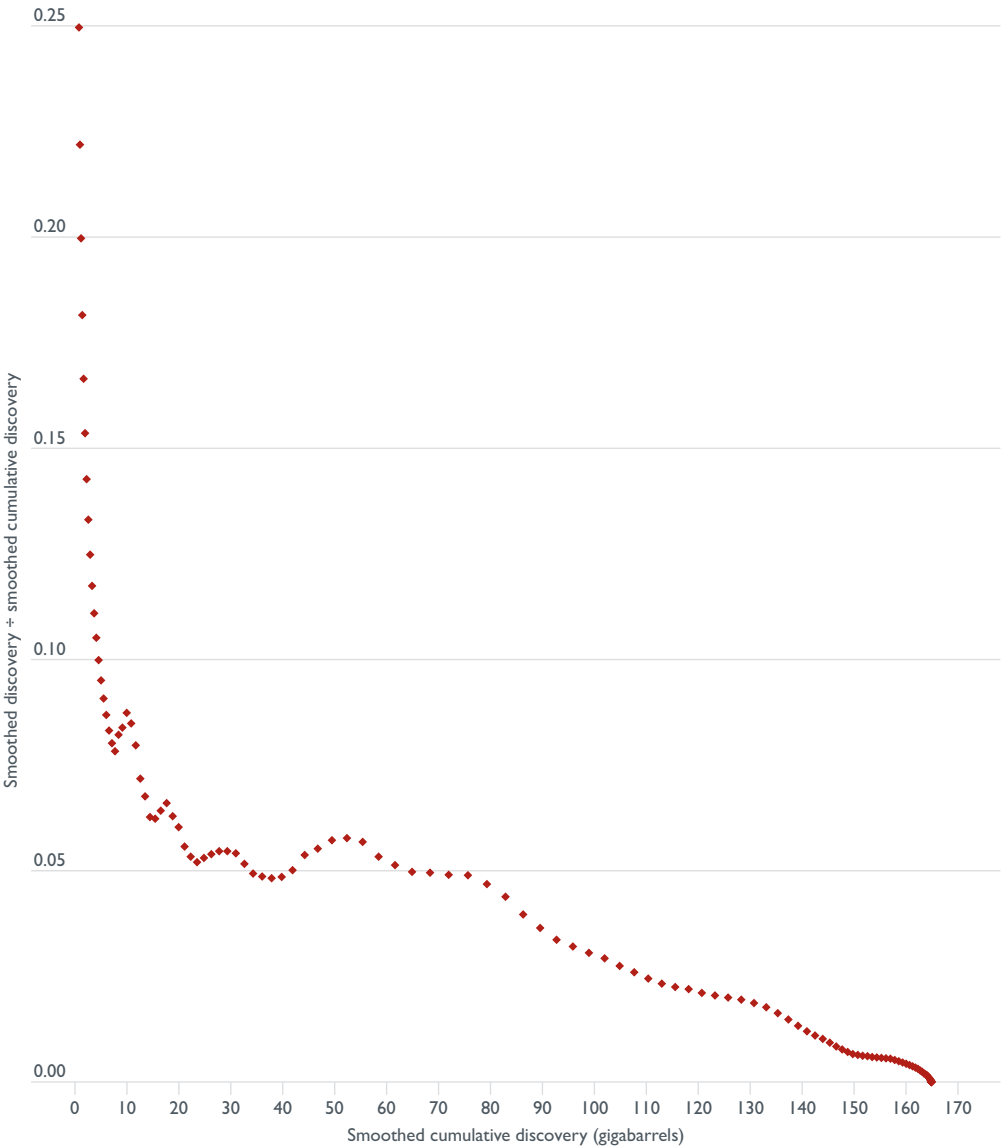
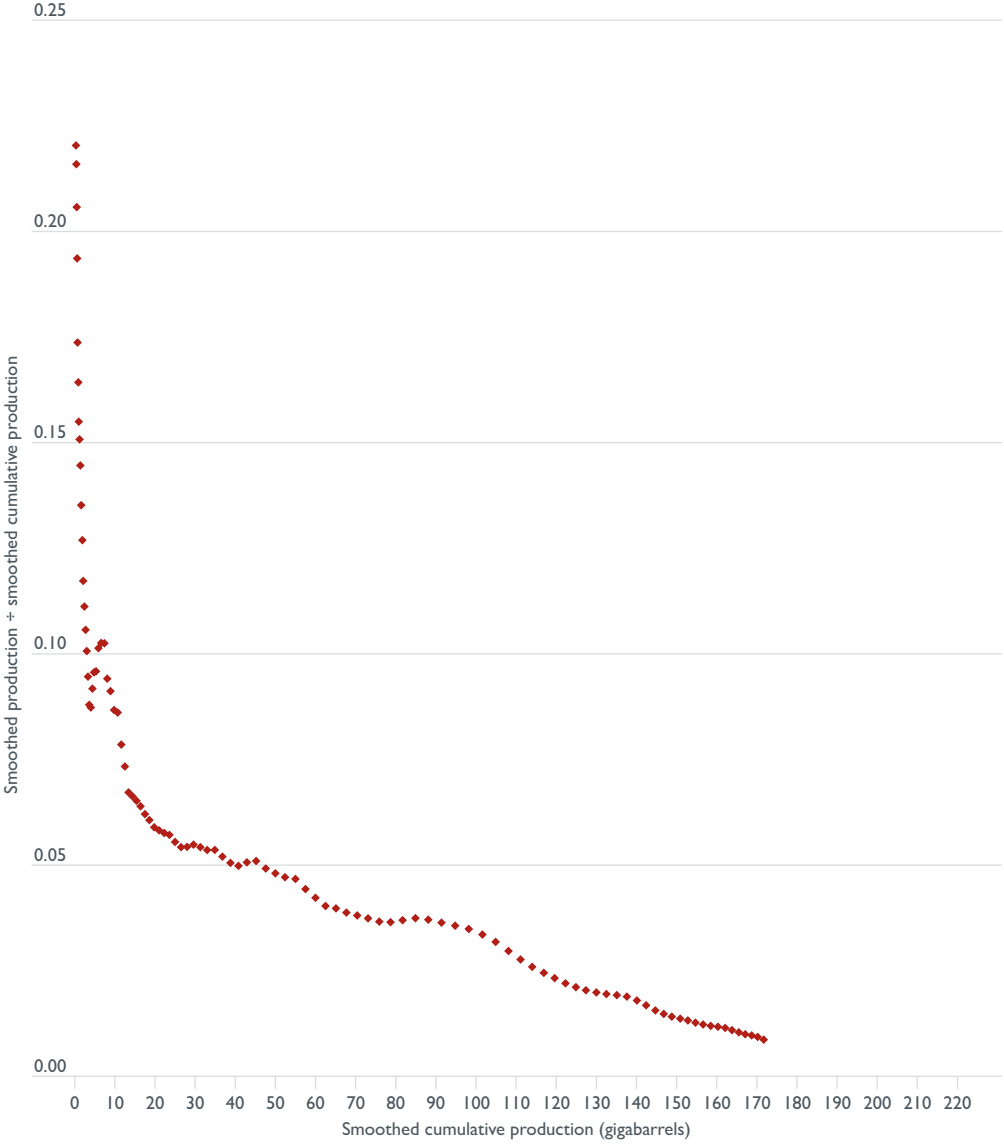


Figure 2.6 shows the graph of lower 48 *production* each year as a per cent of cumulative production by the year before. The production curves are always smoother than the discovery curves (thus the necessity when linking discovery to production to guess at the smoothing necessary).

Figure 2.6 Cumulative production growth curve for the lower 48 states

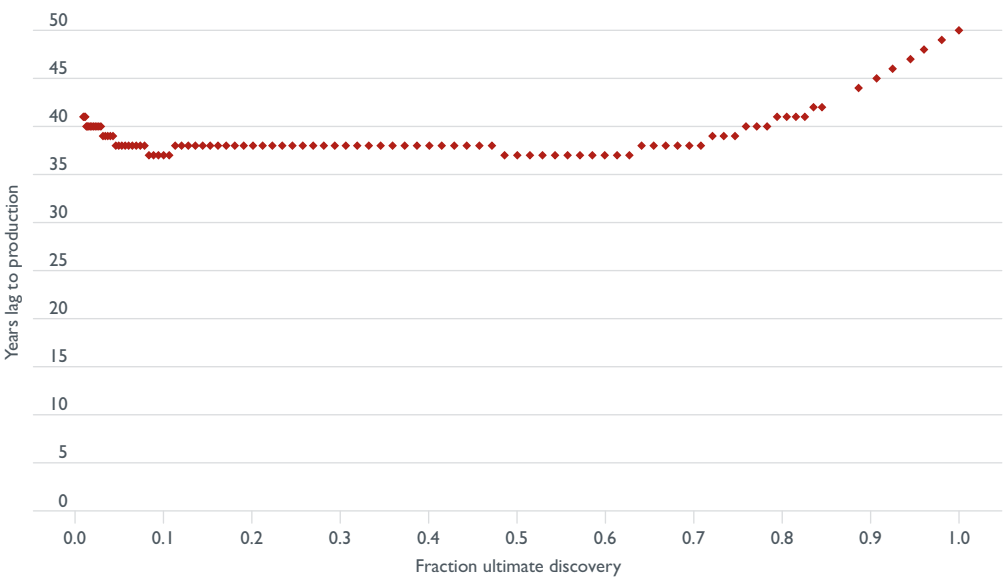


It also is quite complete and indicates an ultimate cumulative production of somewhere around 205 gigabarrels, which means that there is going to be the need for an adjustment in the height of the discovery curve (by 205/165). This lower 48 production curve will be used in subsequent chapters as an overlay to guide the estimation of each country/region’s ultimate cumulative production capacity (as well as the 3 per cent rule).

When the ultimate has been determined, and a final adjusted cumulative discovery curve has been derived (as in Figure 2.1), then attention focuses on the proper smoothing of the discovery curve to match that of production. In the case of the lower 48, a 55 year moving average of cumulative discovery was found appropriate (also shown in Figure 2.1).

Once the cumulative discovery curve has been smoothed, the lag between it reaching a certain level of cumulative discovery and cumulative production reaching the same level can be calculated. It is useful to plot each year's lag against cumulative discovery in that year as a fraction of the final cumulative discovery—a 'stretch lag curve'. Such a curve for the lower 48 is shown in Figure 2.7.

Figure 2.7 **Stretch lag curve for the lower 48 states**



Again, it is quite complete, and shows that after a period of turmoil in the range 0 to 0.1, the lag settles down to a fairly flat period to about 0.7 and then begins a regular rate of increase. It is this regularity that will be useful in performing the last task in forecasting the cumulative oil production curve—that of estimating the increased degree of lean of the production tower vis à vis the discovery tower. Figure 2.6 also shows the projection of the lag adopted in forecasting the lower 48 region.

Once all this has been done, the forecast cumulative production curve can be generated using the projected stretch lags on the adjusted, smoothed cumulative discovery curve. Annual production forecasts are derived from the annual change in this projected curve. For the lower 48 these were shown in Figure 2.2.

This approach, relying as it does on the trend in cumulative production to point to the ultimate recoverable oil, has the benefit that the production history incorporates the past effects of what is termed 'enhanced oil recovery' (EOR), using advanced technologies. If future trends in EOR are similar to past trends, then the number for ultimate recovery coming from the production data will not have to be continually upgraded, as has held for much of the past estimates based on discovery.

This, then, is the methodology that has been applied to all major oil producing countries/regions worldwide and is detailed in the following chapters, starting appropriately with North America.

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Chapter 3

North America



Chapter 3 North America

This is the premier (if not exactly the first) oil-producing province in the world, based on early American discoveries and exploitation in the late 1800s.

It contains five major oil-producing subregions: the lower 48 states, Alaska, Gulf of Mexico deep water, Canadian conventional and Canadian non-conventional (tar sands). The lower 48, Alaska and Canadian conventional will be modelled in subsequent sections of this chapter with the methods outlined in Chapter 2. Deep water and non-conventional oil prospects are examined in Chapters 11 and 12, but the results of those analyses in terms of Gulf of Mexico deep water and Canadian non-conventional are summarised at the end of this chapter.

Lower 48 states

The lower 48 states of the US was the first oil province in the world to have the timing of its peak in production forecast in advance—by oil industry geologist King Hubbert. It is one of the world's oldest and most advanced oil producing regions—a fact that can be used to advantage in predicting the development of other regions at an earlier stage of exploitation.

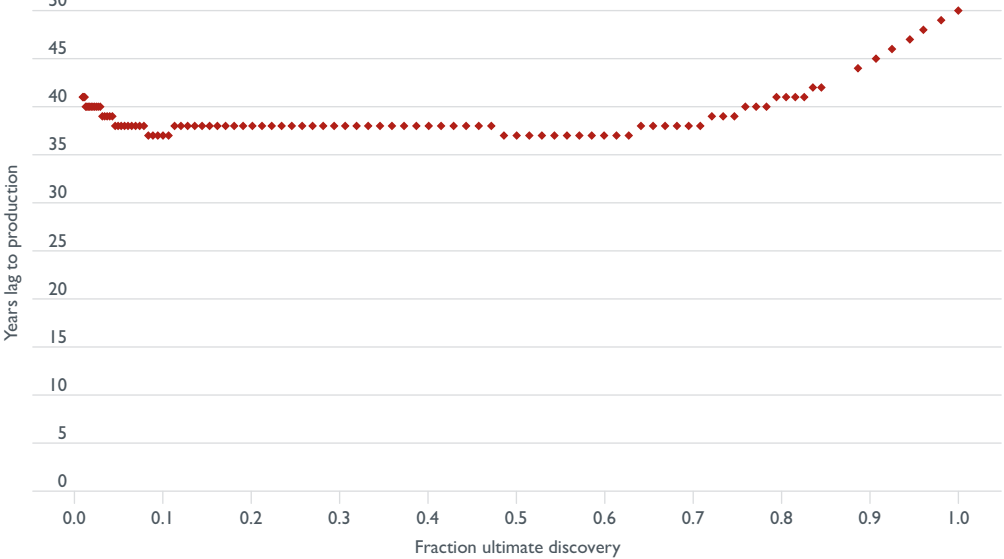
Table 3.1 sets out the calculations from 11 steps to a forecast of production from the region. The first steps are to estimate the ultimate recoverable resource (U) from patterns of growth in production.

1. First, both annual production (P) and cumulative production (CP) are smoothed with a three year average, generating SP and SCP (see Table 3.1).
2. Then the fractional growth in production (SP/SCP) is calculated and plotted against last year's cumulative production (see Figure 2.6).
3. The plot is then examined and a best guess at an ultimate cumulative production (U) is made. In this case, it is 205 gigabarrels.
4. Both discovery (D) and cumulative discovery (CD) are smoothed with 55 year moving averages. This step is iterative with later steps, because the appropriate smoothing is, as said earlier, 'teased out' by successive comparison of fit to the existing part of the cumulative discovery curve. The best guide is to plot the raw CD curve with a trial smoothing against the smoothed cumulative production curve and keep iterating until the smoothed discovery curve seems to match the cumulative production curve. But often it is necessary to revise the smoothing at a later stage and then redo the calculations.
5. Then the fractional growth in discovery (SD/SCD) is calculated and plotted against last year's smoothed cumulative discovery. This plot was shown in Figure 2.5.
6. The plot is examined and a best guess at an ultimate discovery (UD) is made. In this case it is 165 gigabarrels.

- 7. Cumulative discovery in 2006 is already at its expected maximum, so no projection is necessary.
- 8. Next, the height of the cumulative discovery curve has to be adjusted to equal the more reliable cumulative production estimate. In this case, the adjustment amounts to multiplying by 205/165.
- 9. At this stage, we are in the same position as the industrial spy was when he had guessed the final shape of the discovery tower and had used the height estimate for the production tower to correct for distortion in the estimated height of the discovery tower. This gave him a ‘true’ picture of the final discovery tower. Now, assuming he had the smoothing right in step 4 above, he had to figure out the right relative slope rules—the stretch lag.

Figure 3.1 The stretch lag curve for the lower 48 states of the US

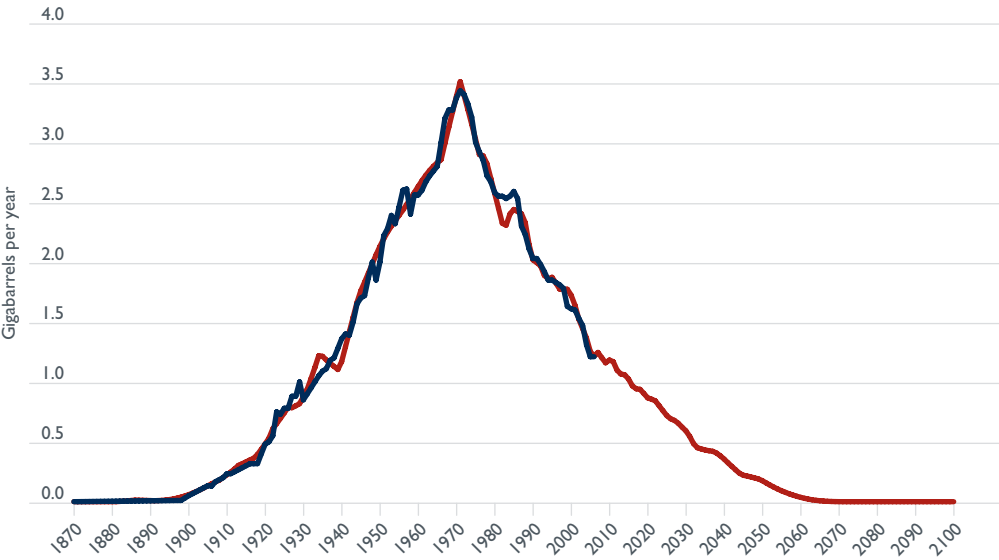
10. Thus the historical stretch lag between the cumulative discovery and production



curves is calculated, and plotted against the fraction of cumulative discovery. This plot is shown for the lower 48 in Figure 3.1. After some noise in the range of zero to 0.2, the stretch lag flattens out and then rises. Extrapolating the trend to 50 years at a cumulative discovery fraction of 1.0 allows the rest of the cumulative production curve to be forecast from the extrapolated discovery curve and the lags.

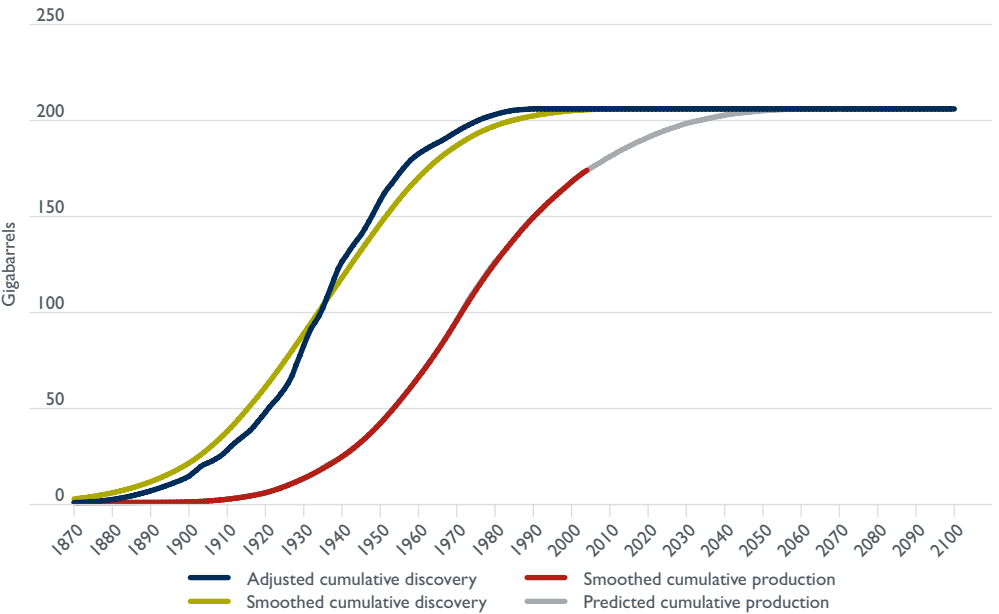
- 11. The predicted cumulative production curve is smoothed with a five year average and then differenced to give a raw predicted annual production. This is then averaged over five years to give a final annual production forecast. This is shown in Figure 3.2.

Figure 3.2 Actual and fitted annual production—lower 48 states



12. Finally the cumulative discovery and production curves (actual and forecast) are plotted in Figure 3.3. This allows a spatial understanding of the relationship between production and discovery. It is not so crucial for the lower 48, with its relatively constant lag, but is important for other producing regions.

Figure 3.3 Adjusted and smoothed cumulative discovery, actual and fitted cumulative production—lower 48 states



Alaska

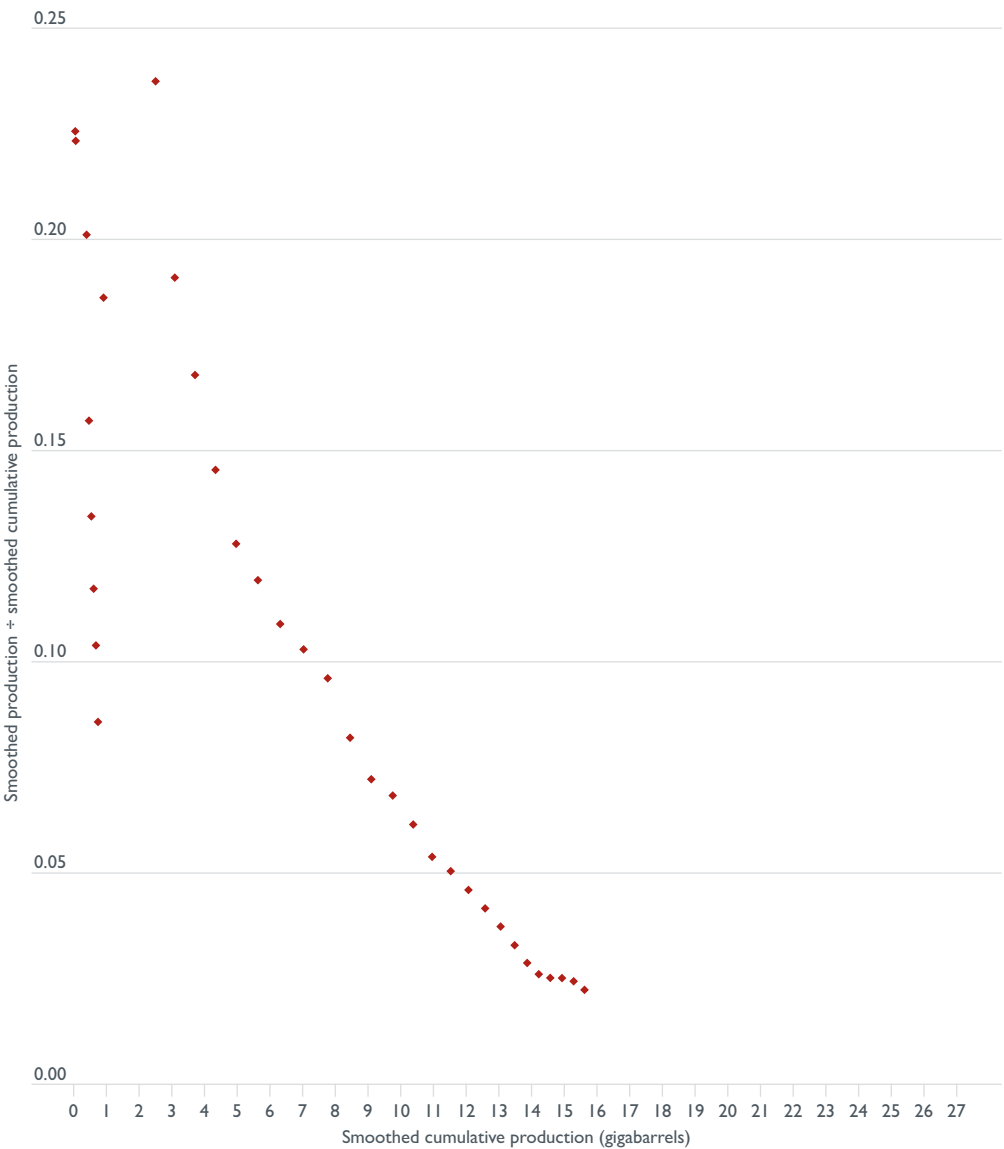
The Alaskan analysis follows the same 11 steps.

Table 3.2 sets out the calculations from the 11 steps to a forecast of production from the Alaskan data.

The first steps are to estimate the ultimate recoverable resource (U) from patterns of growth in production.

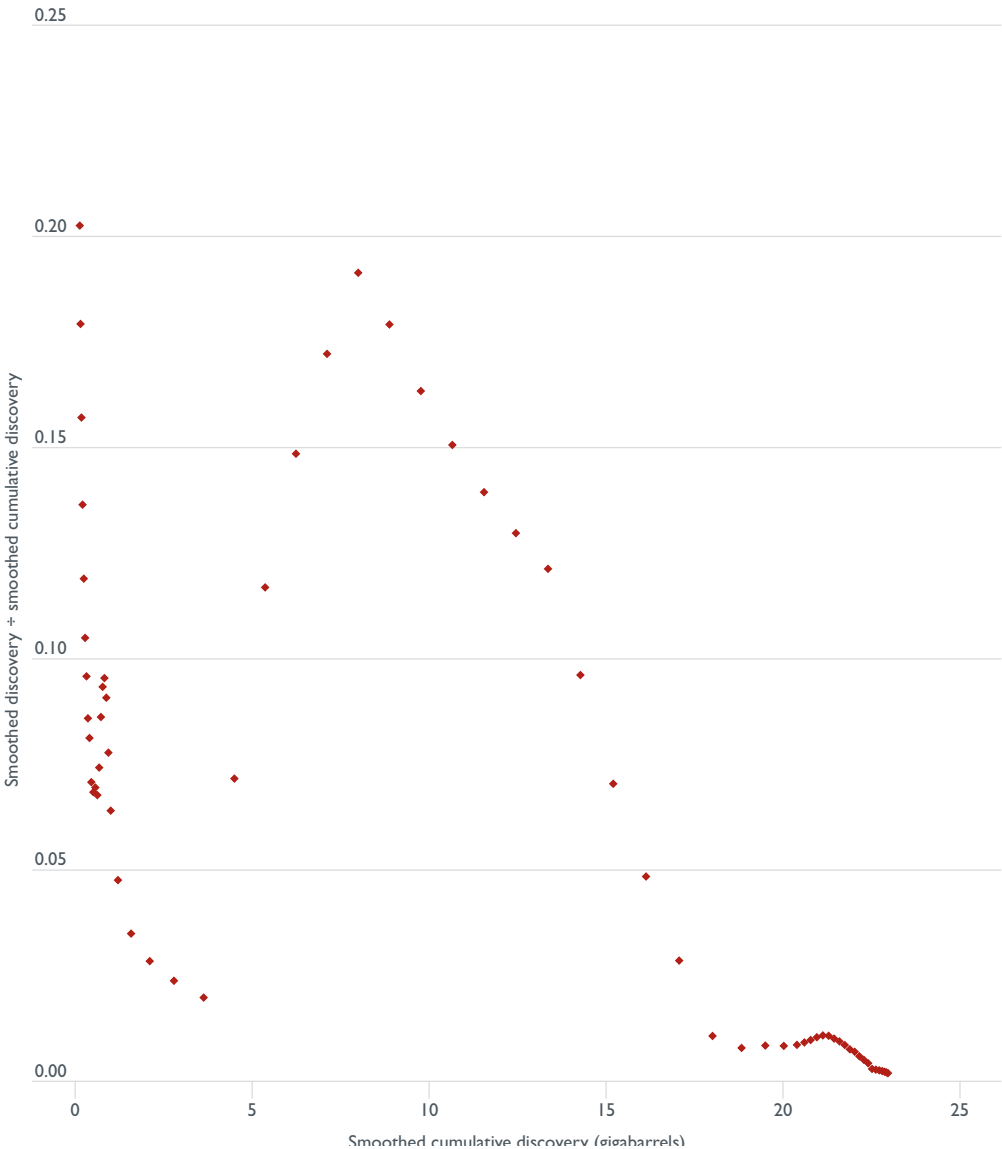
- 1. First, both annual production (P) and cumulative production (CP) are smoothed with a three year average, generating SP and SCP (see Table 3.2).
- 2. Then the fractional growth in production (SP/SCP) is calculated and plotted against last year's cumulative production. This plot is shown in Figure 3.4.

Figure 3.4 Alaskan cumulative production growth curve



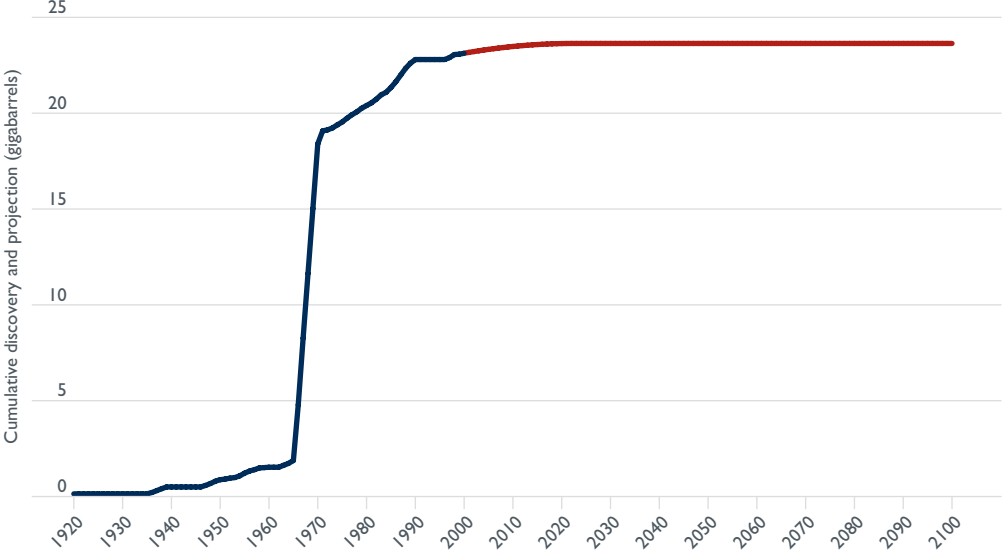
- 3. The plot is then examined and a best guess at an ultimate cumulative production (U) is made. In this case, it is 20 gigabarrels.
- 4. Discovery (D) is smoothed with an 11 year moving average and cumulative discovery (CD) is smoothed with 21 and then 9 year averages.
- 5. Then the fractional growth in discovery (SD/SCD) is calculated and plotted against last year's smoothed cumulative discovery. This plot is shown in Figure 3.5.

Figure 3.5 Alaskan cumulative discovery growth curve



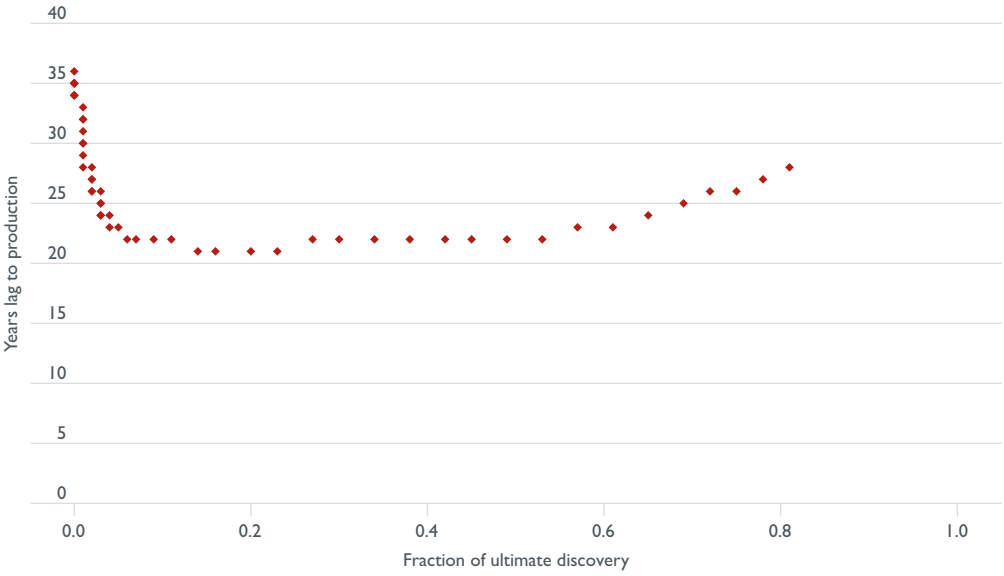
- 6. The plot is examined and a best guess at an ultimate discovery (UD) is made. In this case it is 23.5 gigabarrels.
- 7. Cumulative discovery in 2006 is then projected to UD by bringing SD/SCD estimated for 2006 to zero in 2022. For Alaska, the projection of the cumulative discovery curve is shown in Figure 3.6.

Figure 3.6 Alaskan cumulative discovery projection



- 8. Discovery (D) estimates are adjusted to match the production estimates by multiplying by 20/23.5.
- 9. Next, the historical stretch lag between the cumulative discovery and production curves is calculated, and plotted against the fraction of cumulative discovery. This plot for Alaska is shown in Figure 3.7.

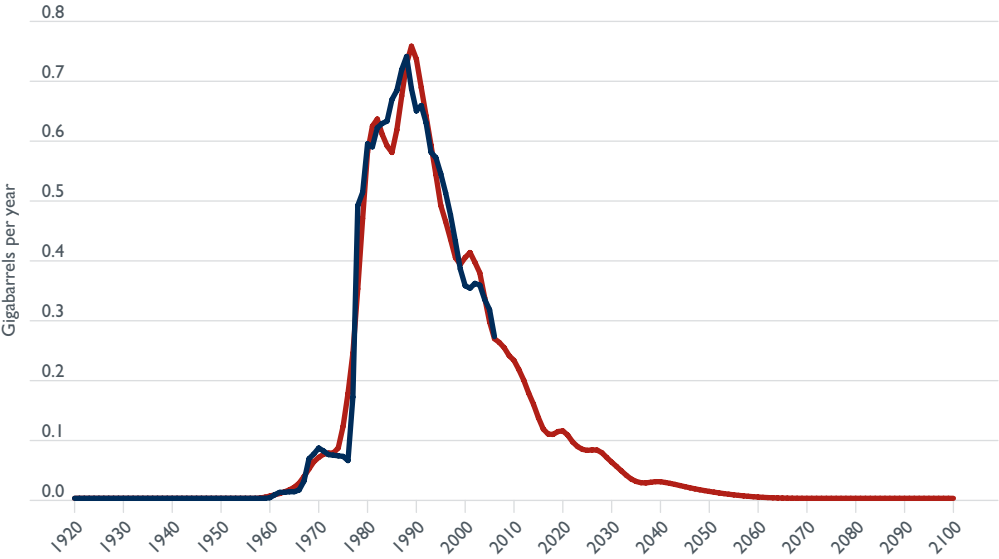
Figure 3.7 Alaskan stretch lag curve



After some noise in the range of zero to 0.1, the stretch lag exhibits a steady rise until 2004. In 2005 and 2006, production was lowered by the closure of the Alaska pipeline, resulting in sharp increases in the lag. Extrapolating the trend from before the closure and applying it from the 2006 lag length to 33 years at 1.0 allows the rest of the cumulative production curve to be forecast from the extrapolated discovery curve and the predicted lags.

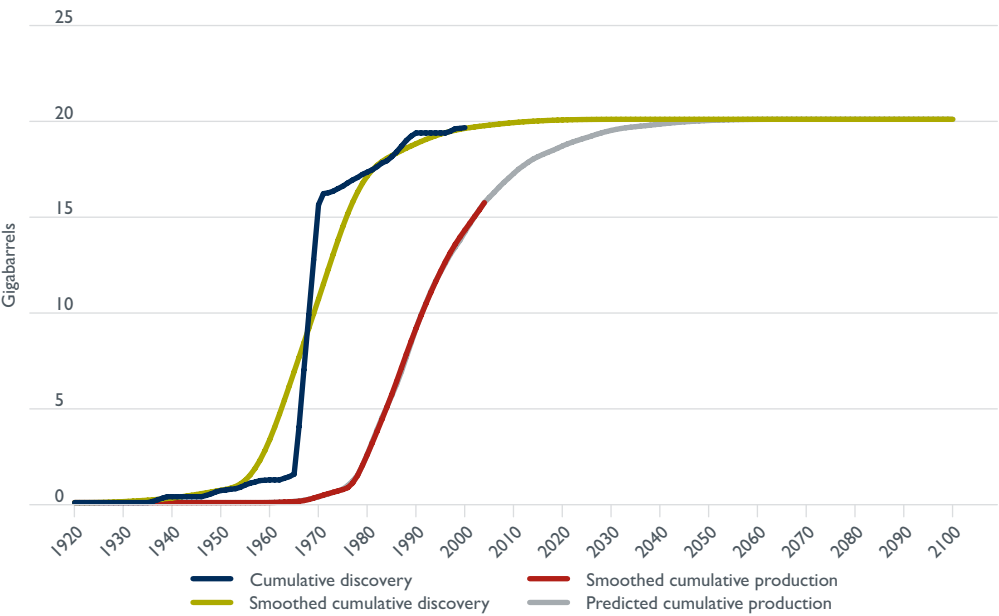
10. The predicted cumulative production curve is smoothed with a five year average and then differenced to give a raw predicted annual production. This is then averaged over three years to give a final annual production forecast. This is shown in Figure 3.8.

Figure 3.8 Alaskan actual and predicted oil production



11. Finally the cumulative discovery and production curves (actual and forecast) are plotted in Figure 3.9. This allows a spatial understanding of the relationship between production and discovery.

Figure 3.9 Alaskan cumulative discovery and production curves



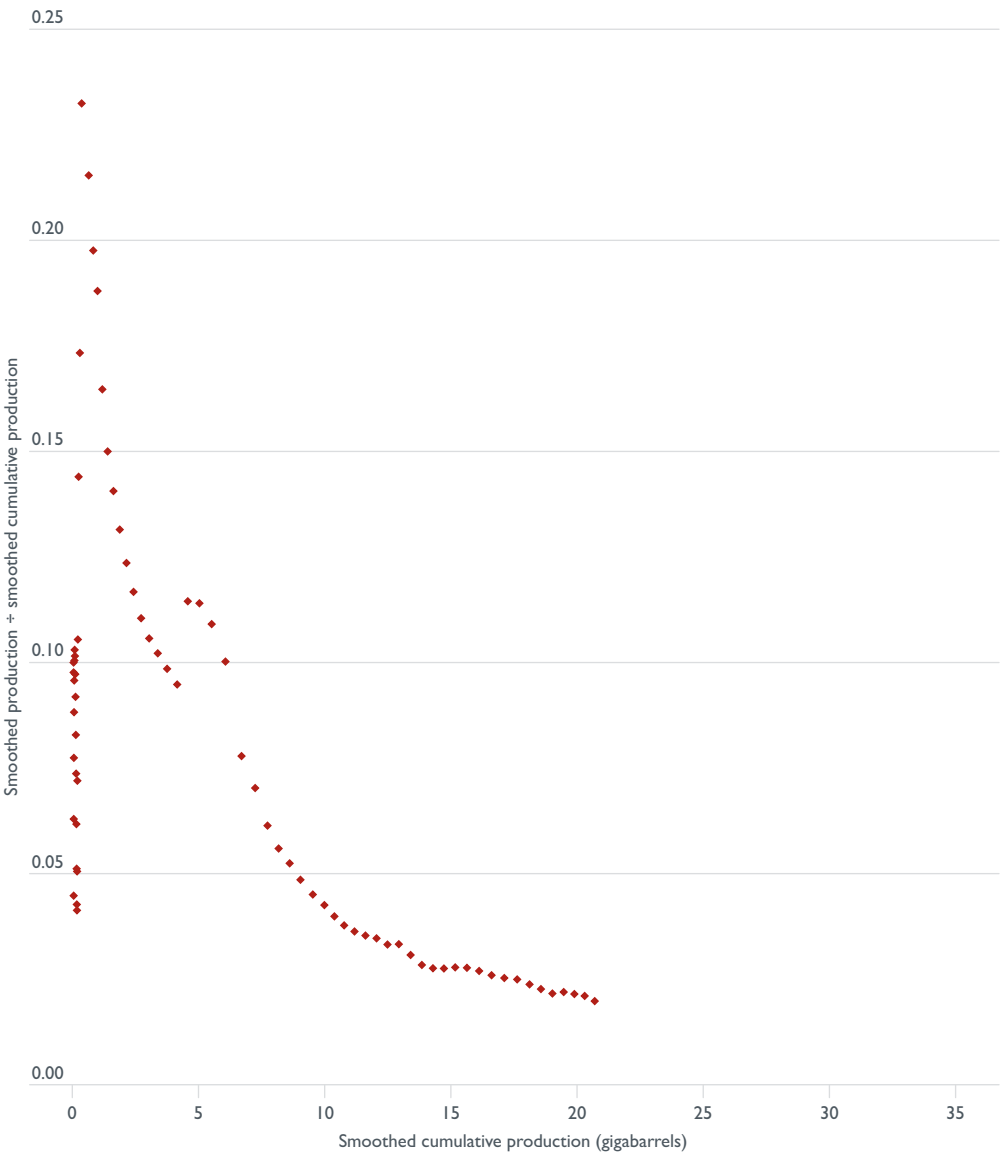
Canadian conventional

Table 3.3 sets out the calculations from the 11 steps to a forecast of production of Canadian conventional oil.

The first steps are to estimate the ultimate recoverable resource (U) from patterns of growth in production.

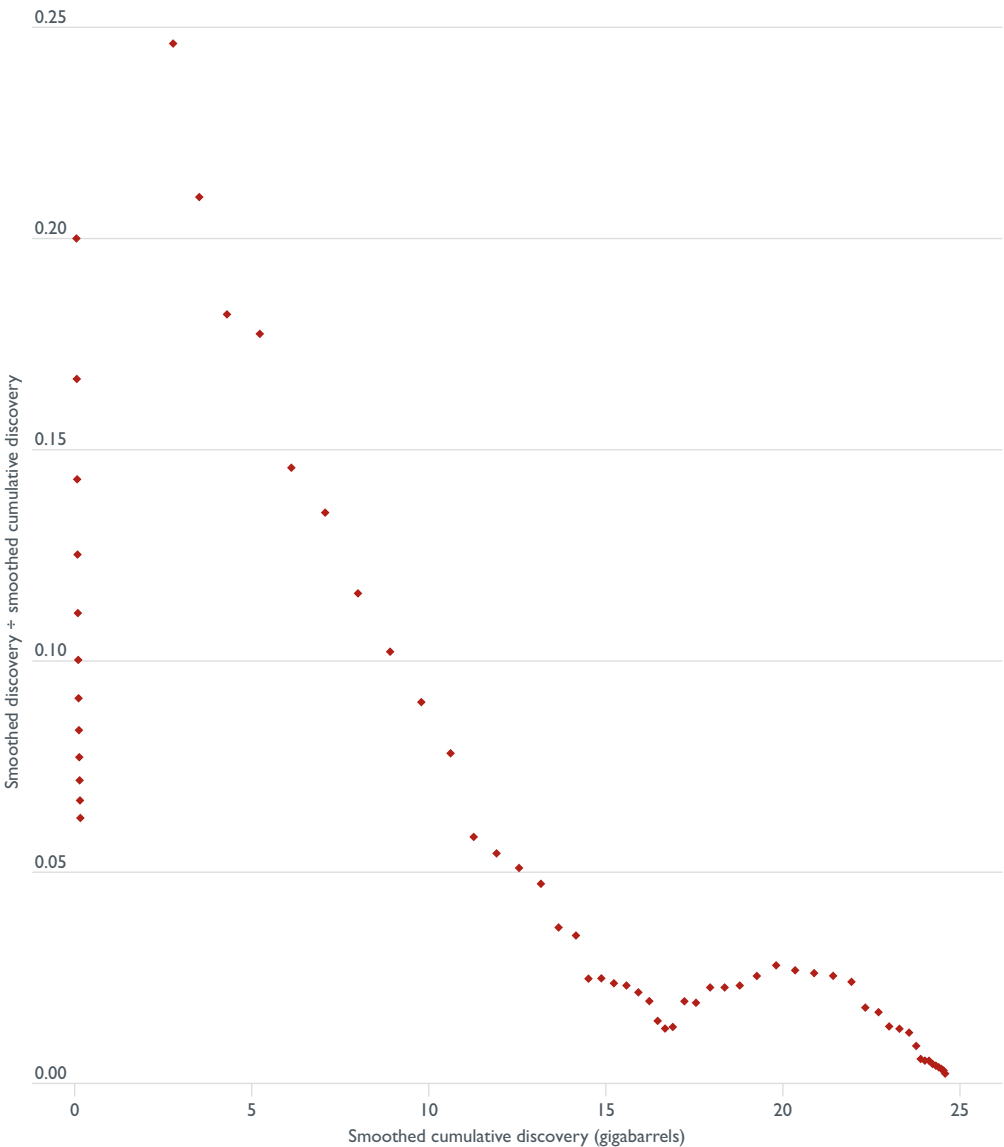
- 1. First, annual production (P) and cumulative production (CP) are smoothed with an 11 year average, generating SP and SCP (see Table 3.3).
- 2. Then the fractional growth in production (SP/SCP) is calculated and plotted against last year's cumulative production. This plot is shown in Figure 3.10.

Figure 3.10 Canadian conventional oil production growth curve



3. The plot is then examined and a best guess at an ultimate cumulative production (U) is made. In this case, it is 30 gigabarrels.
4. Discovery (D) is smoothed with an 11 year moving average and cumulative discovery (CD) is smoothed with a 31 year moving average.
5. Then the fractional growth in discovery (SD/SCD) is calculated and plotted against last year's smoothed cumulative discovery. This plot is shown in Figure 3.11.
6. The plot is examined and a best guess at an ultimate discovery (UD) is made. In this case it is 25 gigabarrels.

Figure 3.11 Canadian conventional oil cumulative discovery growth curve



- 7. Cumulative discovery in 2006 is then projected to UD by bringing SD/SCD estimated for 2006 to zero in 2043. For Canadian conventional oil, the projection of the cumulative discovery curve is shown in Figure 3.12.
- 8. Next, the height of the cumulative discovery curve has to be adjusted to equal the more reliable cumulative production estimate. In this case, the adjustment is upward, amounting to multiplying by 30/25.

Figure 3.12 Canadian conventional oil cumulative discovery projection

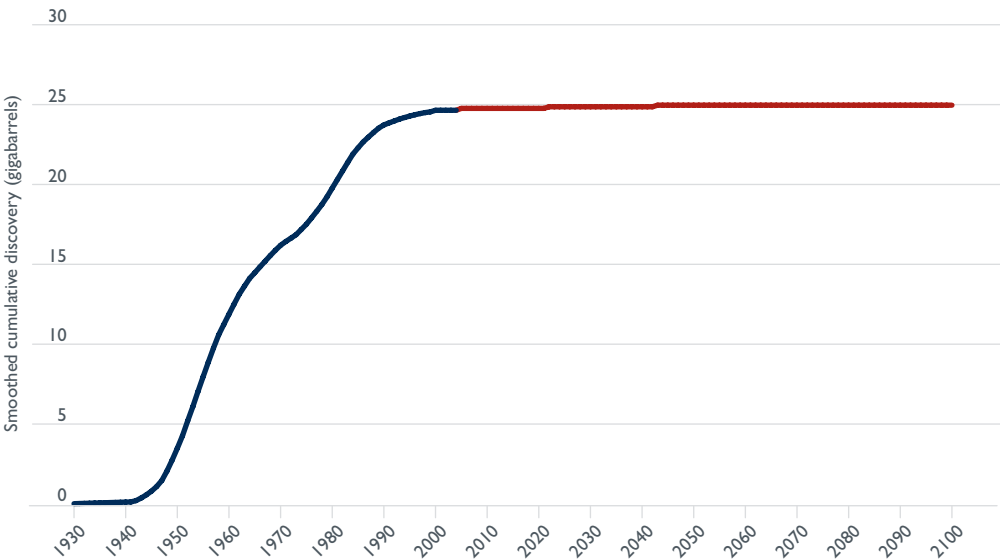
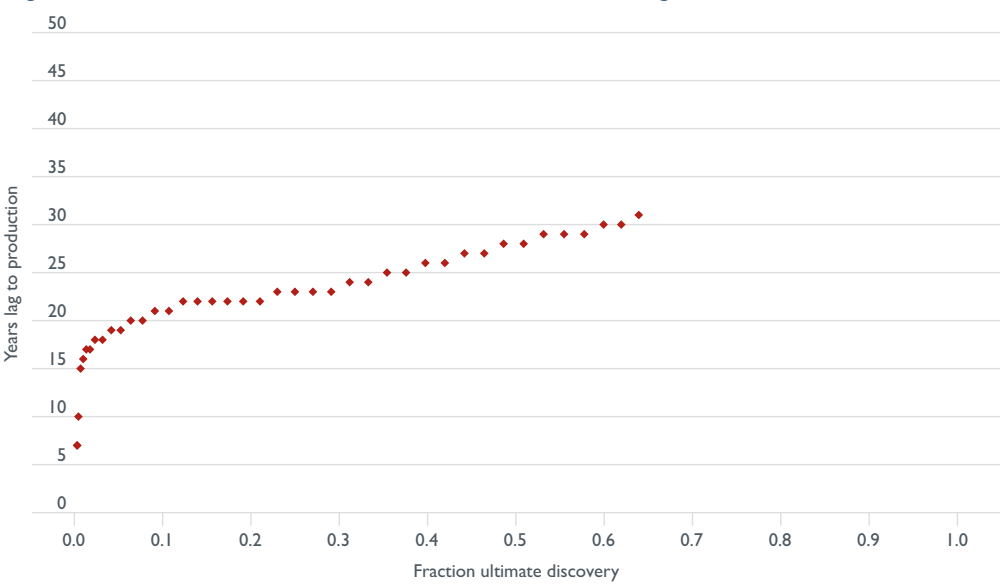


Figure 3.13 Canadian conventional oil stretch lag curve



- 9. Next, the historical stretch lag between the cumulative discovery and production curves is calculated, and plotted against the fraction of cumulative discovery. This plot for Canada is shown in Figure 3.13. It is apparent that there is a regular

relationship. After some noise in the range of zero to 0.2, the stretch lag exhibits a steady rise until 2006. Extrapolating the trend to 39 years at 1.0 allows the rest of the cumulative production curve to be forecast from the extrapolated discovery curve and the predicted lags.

- 10. The predicted cumulative production curve is smoothed with an 11 year average and then differenced to give a raw predicted annual production. This is then averaged over five years to give a final annual production forecast. This is shown in Figure 3.14.

Figure 3.14 Actual and predicted Canadian conventional oil production

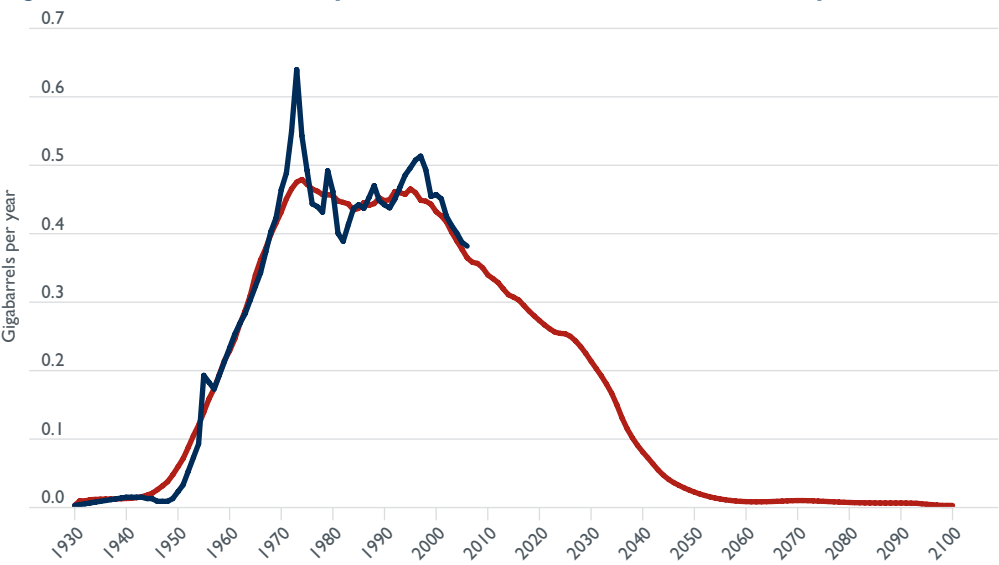
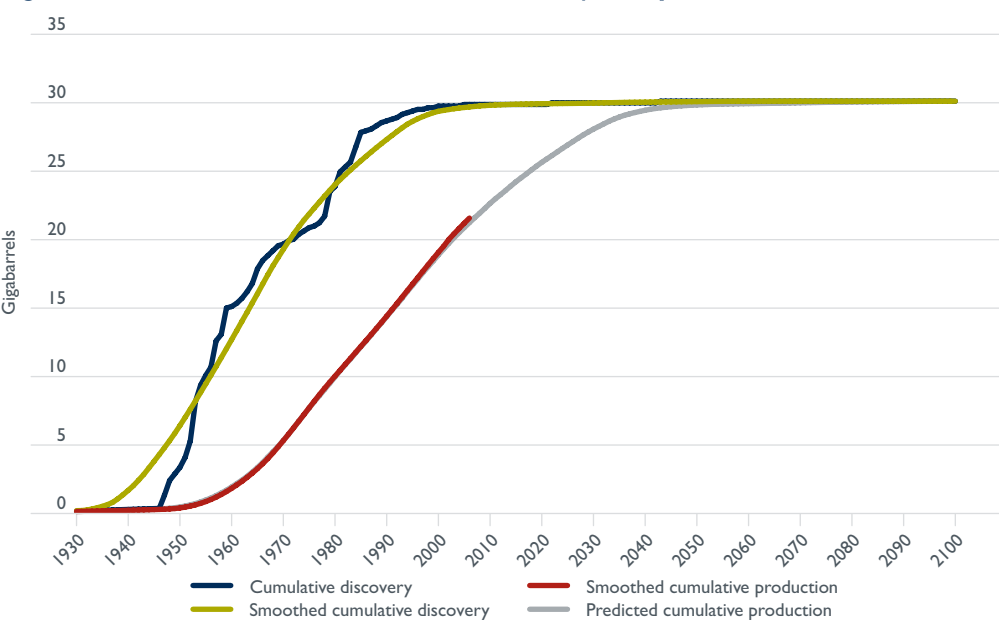


Figure 3.15 Canadian cumulative discovery and production curves



11. Finally the cumulative discovery and production curves (actual and forecast) are plotted in Figure 3.15. This allows a spatial understanding of the relationship between production and discovery.

Deep water and non-conventional oil

Canadian non-conventional oil production comes from tar sands. Figure 3.16 shows historical and projected production. It is apparent that with the decline in conventional production, Canadian oil production will increasingly be coming from the tar sands deposits. The projections in Figure 3.16 agree with those of the Canadian Association of Petroleum Producers. More details of non-conventional oil are given in Chapter 12.

Figure 3.16 Estimated annual production of Canadian heavy oil

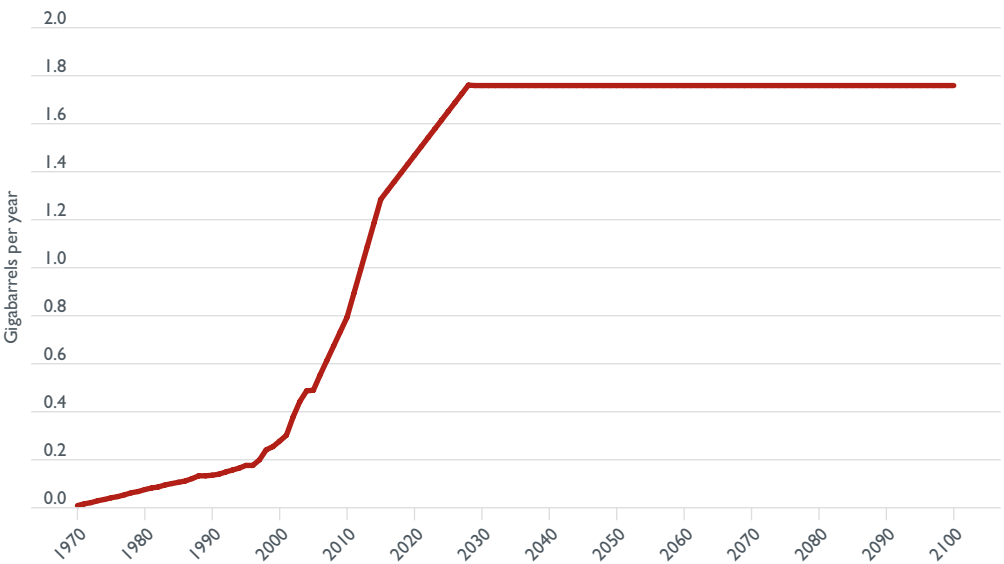
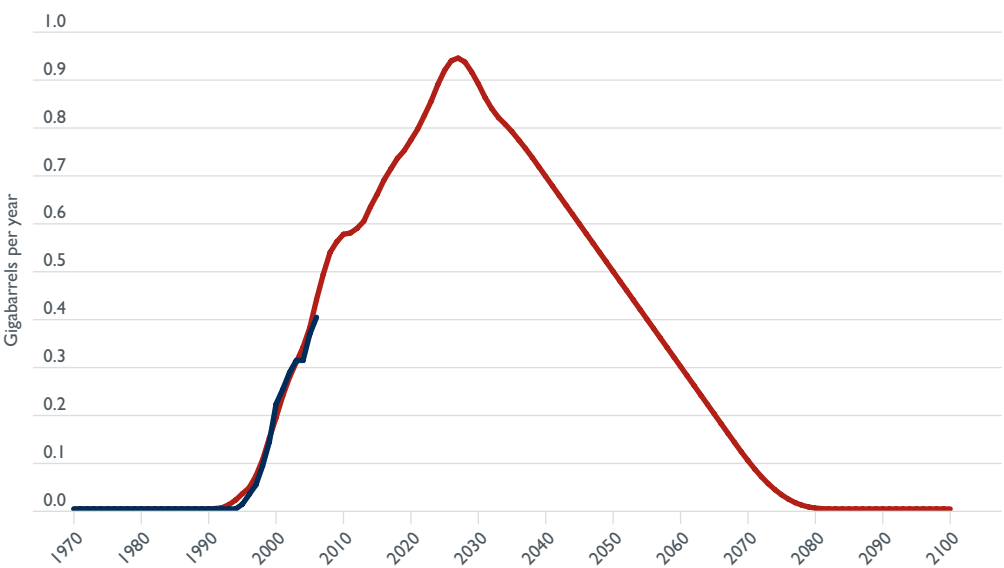


Figure 3.17 Gulf of Mexico deep water oil production



Deep water oil production has commenced from discoveries in the Gulf of Mexico. Figure 3.17 shows best guesses as to historical and future production. The forecasts are based on forecasts of world deep water oil discovery/production detailed in Chapter 11.

North America summary

Assembling the forecasts of the three modelled regions and adding in deep and non-conventional estimates gives the fit of modelled and actual production shown in Figure 3.21. It is apparent that North American crude oil production is set to rebound until about 2030, after which production declines are likely to resume.

Figure 3.18 Actual and predicted North American crude oil production

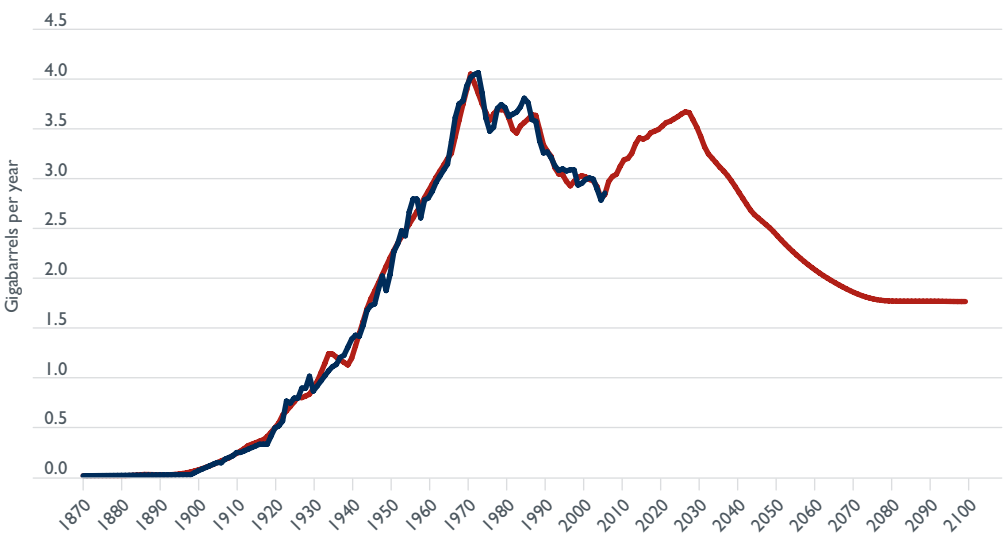
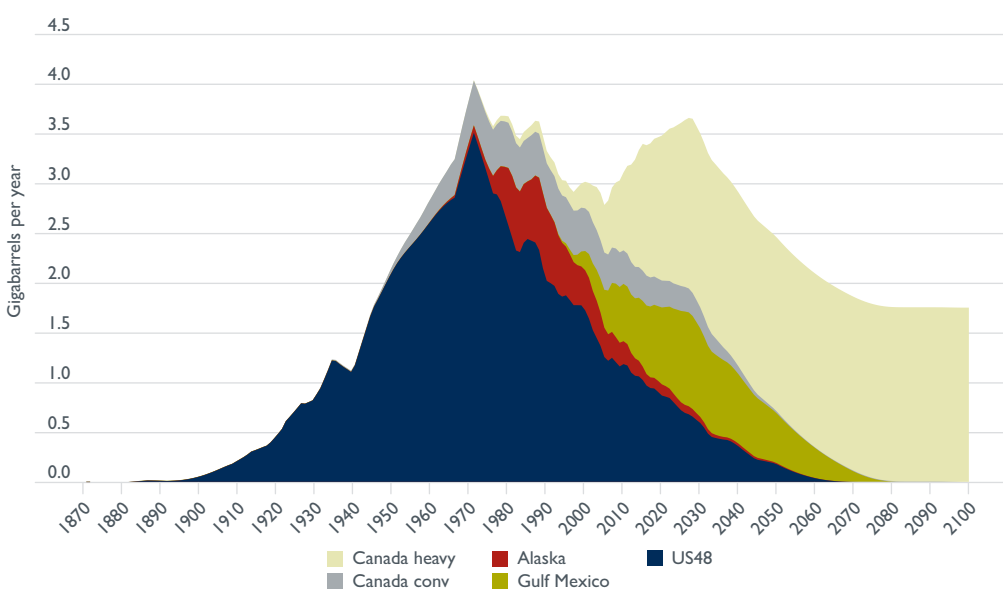


Figure 3.19 Components of North American crude oil production



But it is also apparent that the North American production rebound will be temporary, as the continued decline in conventional and Alaskan oil should be joined after 2030 by declining deep water production.

Table 3.4 summarises the numbers for the five subregions.

Breaking the data down by the five subregions in Figure 3.19 illustrates that the forecast growth of crude oil production in the North American region to 2030 is based on continued expansion of deep water and Canadian non-conventional production.

Table 3.2 Alaska, gigabarrels (continued)

Year	D	CD	9yr SCD	Adj SCD	Predlag	Raw pred CP	5yr smth pred SCP	SCP	Raw pred P	5yr smth pred SP	Actual P
2078	0.00	23.50	23.50	20.00	33	20.00	20.00		0.00	0.00	
2079	0.00	23.50	23.50	20.00	33	20.00	20.00		0.00	0.00	
2080	0.00	23.50	23.50	20.00	33	20.00	20.00		0.00	0.00	
2081	0.00	23.50	23.50	20.00	33	20.00	20.00		0.00	0.00	
2082	0.00	23.50	23.50	20.00	33	20.00	20.00		0.00	0.00	
2083	0.00	23.50	23.50	20.00	33	20.00	20.00		0.00	0.00	
2084	0.00	23.50	23.50	20.00	33	20.00	20.00		0.00	0.00	
2085	0.00	23.50	23.50	20.00	33	20.00	20.00		0.00	0.00	
2086	0.00	23.50	23.50	20.00	33	20.00	20.00		0.00	0.00	
2087	0.00	23.50	23.50	20.00	33	20.00	20.00		0.00	0.00	
2088	0.00	23.50	23.50	20.00	33	20.00	20.00		0.00	0.00	
2089	0.00	23.50	23.50	20.00	33	20.00	20.00		0.00	0.00	
2090	0.00	23.50	23.50	20.00	33	20.00	20.00		0.00	0.00	
2091	0.00	23.50	23.50	20.00	33	20.00	20.00		0.00	0.00	
2092	0.00	23.50	23.50	20.00	33	20.00	20.00		0.00	0.00	
2093	0.00	23.50	23.50	20.00	33	20.00	20.00		0.00	0.00	
2094	0.00	23.50	23.50	20.00	33	20.00	20.00		0.00	0.00	
2095	0.00	23.50	23.50	20.00	33	20.00	20.00		0.00	0.00	
2096	0.00	23.50	23.50	20.00	33	20.00	20.00		0.00	0.00	
2097	0.00	23.50	23.50	20.00	33	20.00	20.00		0.00	0.00	
2098	0.00	23.50	23.50	20.00	33	20.00	20.00		0.00	0.00	
2099	0.00	23.50	23.50	20.00	33	20.00	20.00		0.00	0.00	
2100	0.00	23.50	23.50	20.00	33	20.00	20.00		0.00	0.00	

Notes: D—discovery; CD—cumulative discovery; SCD—smoothed cumulative discovery (years = number of years centred moving average); adj—adjusted (to match cumulative production maximum); predlag—predicted lag between cumulative discovery and cumulative production; raw Pred CP—prediction using direct lag of cumulative discovery by predicted lag years; Pred SCP—raw predicted CP smoothed (with years = number of years centred moving average); SCP—smoothed actual cumulative production (years = number of years centred moving average); raw Pred P—one year change in predicted smoothed cumulative production; Pred SP—smoothed raw Pred P (years = number of years centred moving average); Actual P—actual annual oil production. Shaded numbers are interpolations, extrapolations or forecasts.

Table 3.3 Canadian conventional, gigabarrels (continued)

Year	D	CD	3 1yr SCD	Adj SCD	Pred lag	Raw pred CP	1 1yr smth pred SCP	SCP	Raw pred P	5yr smth pred SP	Actual P
2091	0.00	25.00	25.00	30.00	39	29.98	29.98		0.00	0.00	
2092	0.00	25.00	25.00	30.00	39	29.98	29.98		0.00	0.00	
2093	0.00	25.00	25.00	30.00	39	29.98	29.98		0.00	0.00	
2094	0.00	25.00	25.00	30.00	39	29.99	29.99		0.00	0.00	
2095	0.00	25.00	25.00	30.00	39	29.99	29.99		0.00	0.00	
2096	0.00	25.00	25.00	30.00	39	30.00	30.00		0.00	0.00	
2097	0.00	25.00	25.00	30.00	39	30.00	30.00		0.00	0.00	
2098	0.00	25.00	25.00	30.00	39	30.00	30.00		0.00	0.00	
2099	0.00	25.00	25.00	30.00	39	30.00	30.00		0.00	0.00	
2100	0.00	25.00	25.00	30.00	39	30.00	30.00		0.00	0.00	

Notes: D—discovery; CD—cumulative discovery; SCD—smoothed cumulative discovery (years = number of years centred moving average); adj—adjusted (to match cumulative production maximum); predlag—predicted lag between cumulative discovery and cumulative production; raw Pred CP—prediction using direct lag of cumulative discovery by predicted lag years; Pred SCP—raw predicted CP smoothed (with years = number of years centred moving average); SCP—smoothed actual cumulative production (years = number of years centred moving average); raw Pred P—one year change in predicted smoothed cumulative production; Pred SP—smoothed raw Pred P (years = number of years centred moving average); Actual P—actual annual oil production. Shaded numbers are interpolations, extrapolations or forecasts.

Table 3.4 North America actual, gigabarrels (including deep, polar, non-conventional)

Year	US 48 ex deep	Alaska	Gulf of Mexico deep	USA total	Canada conventional	Canada heavy oil	Canada total	North America total
(actual production)								
1870	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1871	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1872	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1873	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1874	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1875	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1876	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1877	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1878	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1879	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1880	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1881	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1882	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1883	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1884	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01
1885	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01
1886	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01
1887	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01
1888	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01
1889	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01
1890	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01
1891	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01
1892	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01
1893	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01
1894	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01
1895	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01
1896	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01
1897	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01
1898	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01
1899	0.03	0.00	0.00	0.03	0.00	0.00	0.00	0.03
1900	0.05	0.00	0.00	0.05	0.00	0.00	0.00	0.05
1901	0.07	0.00	0.00	0.07	0.00	0.00	0.00	0.07
1902	0.08	0.00	0.00	0.08	0.00	0.00	0.00	0.08
1903	0.10	0.00	0.00	0.10	0.00	0.00	0.00	0.10
1904	0.12	0.00	0.00	0.12	0.00	0.00	0.00	0.12
1905	0.13	0.00	0.00	0.13	0.00	0.00	0.00	0.13
1906	0.13	0.00	0.00	0.13	0.00	0.00	0.00	0.13
1907	0.17	0.00	0.00	0.17	0.00	0.00	0.00	0.17
1908	0.18	0.00	0.00	0.18	0.00	0.00	0.00	0.18
1909	0.20	0.00	0.00	0.20	0.00	0.00	0.00	0.20
1910	0.23	0.00	0.00	0.23	0.00	0.00	0.00	0.23
1911	0.23	0.00	0.00	0.23	0.00	0.00	0.00	0.23
1912	0.25	0.00	0.00	0.25	0.00	0.00	0.00	0.25
1913	0.27	0.00	0.00	0.27	0.00	0.00	0.00	0.27
1914	0.28	0.00	0.00	0.28	0.00	0.00	0.00	0.28
1915	0.30	0.00	0.00	0.30	0.00	0.00	0.00	0.30
1916	0.32	0.00	0.00	0.32	0.00	0.00	0.00	0.32
1917	0.32	0.00	0.00	0.32	0.00	0.00	0.00	0.32
1918	0.32	0.00	0.00	0.32	0.00	0.00	0.00	0.32
1919	0.40	0.00	0.00	0.40	0.00	0.00	0.00	0.40
1920	0.48	0.00	0.00	0.48	0.00	0.00	0.00	0.48
1921	0.50	0.00	0.00	0.50	0.00	0.00	0.00	0.50
1922	0.55	0.00	0.00	0.55	0.00	0.00	0.00	0.55
1923	0.75	0.00	0.00	0.75	0.00	0.00	0.00	0.75
1924	0.73	0.00	0.00	0.73	0.00	0.00	0.00	0.73
1925	0.78	0.00	0.00	0.78	0.00	0.00	0.00	0.78
1926	0.78	0.00	0.00	0.78	0.00	0.00	0.00	0.78
1927	0.88	0.00	0.00	0.88	0.00	0.00	0.00	0.88
1928	0.88	0.00	0.00	0.88	0.00	0.00	0.00	0.88
1929	1.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00
1930	0.85	0.00	0.00	0.85	0.00	0.00	0.00	0.85
1931	0.90	0.00	0.00	0.90	0.00	0.00	0.00	0.90
1932	0.95	0.00	0.00	0.95	0.00	0.00	0.00	0.95
1933	1.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00
1934	1.05	0.00	0.00	1.05	0.00	0.00	0.00	1.05
1935	1.09	0.00	0.00	1.09	0.01	0.00	0.01	1.10
1936	1.11	0.00	0.00	1.11	0.01	0.00	0.01	1.12
1937	1.18	0.00	0.00	1.18	0.01	0.00	0.01	1.19
1938	1.20	0.00	0.00	1.20	0.01	0.00	0.01	1.21
1939	1.28	0.00	0.00	1.28	0.01	0.00	0.01	1.29
1940	1.36	0.00	0.00	1.36	0.01	0.00	0.01	1.37
1941	1.40	0.00	0.00	1.40	0.01	0.00	0.01	1.41
1942	1.39	0.00	0.00	1.39	0.01	0.00	0.01	1.40
1943	1.50	0.00	0.00	1.50	0.01	0.00	0.01	1.51
1944	1.65	0.00	0.00	1.65	0.01	0.00	0.01	1.66
1945	1.70	0.00	0.00	1.70	0.01	0.00	0.01	1.71
1946	1.72	0.00	0.00	1.72	0.01	0.00	0.01	1.73

(continued)

Table 3.4 North America actual, gigabarrels (including deep, polar, non-conventional) (continued)

Year	US 48 ex deep	Alaska	Gulf of Mexico deep	USA total	Canada conventional	Canada heavy oil	Canada total	North America total
(actual production)								
1947	1.87	0.00	0.00	1.87	0.01	0.00	0.01	1.88
1948	2.00	0.00	0.00	2.00	0.01	0.00	0.01	2.01
1949	1.85	0.00	0.00	1.85	0.01	0.00	0.01	1.86
1950	2.00	0.00	0.00	2.00	0.02	0.00	0.02	2.02
1951	2.22	0.00	0.00	2.22	0.03	0.00	0.03	2.25
1952	2.28	0.00	0.00	2.28	0.05	0.00	0.05	2.33
1953	2.39	0.00	0.00	2.39	0.07	0.00	0.07	2.46
1954	2.32	0.00	0.00	2.32	0.09	0.00	0.09	2.41
1955	2.46	0.00	0.00	2.46	0.19	0.00	0.19	2.65
1956	2.60	0.00	0.00	2.60	0.18	0.00	0.18	2.78
1957	2.61	0.00	0.00	2.61	0.17	0.00	0.17	2.78
1958	2.40	0.00	0.00	2.40	0.19	0.00	0.19	2.59
1959	2.56	0.00	0.00	2.56	0.21	0.00	0.21	2.77
1960	2.56	0.00	0.00	2.56	0.23	0.00	0.23	2.79
1961	2.60	0.01	0.00	2.61	0.25	0.00	0.25	2.86
1962	2.67	0.01	0.00	2.68	0.27	0.00	0.27	2.95
1963	2.72	0.01	0.00	2.73	0.28	0.00	0.28	3.01
1964	2.76	0.01	0.00	2.77	0.30	0.00	0.30	3.07
1965	2.80	0.01	0.00	2.81	0.32	0.00	0.32	3.13
1966	3.00	0.01	0.00	3.01	0.34	0.00	0.34	3.35
1967	3.20	0.03	0.00	3.23	0.37	0.00	0.37	3.60
1968	3.27	0.07	0.00	3.34	0.40	0.00	0.40	3.74
1969	3.27	0.07	0.00	3.34	0.42	0.00	0.42	3.76
1970	3.37	0.08	0.00	3.45	0.46	0.00	0.46	3.91
1971	3.43	0.08	0.00	3.51	0.49	0.01	0.49	4.00
1972	3.40	0.07	0.00	3.47	0.55	0.01	0.56	4.03
1973	3.32	0.07	0.00	3.39	0.64	0.02	0.66	4.05
1974	3.21	0.07	0.00	3.28	0.54	0.03	0.57	3.85
1975	3.00	0.07	0.00	3.07	0.49	0.03	0.52	3.59
1976	2.92	0.06	0.00	2.98	0.44	0.04	0.48	3.46
1977	2.85	0.17	0.00	3.02	0.44	0.05	0.48	3.50
1978	2.72	0.49	0.00	3.21	0.43	0.05	0.48	3.69
1979	2.67	0.51	0.00	3.18	0.49	0.06	0.55	3.73
1980	2.58	0.59	0.00	3.17	0.46	0.07	0.53	3.70
1981	2.55	0.59	0.00	3.14	0.40	0.07	0.47	3.61
1982	2.55	0.62	0.00	3.17	0.39	0.08	0.46	3.63
1983	2.53	0.63	0.00	3.16	0.41	0.09	0.50	3.65
1984	2.55	0.63	0.00	3.18	0.43	0.09	0.53	3.71
1985	2.59	0.67	0.00	3.26	0.44	0.10	0.54	3.79
1986	2.53	0.68	0.00	3.21	0.43	0.10	0.54	3.75
1987	2.30	0.72	0.00	3.02	0.45	0.11	0.56	3.58
1988	2.23	0.74	0.00	2.97	0.47	0.12	0.59	3.56
1989	2.11	0.68	0.00	2.79	0.45	0.12	0.57	3.36
1990	2.03	0.65	0.00	2.68	0.44	0.13	0.57	3.24
1991	2.03	0.66	0.00	2.69	0.43	0.13	0.57	3.25
1992	1.98	0.63	0.00	2.61	0.45	0.14	0.59	3.19
1993	1.92	0.58	0.00	2.50	0.47	0.15	0.61	3.11
1994	1.85	0.57	0.00	2.42	0.48	0.16	0.64	3.06
1995	1.85	0.54	0.01	2.40	0.49	0.17	0.66	3.06
1996	1.83	0.51	0.03	2.37	0.50	0.17	0.67	3.04
1997	1.81	0.47	0.05	2.33	0.51	0.19	0.70	3.03
1998	1.78	0.43	0.09	2.30	0.49	0.23	0.72	3.02
1999	1.63	0.38	0.14	2.15	0.45	0.25	0.70	2.85
2000	1.61	0.36	0.22	2.18	0.45	0.27	0.72	2.91
2001	1.60	0.35	0.25	2.20	0.45	0.29	0.74	2.94
2002	1.53	0.36	0.29	2.17	0.42	0.37	0.79	2.97
2003	1.47	0.36	0.31	2.14	0.41	0.43	0.84	2.98
2004	1.31	0.33	0.31	1.95	0.40	0.48	0.88	2.83
2005	1.21	0.32	0.37	1.89	0.38	0.48	0.87	2.76
2006	1.21	0.27	0.40	1.88	0.38	0.54	0.92	2.80

Notes: Ex—excluding; P Pred—Predicted annual production.

Table 3.4 North America predicted, gigabarrels (including deep, polar, non-conventional)

Year	US48 ex deep P Pred	Alaska P Pred	Gulf of Mexico deep P Pred	USA total P Pred	Canada conventional P Pred	Canada heavy oil implied	Canada total P Pred	North America total P Pred
1870	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1871	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1872	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1873	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1874	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1875	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1876	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1877	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1878	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1879	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1880	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1881	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1882	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1883	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1884	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01
1885	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01
1886	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01
1887	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01
1888	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01
1889	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01
1890	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01
1891	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01
1892	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01
1893	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01
1894	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01
1895	0.02	0.00	0.00	0.02	0.00	0.00	0.00	0.02
1896	0.02	0.00	0.00	0.02	0.00	0.00	0.00	0.02
1897	0.03	0.00	0.00	0.03	0.00	0.00	0.00	0.03
1898	0.04	0.00	0.00	0.04	0.00	0.00	0.00	0.04
1899	0.05	0.00	0.00	0.05	0.00	0.00	0.00	0.05
1900	0.06	0.00	0.00	0.06	0.00	0.00	0.00	0.06
1901	0.07	0.00	0.00	0.07	0.00	0.00	0.00	0.07
1902	0.08	0.00	0.00	0.08	0.00	0.00	0.00	0.08
1903	0.10	0.00	0.00	0.10	0.00	0.00	0.00	0.10
1904	0.12	0.00	0.00	0.12	0.00	0.00	0.00	0.12
1905	0.13	0.00	0.00	0.13	0.00	0.00	0.00	0.13
1906	0.15	0.00	0.00	0.15	0.00	0.00	0.00	0.15
1907	0.17	0.00	0.00	0.17	0.00	0.00	0.00	0.17
1908	0.18	0.00	0.00	0.18	0.00	0.00	0.00	0.18
1909	0.20	0.00	0.00	0.20	0.00	0.00	0.00	0.20
1910	0.22	0.00	0.00	0.22	0.00	0.00	0.00	0.22
1911	0.25	0.00	0.00	0.25	0.00	0.00	0.00	0.25
1912	0.27	0.00	0.00	0.27	0.00	0.00	0.00	0.27
1913	0.30	0.00	0.00	0.30	0.00	0.00	0.00	0.30
1914	0.32	0.00	0.00	0.32	0.00	0.00	0.00	0.32
1915	0.33	0.00	0.00	0.33	0.00	0.00	0.00	0.33
1916	0.35	0.00	0.00	0.35	0.00	0.00	0.00	0.35
1917	0.36	0.00	0.00	0.36	0.00	0.00	0.00	0.36
1918	0.39	0.00	0.00	0.39	0.00	0.00	0.00	0.39
1919	0.44	0.00	0.00	0.44	0.00	0.00	0.00	0.44
1920	0.48	0.00	0.00	0.48	0.00	0.00	0.00	0.48
1921	0.53	0.00	0.00	0.53	0.00	0.00	0.00	0.53
1922	0.61	0.00	0.00	0.61	0.00	0.00	0.00	0.61
1923	0.65	0.00	0.00	0.65	0.00	0.00	0.00	0.65
1924	0.70	0.00	0.00	0.70	0.00	0.00	0.00	0.70
1925	0.74	0.00	0.00	0.74	0.00	0.00	0.00	0.74
1926	0.79	0.00	0.00	0.79	0.00	0.00	0.00	0.79
1927	0.78	0.00	0.00	0.78	0.00	0.00	0.00	0.78
1928	0.80	0.00	0.00	0.80	0.00	0.00	0.00	0.80
1929	0.82	0.00	0.00	0.82	0.00	0.00	0.00	0.82
1930	0.88	0.00	0.00	0.88	0.00	0.00	0.00	0.88
1931	0.94	0.00	0.00	0.94	0.01	0.00	0.01	0.95
1932	1.03	0.00	0.00	1.03	0.01	0.00	0.01	1.03
1933	1.12	0.00	0.00	1.12	0.01	0.00	0.01	1.13
1934	1.22	0.00	0.00	1.22	0.01	0.00	0.01	1.23
1935	1.21	0.00	0.00	1.21	0.01	0.00	0.01	1.22
1936	1.18	0.00	0.00	1.18	0.01	0.00	0.01	1.19
1937	1.15	0.00	0.00	1.15	0.01	0.00	0.01	1.16
1938	1.13	0.00	0.00	1.13	0.01	0.00	0.01	1.14
1939	1.10	0.00	0.00	1.10	0.01	0.00	0.01	1.11
1940	1.17	0.00	0.00	1.17	0.01	0.00	0.01	1.18
1941	1.29	0.00	0.00	1.29	0.01	0.00	0.01	1.30
1942	1.42	0.00	0.00	1.42	0.01	0.00	0.01	1.43
1943	1.54	0.00	0.00	1.54	0.01	0.00	0.01	1.55
1944	1.66	0.00	0.00	1.66	0.01	0.00	0.01	1.68
1945	1.76	0.00	0.00	1.76	0.02	0.00	0.02	1.78
1946	1.83	0.00	0.00	1.83	0.02	0.00	0.02	1.86
1947	1.91	0.00	0.00	1.91	0.03	0.00	0.03	1.94

(continued)

Table 3.4 North America predicted, gigabarrels (including deep, polar, non-conventional) (continued)

Year	US48 ex deep P Pred	Alaska P Pred	Gulf of Mexico deep P Pred	USA total P Pred	Canada conventional P Pred	Canada heavy oil implied	Canada total P Pred	North America total P Pred
1948	1.98	0.00	0.00	1.98	0.03	0.00	0.03	2.02
1949	2.06	0.00	0.00	2.06	0.04	0.00	0.04	2.11
1950	2.13	0.00	0.00	2.13	0.06	0.00	0.06	2.19
1951	2.19	0.00	0.00	2.19	0.07	0.00	0.07	2.26
1952	2.25	0.00	0.00	2.25	0.08	0.00	0.08	2.34
1953	2.30	0.00	0.00	2.30	0.10	0.00	0.10	2.40
1954	2.35	0.00	0.00	2.35	0.12	0.00	0.12	2.46
1955	2.39	0.00	0.00	2.39	0.14	0.00	0.14	2.53
1956	2.43	0.00	0.00	2.43	0.16	0.00	0.16	2.59
1957	2.48	0.00	0.00	2.48	0.17	0.00	0.17	2.65
1958	2.53	0.00	0.00	2.53	0.19	0.00	0.19	2.72
1959	2.58	0.00	0.00	2.58	0.21	0.00	0.21	2.79
1960	2.63	0.00	0.00	2.63	0.23	0.00	0.23	2.86
1961	2.68	0.01	0.00	2.69	0.24	0.00	0.24	2.93
1962	2.72	0.01	0.00	2.73	0.27	0.00	0.27	3.00
1963	2.77	0.01	0.00	2.78	0.28	0.00	0.28	3.06
1964	2.80	0.01	0.00	2.81	0.31	0.00	0.31	3.12
1965	2.83	0.02	0.00	2.85	0.34	0.00	0.34	3.19
1966	2.85	0.03	0.00	2.88	0.36	0.00	0.36	3.24
1967	2.99	0.04	0.00	3.03	0.38	0.00	0.38	3.40
1968	3.13	0.05	0.00	3.17	0.40	0.00	0.40	3.57
1969	3.26	0.06	0.00	3.32	0.41	0.00	0.41	3.73
1970	3.38	0.07	0.00	3.45	0.43	0.00	0.43	3.88
1971	3.51	0.07	0.00	3.58	0.45	0.01	0.46	4.04
1972	3.39	0.08	0.00	3.47	0.46	0.01	0.47	3.94
1973	3.27	0.08	0.00	3.35	0.47	0.02	0.49	3.84
1974	3.15	0.08	0.00	3.23	0.48	0.03	0.50	3.74
1975	3.03	0.12	0.00	3.15	0.47	0.03	0.50	3.65
1976	2.90	0.18	0.00	3.07	0.46	0.04	0.50	3.57
1977	2.89	0.24	0.00	3.13	0.46	0.05	0.50	3.63
1978	2.82	0.35	0.00	3.17	0.45	0.05	0.51	3.68
1979	2.70	0.47	0.00	3.16	0.45	0.06	0.51	3.68
1980	2.57	0.58	0.00	3.15	0.45	0.07	0.52	3.67
1981	2.45	0.62	0.00	3.07	0.44	0.07	0.52	3.59
1982	2.32	0.63	0.00	2.96	0.44	0.08	0.52	3.48
1983	2.31	0.61	0.00	2.92	0.44	0.09	0.53	3.44
1984	2.40	0.59	0.00	2.99	0.43	0.09	0.52	3.51
1985	2.44	0.58	0.00	3.02	0.43	0.10	0.53	3.55
1986	2.42	0.62	0.00	3.04	0.44	0.10	0.54	3.58
1987	2.40	0.67	0.00	3.08	0.44	0.11	0.55	3.63
1988	2.33	0.73	0.00	3.05	0.44	0.12	0.57	3.62
1989	2.15	0.76	0.00	2.90	0.45	0.12	0.57	3.47
1990	2.02	0.73	0.00	2.75	0.45	0.13	0.57	3.32
1991	2.00	0.69	0.00	2.68	0.45	0.13	0.58	3.26
1992	1.97	0.64	0.00	2.61	0.46	0.14	0.60	3.21
1993	1.89	0.59	0.01	2.49	0.46	0.15	0.61	3.09
1994	1.86	0.54	0.02	2.42	0.45	0.16	0.61	3.03
1995	1.87	0.49	0.03	2.39	0.46	0.17	0.63	3.02
1996	1.83	0.46	0.04	2.33	0.46	0.17	0.62	2.96
1997	1.77	0.43	0.07	2.28	0.45	0.19	0.64	2.91
1998	1.77	0.40	0.10	2.28	0.44	0.23	0.68	2.96
1999	1.77	0.39	0.15	2.31	0.44	0.25	0.69	3.00
2000	1.72	0.40	0.19	2.32	0.43	0.27	0.70	3.01
2001	1.64	0.41	0.24	2.29	0.42	0.29	0.72	3.00
2002	1.52	0.39	0.27	2.19	0.41	0.37	0.78	2.98
2003	1.44	0.38	0.31	2.13	0.40	0.43	0.83	2.96
2004	1.37	0.33	0.34	2.04	0.39	0.48	0.86	2.90
2005	1.25	0.29	0.38	1.93	0.37	0.48	0.86	2.78
2006	1.22	0.27	0.44	1.92	0.36	0.54	0.91	2.83
2007	1.25	0.26	0.49	2.00	0.36	0.60	0.96	2.96
2008	1.20	0.25	0.54	1.99	0.35	0.66	1.02	3.01
2009	1.16	0.24	0.56	1.95	0.35	0.72	1.07	3.03
2010	1.18	0.23	0.57	1.99	0.34	0.79	1.12	3.11
2011	1.17	0.21	0.58	1.96	0.33	0.88	1.21	3.17
2012	1.10	0.20	0.59	1.88	0.33	0.98	1.31	3.19
2013	1.07	0.18	0.60	1.84	0.32	1.08	1.40	3.24
2014	1.06	0.16	0.63	1.85	0.31	1.18	1.49	3.33
2015	1.02	0.13	0.66	1.81	0.30	1.28	1.58	3.39
2016	0.97	0.12	0.69	1.77	0.30	1.31	1.61	3.38
2017	0.94	0.11	0.71	1.76	0.29	1.35	1.64	3.40
2018	0.94	0.11	0.73	1.78	0.28	1.39	1.67	3.45
2019	0.90	0.11	0.75	1.76	0.28	1.42	1.70	3.46
2020	0.87	0.11	0.77	1.75	0.27	1.46	1.73	3.48
2021	0.86	0.11	0.79	1.75	0.26	1.50	1.76	3.51
2022	0.84	0.09	0.82	1.76	0.26	1.53	1.79	3.55
2023	0.80	0.09	0.85	1.74	0.25	1.57	1.82	3.56
2024	0.76	0.08	0.89	1.73	0.25	1.61	1.86	3.58

(continued)

Table 3.4 North America predicted, gigabarrels (including deep, polar, non-conventional) (continued)

Year	US48 ex deep P Pred	Alaska P Pred	Gulf of Mexico deep P Pred	USA total P Pred	Canada conventional P Pred	Canada heavy oil implied	Canada total P Pred	North America total P Pred
2025	0.72	0.08	0.92	1.71	0.25	1.64	1.89	3.61
2026	0.69	0.08	0.94	1.71	0.25	1.68	1.93	3.63
2027	0.68	0.08	0.94	1.70	0.24	1.72	1.96	3.66
2028	0.65	0.08	0.93	1.66	0.23	1.75	1.98	3.65
2029	0.62	0.07	0.91	1.60	0.22	1.75	1.97	3.57
2030	0.59	0.06	0.89	1.54	0.21	1.75	1.96	3.50
2031	0.54	0.05	0.86	1.46	0.20	1.75	1.95	3.41
2032	0.48	0.05	0.84	1.37	0.19	1.75	1.94	3.30
2033	0.45	0.04	0.82	1.31	0.18	1.75	1.93	3.23
2034	0.44	0.03	0.80	1.28	0.16	1.75	1.91	3.19
2035	0.43	0.03	0.79	1.25	0.15	1.75	1.90	3.14
2036	0.43	0.03	0.77	1.22	0.13	1.75	1.88	3.10
2037	0.42	0.03	0.75	1.20	0.11	1.75	1.86	3.06
2038	0.41	0.03	0.73	1.17	0.10	1.75	1.85	3.01
2039	0.38	0.03	0.71	1.12	0.09	1.75	1.84	2.96
2040	0.36	0.03	0.69	1.08	0.08	1.75	1.83	2.90
2041	0.32	0.03	0.67	1.02	0.07	1.75	1.82	2.84
2042	0.29	0.02	0.65	0.97	0.06	1.75	1.81	2.78
2043	0.27	0.02	0.63	0.92	0.05	1.75	1.80	2.72
2044	0.24	0.02	0.61	0.87	0.04	1.75	1.79	2.67
2045	0.22	0.02	0.59	0.83	0.04	1.75	1.79	2.62
2046	0.21	0.02	0.57	0.81	0.03	1.75	1.78	2.59
2047	0.21	0.02	0.56	0.78	0.03	1.75	1.78	2.56
2048	0.20	0.01	0.54	0.75	0.03	1.75	1.78	2.52
2049	0.19	0.01	0.52	0.72	0.02	1.75	1.77	2.49
2050	0.18	0.01	0.50	0.68	0.02	1.75	1.77	2.45
2051	0.16	0.01	0.48	0.64	0.02	1.75	1.77	2.41
2052	0.14	0.01	0.46	0.60	0.01	1.75	1.76	2.37
2053	0.12	0.01	0.44	0.57	0.01	1.75	1.76	2.33
2054	0.11	0.01	0.42	0.53	0.01	1.75	1.76	2.29
2055	0.09	0.01	0.40	0.49	0.01	1.75	1.76	2.25
2056	0.08	0.00	0.38	0.46	0.01	1.75	1.76	2.22
2057	0.07	0.00	0.36	0.43	0.01	1.75	1.76	2.18
2058	0.05	0.00	0.34	0.40	0.01	1.75	1.76	2.15
2059	0.04	0.00	0.32	0.36	0.01	1.75	1.76	2.12
2060	0.04	0.00	0.30	0.34	0.01	1.75	1.76	2.09
2061	0.03	0.00	0.28	0.31	0.01	1.75	1.76	2.06
2062	0.02	0.00	0.26	0.28	0.01	1.75	1.76	2.04
2063	0.02	0.00	0.24	0.25	0.01	1.75	1.76	2.01
2064	0.01	0.00	0.22	0.23	0.01	1.75	1.76	1.99
2065	0.01	0.00	0.20	0.21	0.01	1.75	1.76	1.96
2066	0.01	0.00	0.18	0.18	0.01	1.75	1.76	1.94
2067	0.00	0.00	0.16	0.16	0.01	1.75	1.76	1.92
2068	0.00	0.00	0.14	0.14	0.01	1.75	1.76	1.90
2069	0.00	0.00	0.12	0.12	0.01	1.75	1.76	1.88
2070	0.00	0.00	0.10	0.10	0.01	1.75	1.76	1.86
2071	0.00	0.00	0.08	0.08	0.01	1.75	1.76	1.84
2072	0.00	0.00	0.07	0.07	0.01	1.75	1.76	1.82
2073	0.00	0.00	0.05	0.05	0.01	1.75	1.76	1.81
2074	0.00	0.00	0.04	0.04	0.01	1.75	1.76	1.80
2075	0.00	0.00	0.03	0.03	0.01	1.75	1.76	1.79
2076	0.00	0.00	0.02	0.02	0.01	1.75	1.76	1.78
2077	0.00	0.00	0.01	0.01	0.01	1.75	1.76	1.77
2078	0.00	0.00	0.01	0.01	0.00	1.75	1.75	1.76
2079	0.00	0.00	0.00	0.00	0.00	1.75	1.75	1.76
2080	0.00	0.00	0.00	0.00	0.00	1.75	1.75	1.76
2081	0.00	0.00	0.00	0.00	0.00	1.75	1.75	1.75
2082	0.00	0.00	0.00	0.00	0.00	1.75	1.75	1.75
2083	0.00	0.00	0.00	0.00	0.00	1.75	1.75	1.75
2084	0.00	0.00	0.00	0.00	0.00	1.75	1.75	1.75
2085	0.00	0.00	0.00	0.00	0.00	1.75	1.75	1.75
2086	0.00	0.00	0.00	0.00	0.00	1.75	1.75	1.75
2087	0.00	0.00	0.00	0.00	0.00	1.75	1.75	1.75
2088	0.00	0.00	0.00	0.00	0.00	1.75	1.75	1.75
2089	0.00	0.00	0.00	0.00	0.00	1.75	1.75	1.75
2090	0.00	0.00	0.00	0.00	0.00	1.75	1.75	1.75
2091	0.00	0.00	0.00	0.00	0.00	1.75	1.75	1.75
2092	0.00	0.00	0.00	0.00	0.00	1.75	1.75	1.75
2093	0.00	0.00	0.00	0.00	0.00	1.75	1.75	1.75
2094	0.00	0.00	0.00	0.00	0.00	1.75	1.75	1.75
2095	0.00	0.00	0.00	0.00	0.00	1.75	1.75	1.75
2096	0.00	0.00	0.00	0.00	0.00	1.75	1.75	1.75
2097	0.00	0.00	0.00	0.00	0.00	1.75	1.75	1.75
2098	0.00	0.00	0.00	0.00	0.00	1.75	1.75	1.75
2099	0.00	0.00	0.00	0.00	0.00	1.75	1.75	1.75
2100	0.00	0.00	0.00	0.00	0.00	1.75	1.75	1.75

Notes: Ex—excluding; P Pred—Predicted annual production.

bitre

Chapter 4

Latin America



Chapter 4 Latin America

Latin America will be analysed as five major oil-producing subregions: conventional oil production in Venezuela, Mexico, and the rest of Latin America, non-conventional (heavy oil) in Venezuela, and deep water production in Brazil. The three conventional areas will be analysed first. Brazilian deep water and Venezuelan non-conventional oil prospects will be examined in more detail in Chapters 11 and 12, but the results of that analysis as concerns Latin America will be summarised at the end of this chapter.

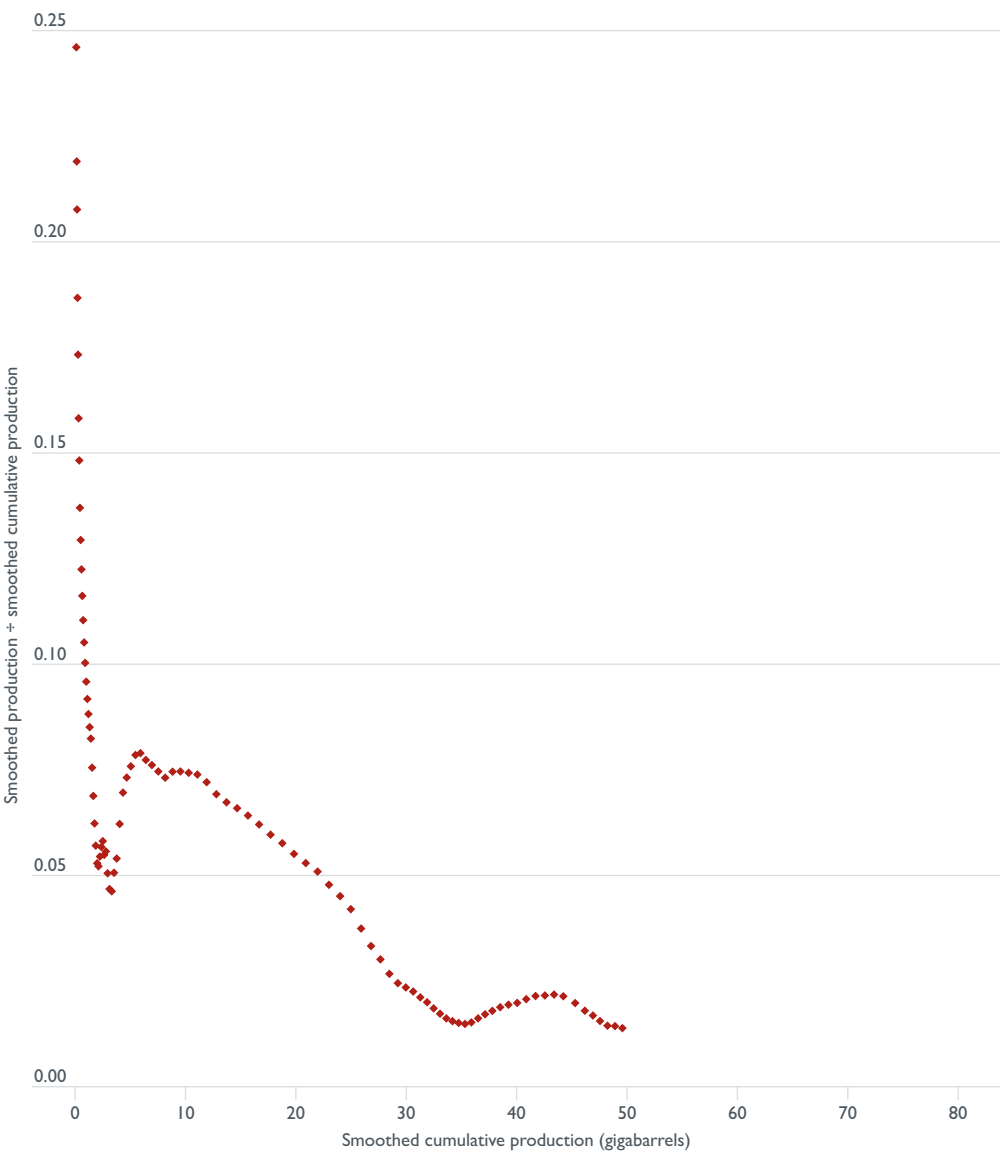
Venezuela

Table 4.1 sets out the calculations from the 11 steps to a forecast of production of Venezuelan conventional oil.

The first steps are to estimate the ultimate recoverable resource (U) from patterns of growth in production.

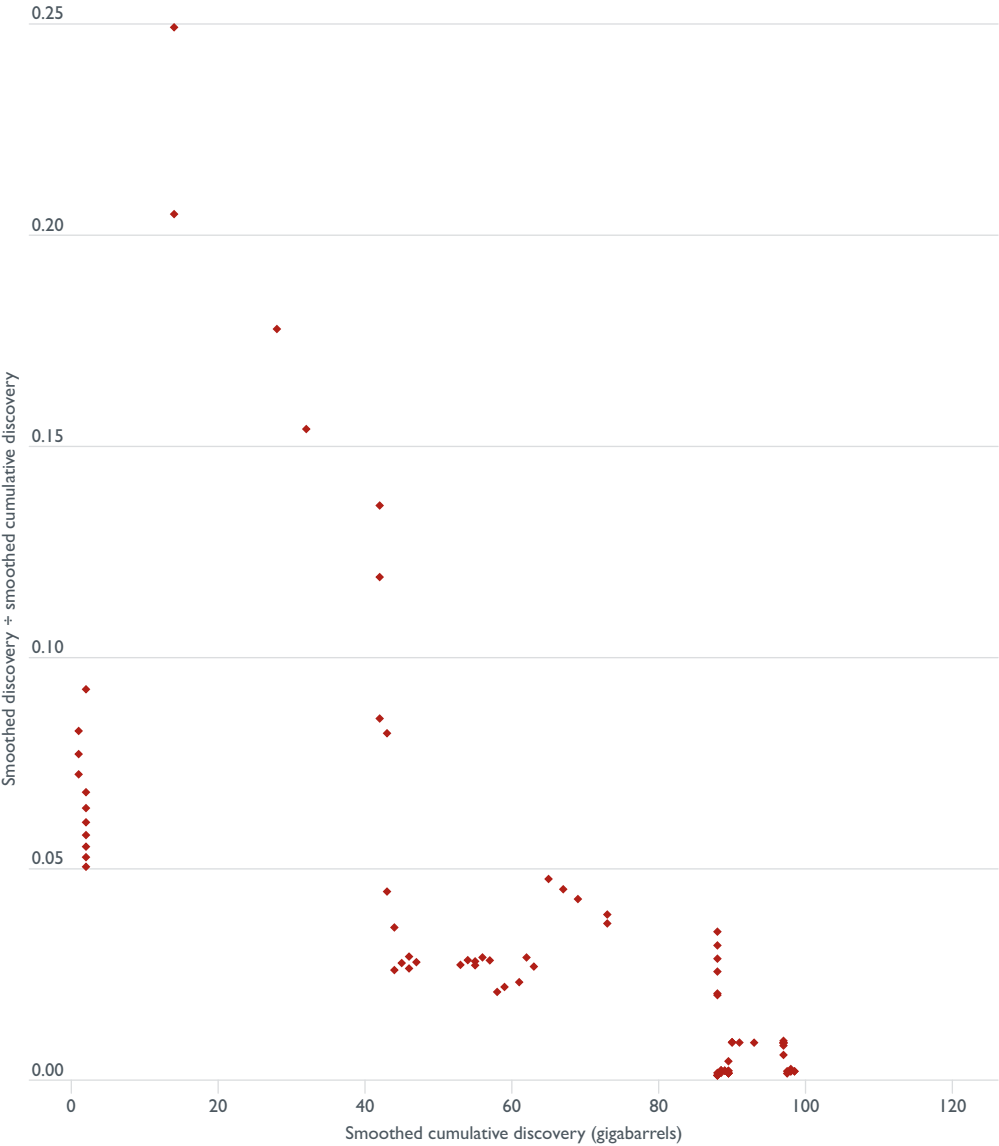
1. First, annual production (P) and cumulative production (CP) are smoothed with an 11 year average, generating SP and SCP (see Table 4.1).
2. Then the fractional growth in production (SP/SCP) is calculated and plotted against last year's cumulative production. This plot is shown in Figure 4.1.

Figure 4.1 **Venezuelan cumulative production growth curve**



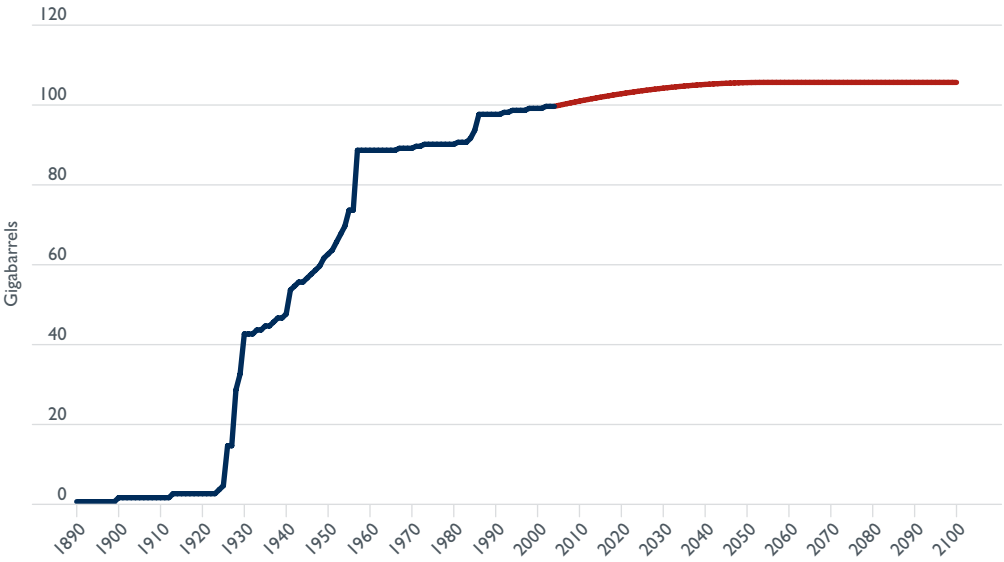
3. The plot is then examined and a best guess at an ultimate cumulative production (U) is made. In this case, it is 65 gigabarrels.
4. Discovery (D) is smoothed with an 11 year moving average and cumulative discovery (CD) is smoothed with an 11 and then 31 year moving average (31 after 1942).
5. Then the fractional growth in discovery (SD/SCD) is calculated and plotted against last year's smoothed cumulative discovery. This plot is shown in Figure 4.2.

Figure 4.2 Venezuelan cumulative discovery growth curve



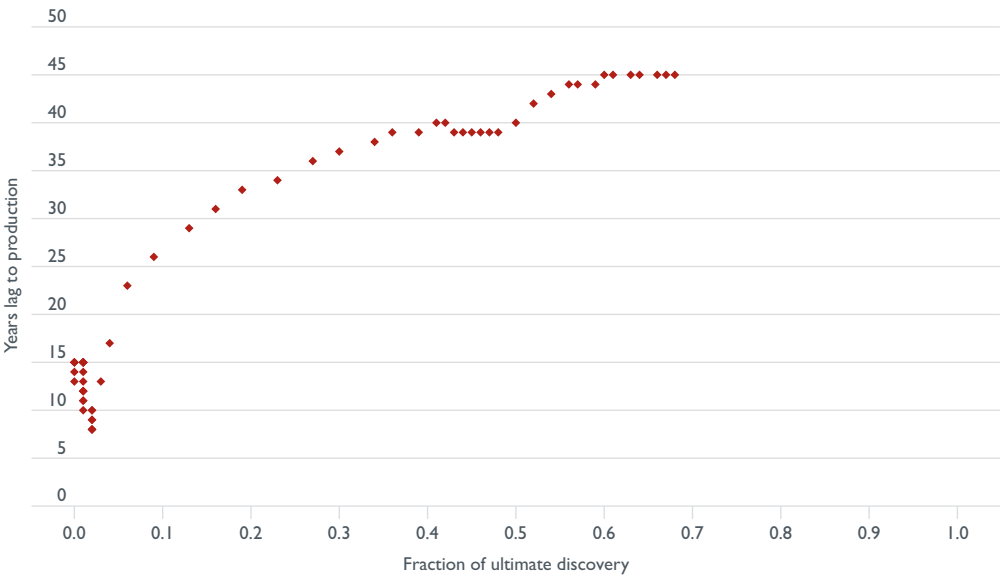
6. The plot is examined and a best guess at an ultimate discovery (UD) is made. In this case it is 105 gigabarrels.
7. Cumulative discovery in 2006 is then projected to UD by bringing SD estimated for 2006 to zero in 2056. For Venezuelan conventional oil, the projection of the cumulative discovery curve is shown in Figure 4.3.

Figure 4.3 **Venezuelan cumulative discovery projection**



- 8. Next, the height of the cumulative discovery curve has to be adjusted to equal the more reliable cumulative production estimate. In this case, the adjustment is downward, amounting to multiplying by 65/105.
- 9. Then, the historical stretch lag between the cumulative discovery and production curves is calculated, and plotted against the fraction of cumulative discovery. This plot for Venezuela is shown in Figure 4.4.

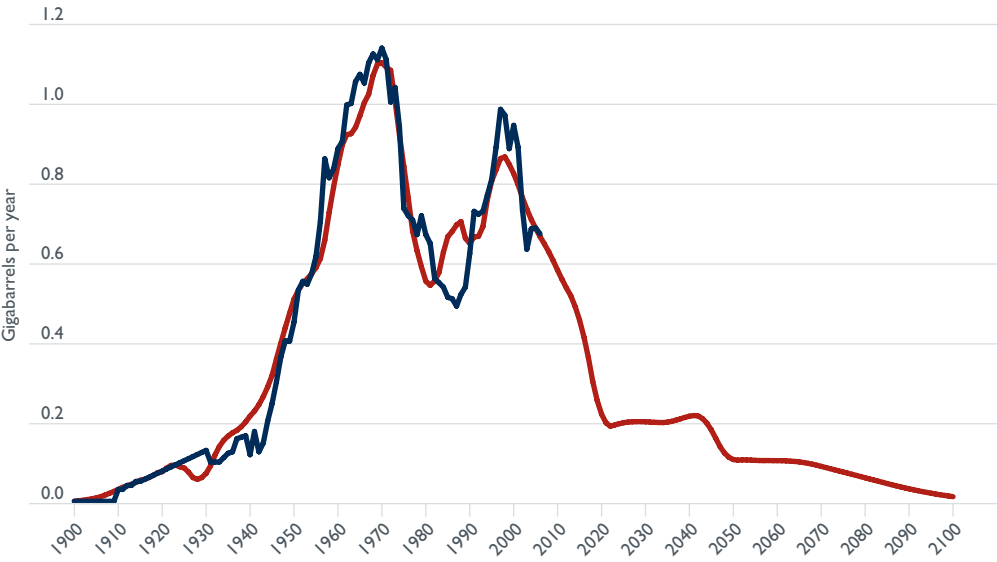
Figure 4.4 **Venezuelan stretch lag curve**



After some noise in the range of zero to 0.1, the stretch lag exhibits growth to a plateau of 39 years in 1970s' production lag. Then the OPEC slowdown in production pushed the lag up to about 45 years for mid-1980s production onwards. Extrapolating at 45 years at 1.0 allows the rest of the cumulative production curve to be forecast from the extrapolated discovery curve and the predicted lags.

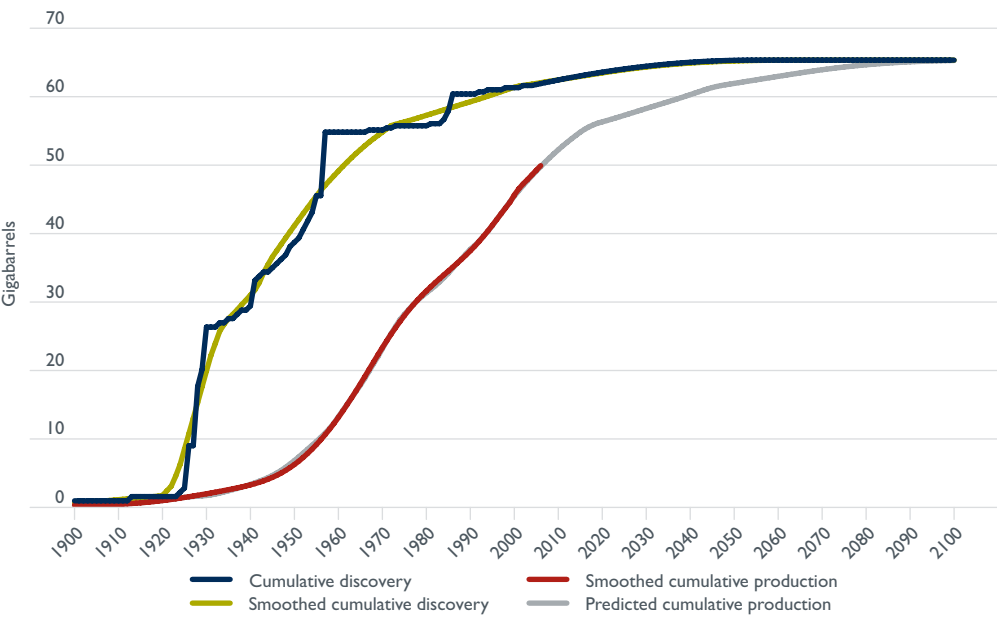
10. The predicted cumulative production curve is smoothed with a year average and then differenced to give a raw predicted annual production. This is then averaged over five years to give a final annual production forecast. This is shown in Figure 4.5.

Figure 4.5 Venezuelan actual and predicted crude oil production



11. Finally the cumulative discovery and production curves (actual and forecast) are plotted in Figure 4.6. This allows a spatial understanding of the relationship between production and discovery.

Figure 4.6 Venezuelan cumulative discovery and cumulative production curves



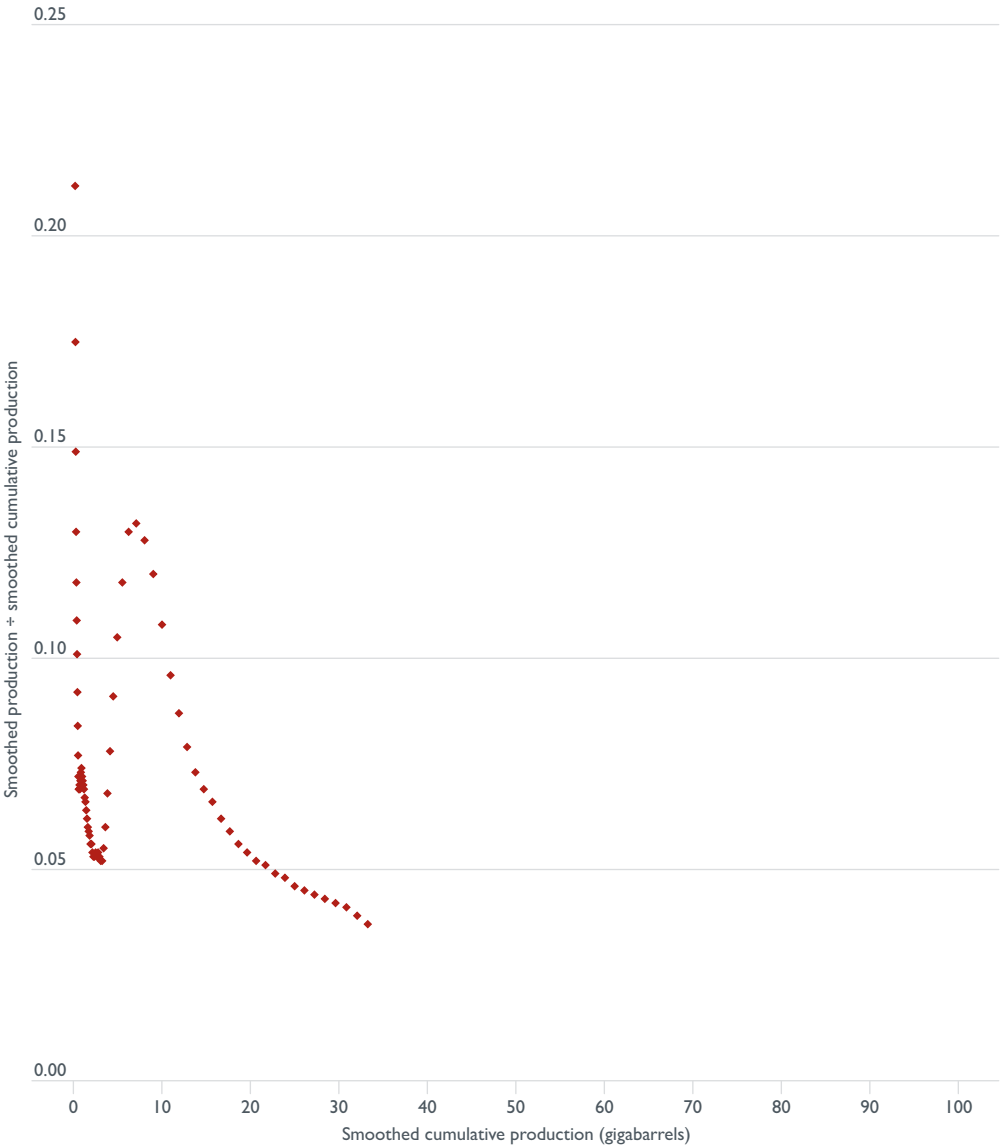
Mexico

Table 4.2 sets out the calculations from the 11 steps to a forecast of Mexican oil production.

The first steps are to estimate the ultimate recoverable resource (U) from patterns of growth in production.

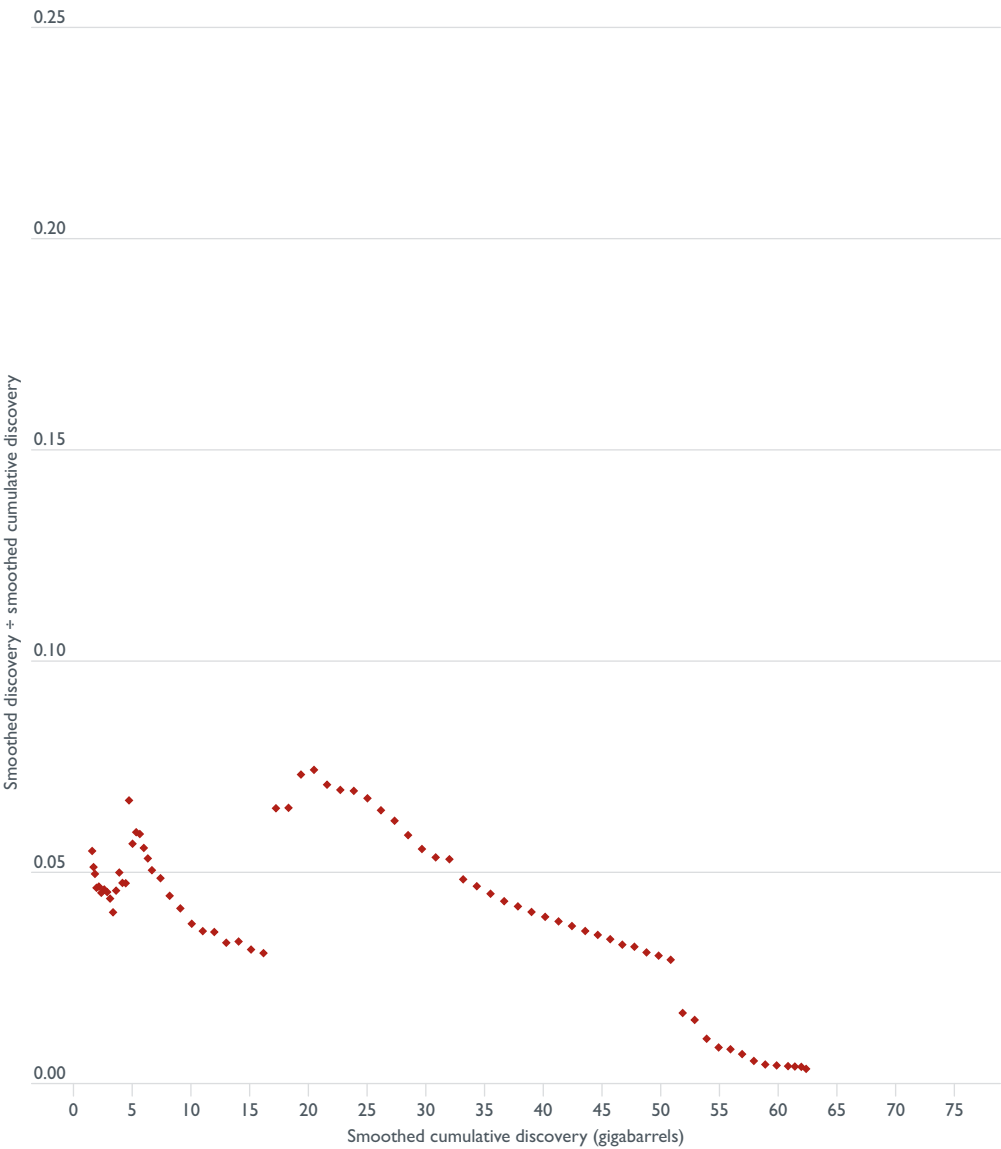
- 1. First, annual production (P) and cumulative production (CP) are smoothed with five and three year averages, generating SP and SCP (see Table 4.2).
- 2. Then the fractional growth in production (SP/SCP) is calculated and plotted against last year's cumulative production. This plot is shown in Figure 4.7.

Figure 4.7 Mexican cumulative production growth curve



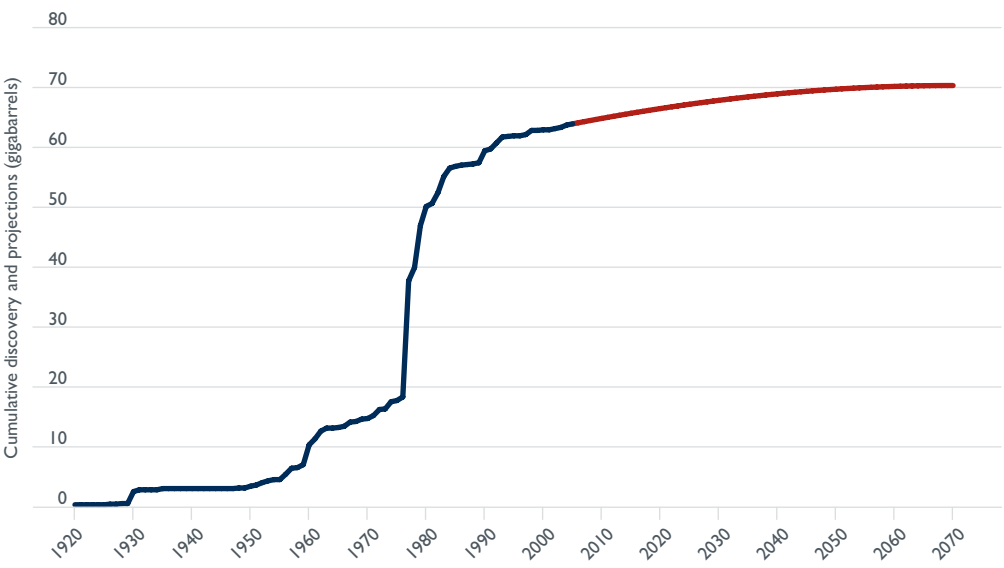
- 3. The plot is then examined and a best guess at an ultimate cumulative production (U) is made. In this case, it is 84 gigabarrels.
- 4. Discovery (D) is smoothed with a 31 year moving average and cumulative discovery (CD) is smoothed with a 51 year moving average.
- 5. Then the fractional growth in discovery (SD/SCD) is calculated and plotted against last year's smoothed cumulative discovery. This plot is shown in Figure 4.8.

Figure 4.8 Mexican cumulative discovery growth curve



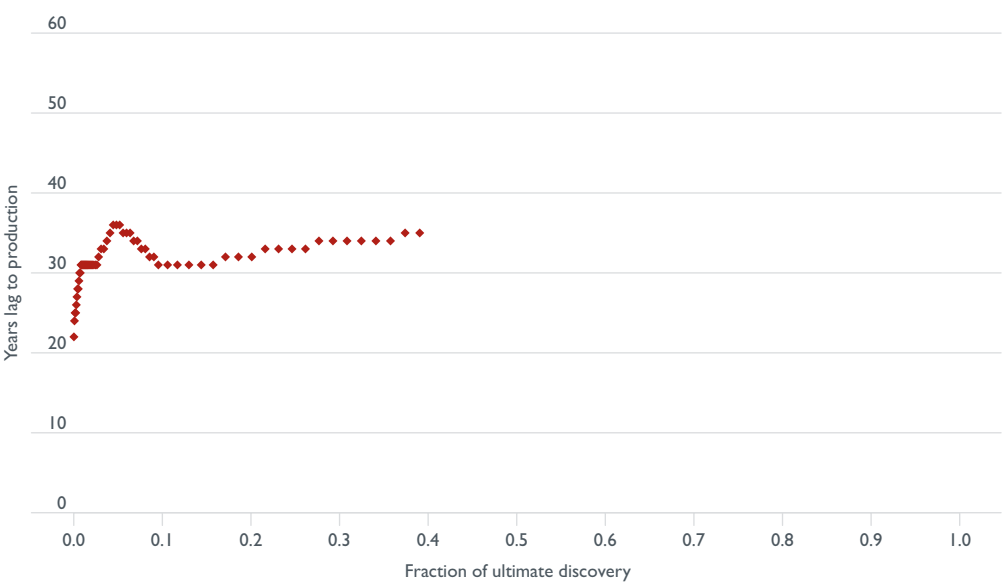
- 6. The plot is examined and a best guess at an ultimate discovery (UD) is made. In this case it is 70 gigabarrels.
- 7. Cumulative discovery in 2006 is then projected to UD by bringing SD estimated for 2006 to zero in 2070. For Mexican oil, the projection of the cumulative discovery curve is shown in Figure 4.9.

Figure 4.9 Mexican cumulative discovery projection



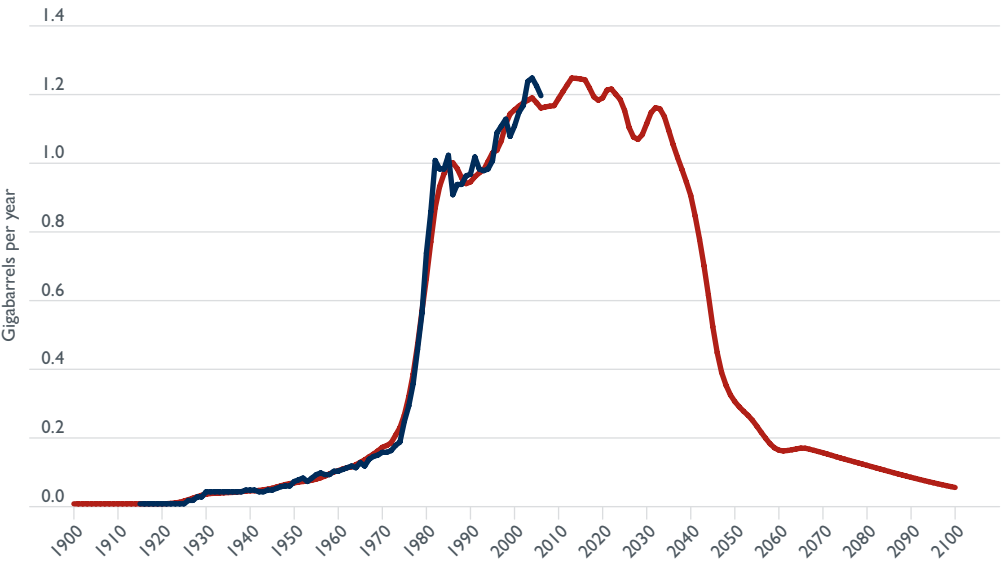
8. Next, the height of the cumulative discovery curve has to be adjusted to equal the more reliable cumulative production estimate. In this case, the adjustment is upward, amounting to multiplying by 84/70.
9. Next, the historical stretch lag between the cumulative discovery and production curves is calculated, and plotted against the fraction of cumulative discovery. This plot for Mexico is shown in Figure 4.10. It is apparent that there is a regular relationship. After some noise in the range of zero to 0.1, the stretch lag exhibits a steady rise. Extrapolating the trend to 40 years at 1.0 allows the rest of the cumulative production curve to be forecast from the extrapolated discovery curve and the predicted lags.

Figure 4.10 Mexican stretch lag curve



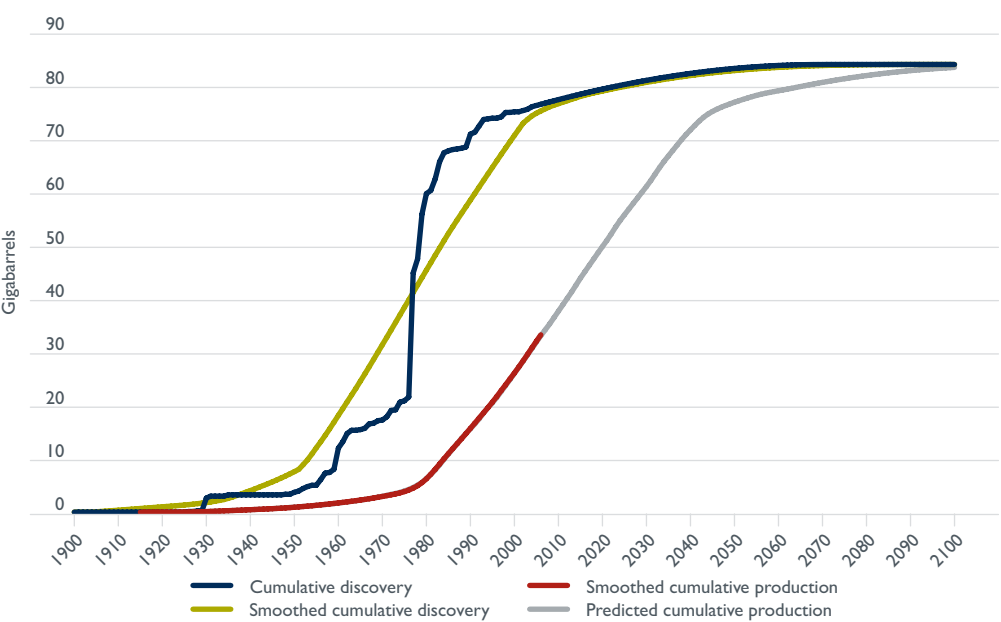
10. The predicted cumulative production curve is smoothed with a seven year average and then differenced to give a raw predicted annual production. This is then averaged over five years to give a final annual production forecast. This is shown in Figure 4.11.

Figure 4.11 Actual and predicted Mexican crude oil production



11. Finally the cumulative discovery and production curves (actual and forecast) are plotted in Figure 4.12. This allows a spatial understanding of the relationship between production and discovery.

Figure 4.12 Mexican cumulative discovery and cumulative production curves



The Rest of Latin America

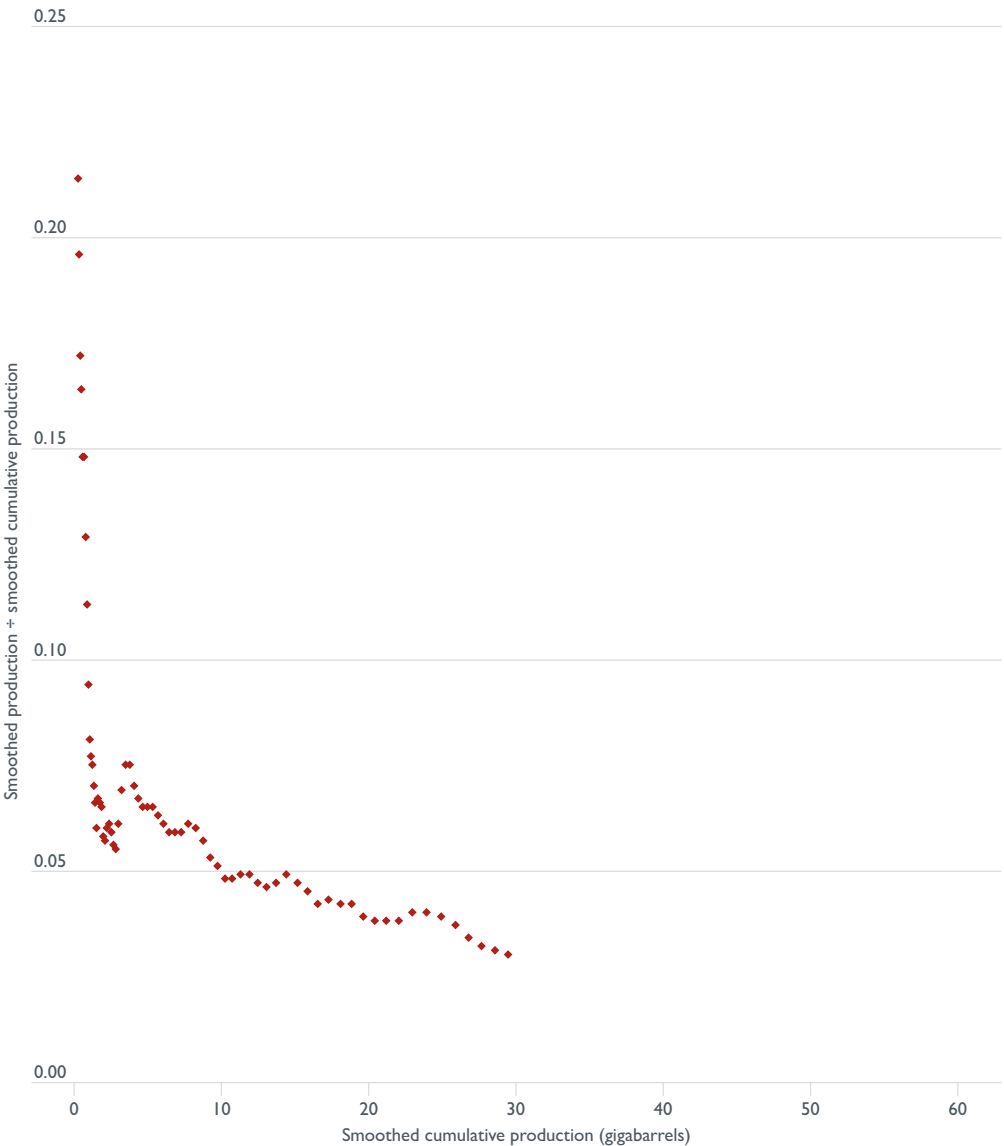
The other oil-producing nations of Latin America include Argentina, Columbia, Ecuador, Brazil, Trinidad, Peru, Bolivia and Chile.

Table 4.3 sets out the calculations from the 11 steps to a forecast of oil production from the rest of Latin America.

The first steps are to estimate the ultimate recoverable resource (U) from patterns of growth in production.

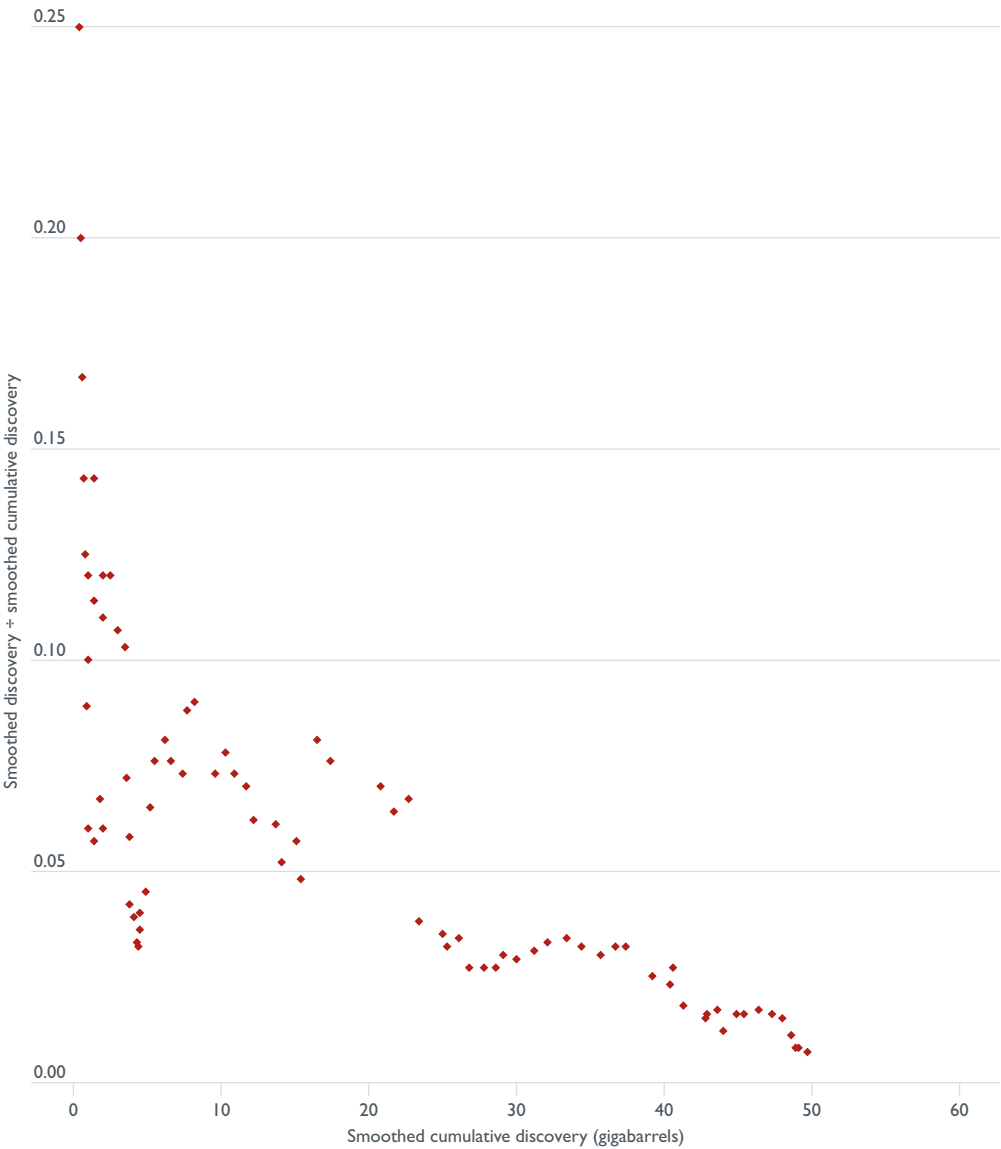
- 1. First, annual production (P) and cumulative production (CP) are smoothed with a three year average, generating SP and SCP (see Table 4.3).

Figure 4.13 Cumulative production growth curve for the Rest of Latin America



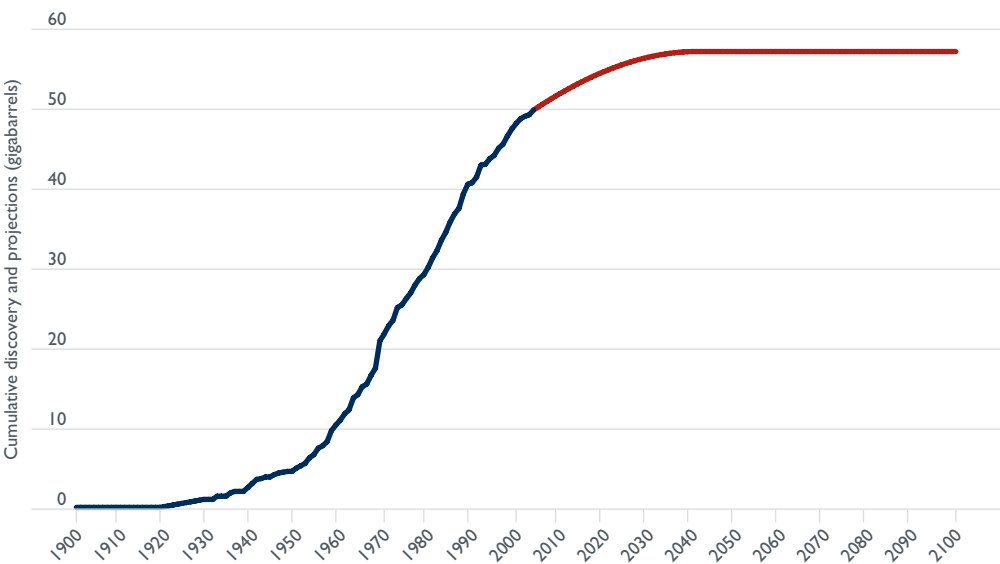
- 2. Then the fractional growth in production (SP/SCP) is calculated and plotted against last year's cumulative production. This plot is shown in Figure 4.13.
- 3. The plot is then examined and a best guess at an ultimate cumulative production (U) is made. In this case, it is 57 gigabarrels.
- 4. Discovery (D) is smoothed with a five year moving average and cumulative discovery (CD) is smoothed with an 11 year moving average.
- 5. Then the fractional growth in discovery (SD/SCD) is calculated and plotted against last year's smoothed cumulative discovery. This plot is shown in Figure 4.14.

Figure 4.14 Cumulative discovery growth curve for the Rest of Latin America



6. The plot is examined and a best guess at an ultimate discovery (UD) is made. In this case it is also 57 gigabarrels.
7. Cumulative discovery in 2006 is then projected to UD by bringing SD estimated for 2006 to zero in 2042. For the Rest of Latin America, the projection of the cumulative discovery curve is shown in Figure 4.15.

Figure 4.15 Cumulative discovery projection for the Rest of Latin America



8. No adjustment to the height of the cumulative discovery curve is necessary in this case.
9. Next, the historical stretch lag between the cumulative discovery and production curves is calculated, and plotted against the fraction of cumulative discovery. This plot for the Rest of Latin America is shown in Figure 4.16. It is apparent that there is a regular relationship. After some noise in the range of zero to 0.1, the stretch lag climbs steadily before levelling off at 24 years. Extrapolating the trend at 24 years allows the rest of the cumulative production curve to be forecast from the extrapolated discovery curve and the predicted lags.
10. The predicted cumulative production curve is smoothed with a five year average and then differenced to give a raw predicted annual production. This is then averaged over five years to give a final annual production forecast. This is shown in Figure 4.17.
11. Finally the cumulative discovery and production curves (actual and forecast) are plotted in Figure 4.18. This allows a spatial understanding of the relationship between production and discovery.

Figure 4.16 Stretch lag curve for the rest of Latin America

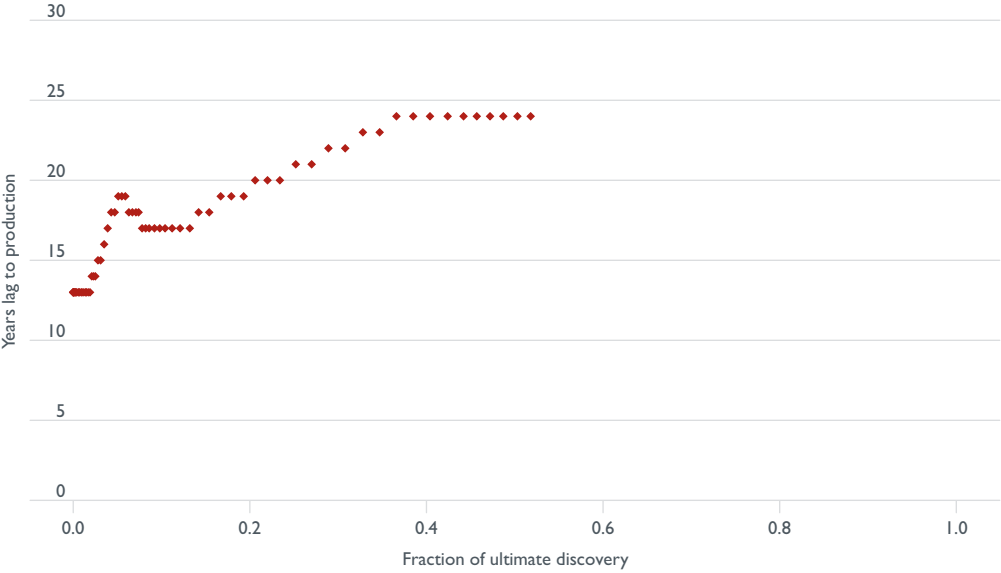


Figure 4.17 Actual and predicted crude oil production for the Rest of Latin America

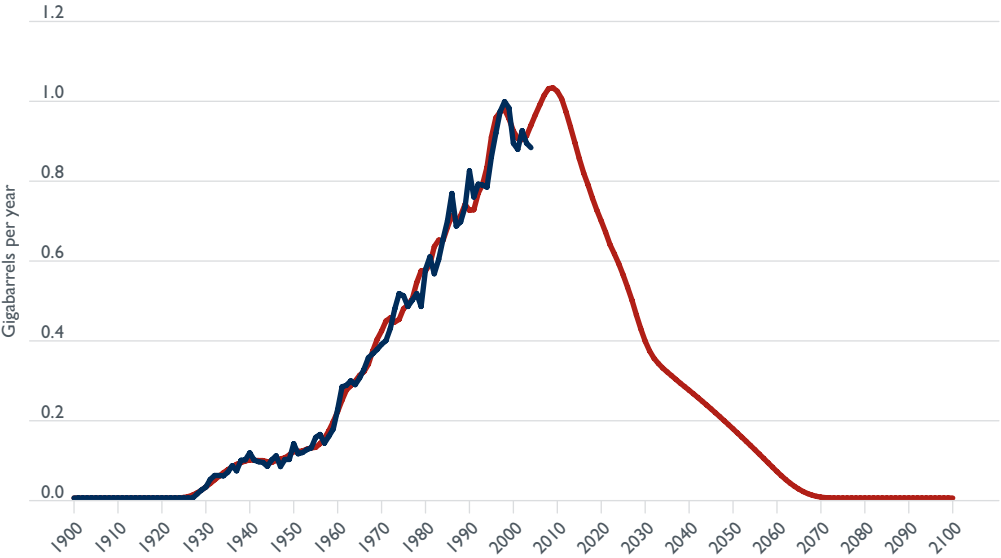
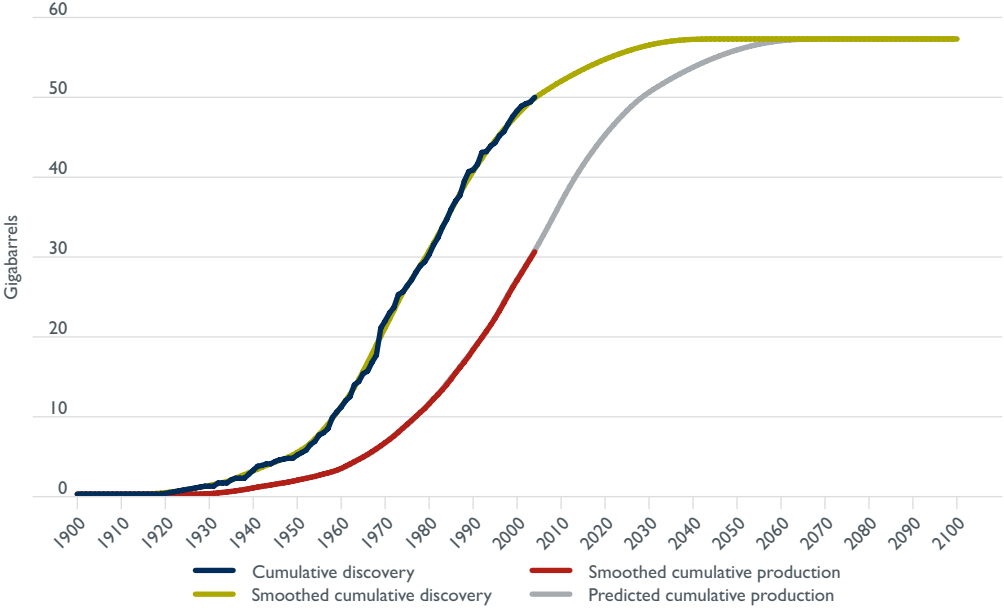


Figure 4.18 Cumulative discovery and cumulative production curves for the Rest of Latin America



Venezuelan extra heavy and Brazilian deep water

Both of these considerable resources of oil will be mentioned briefly here and then the details expanded in Chapters 11 and 12.

Venezuelan production of extra heavy oil is assumed to follow the pattern presented in Figure 4.19. If these projections are correct, heavy oil production will come to replace current Venezuelan conventional oil production on an almost one-to-one basis.

Figure 4.19 Assumed Venezuelan extra heavy oil production

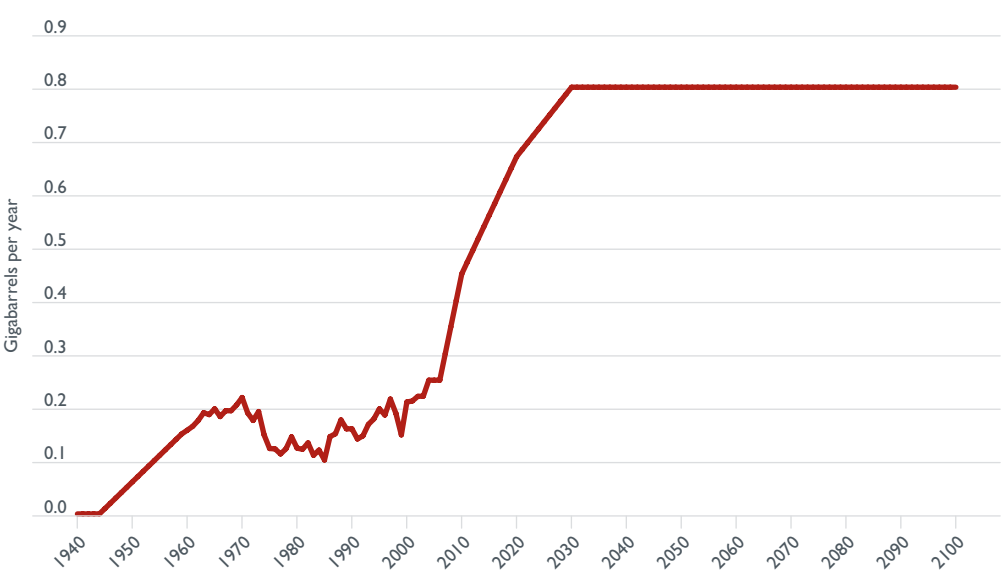
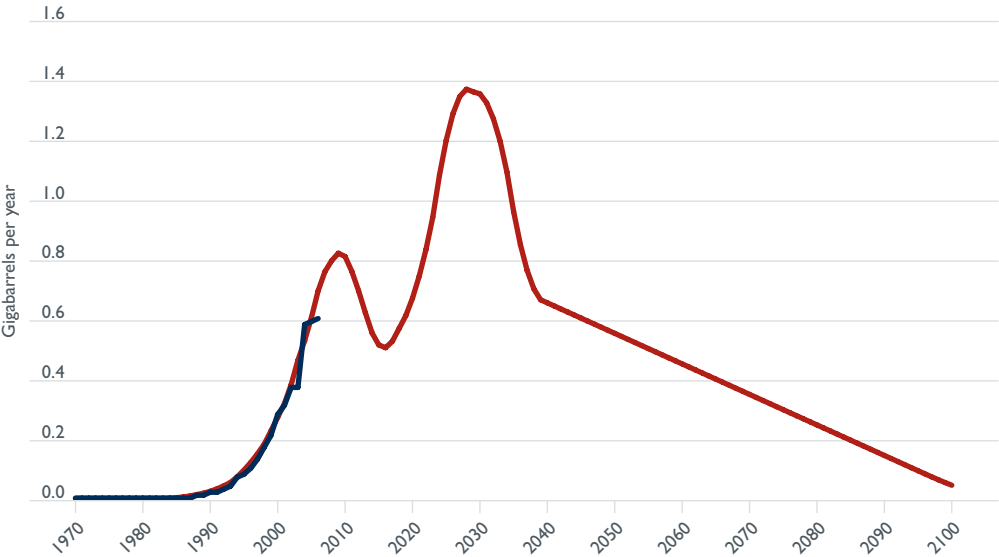


Figure 4.20 Brazilian deep water oil production



Brazil was the first deep water oil province to begin production in the early 1990s. Figure 4.20 shows the history and a forecast for Brazilian deep water oil production.

Latin America summary

Assembling the forecasts of the three modelled regions and adding in deep and non-conventional estimates gives the fit of modelled and actual production shown in Figure 4.21. Latin American crude oil production has two peaks to 2035, after which production declines are likely to begin.

Figure 4.21 Actual and predicted Latin American crude oil production

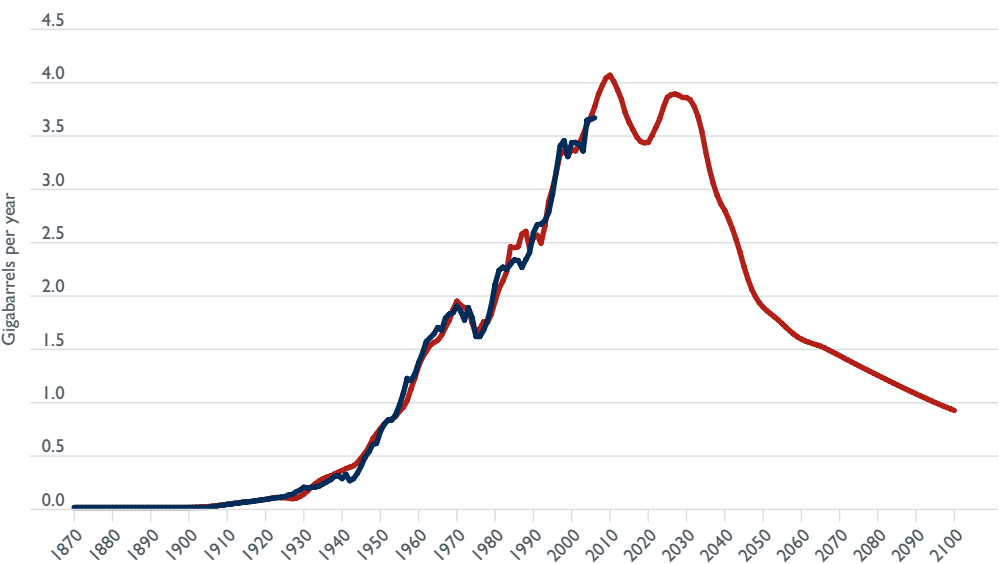


Table 4.4 summarises the numbers for the five subregions. Breaking the data down by the five subregions in Figure 4.22 illustrates that the forecast growth of crude oil production in the Latin American region to the first peak in 2013 is based on continued expansion of Brazilian deep water and Venezuelan non-conventional production until that time. After 2013 Venezuelan conventional and Rest of Latin America oil production lead to a decline, before a Brazilian deep water oil spurt carries the production back up to a second 2035 peak.

Figure 4.22 **Components of Latin American crude oil production**

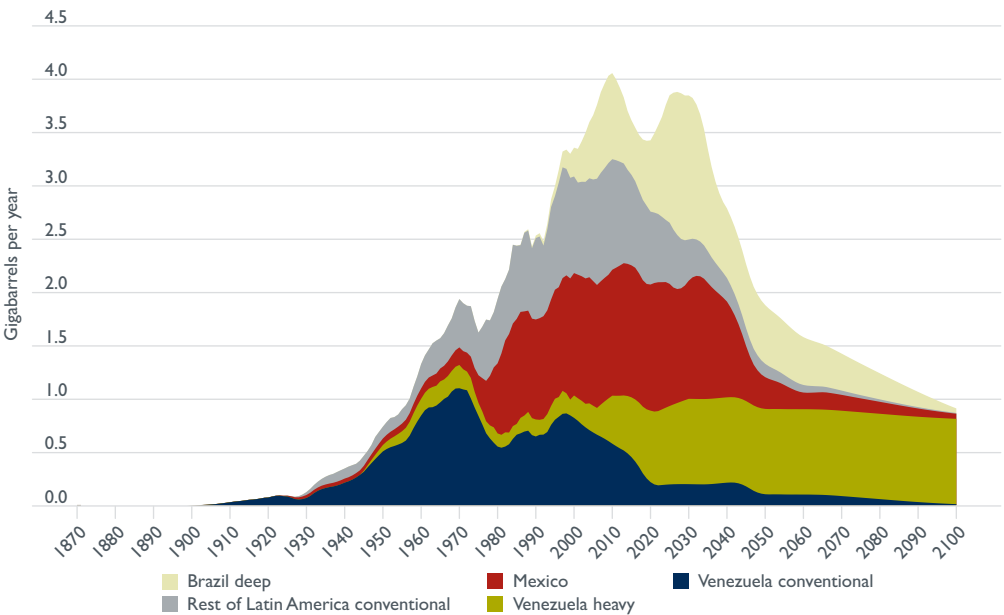


Table 4.1 Venezuela conventional oil, gigabarrels (less extra heavy)
(continued)

Year	D	CD	11,31yr SCD	Adj SCD	Predlag	Raw pred CP	Syr smth pred SCP	SCP	Raw pred P	Syr smth pred SP	Actual P
2052	0.01	104.98	104.85	64.91	45	61.81	61.80		0.11	0.10	
2053	0.01	104.99	104.87	64.92	45	61.91	61.91		0.10	0.10	
2054	0.01	105.00	104.89	64.93	45	62.01	62.01		0.10	0.10	
2055	0.00	105.00	104.91	64.95	45	62.11	62.11		0.10	0.10	
2056	0.00	105.00	104.93	64.96	45	62.21	62.21		0.10	0.10	
2057	0.00	105.00	104.94	64.96	45	62.32	62.32		0.10	0.10	
2058	0.00	105.00	104.95	64.97	45	62.42	62.42		0.10	0.10	
2059	0.00	105.00	104.97	64.98	45	62.52	62.52		0.10	0.10	
2060	0.00	105.00	104.97	64.98	45	62.62	62.62		0.10	0.10	
2061	0.00	105.00	104.98	64.99	45	62.72	62.72		0.10	0.10	
2062	0.00	105.00	104.99	64.99	45	62.83	62.83		0.10	0.10	
2063	0.00	105.00	104.99	64.99	45	62.93	62.93		0.10	0.10	
2064	0.00	105.00	104.99	65.00	45	63.03	63.03		0.10	0.10	
2065	0.00	105.00	105.00	65.00	45	63.13	63.13		0.10	0.10	
2066	0.00	105.00	105.00	65.00	45	63.23	63.22		0.10	0.10	
2067	0.00	105.00	105.00	65.00	45	63.32	63.32		0.10	0.10	
2068	0.00	105.00	105.00	65.00	45	63.42	63.41		0.09	0.09	
2069	0.00	105.00	105.00	65.00	45	63.51	63.50		0.09	0.09	
2070	0.00	105.00	105.00	65.00	45	63.59	63.59		0.09	0.09	
2071	0.00	105.00	105.00	65.00	45	63.68	63.68		0.08	0.08	
2072	0.00	105.00	105.00	65.00	45	63.76	63.76		0.08	0.08	
2073	0.00	105.00	105.00	65.00	45	63.84	63.84		0.08	0.08	
2074	0.00	105.00	105.00	65.00	45	63.92	63.91		0.08	0.08	
2075	0.00	105.00	105.00	65.00	45	63.99	63.99		0.07	0.07	
2076	0.00	105.00	105.00	65.00	45	64.06	64.06		0.07	0.07	
2077	0.00	105.00	105.00	65.00	45	64.13	64.13		0.07	0.07	
2078	0.00	105.00	105.00	65.00	45	64.19	64.19		0.06	0.06	
2079	0.00	105.00	105.00	65.00	45	64.26	64.25		0.06	0.06	
2080	0.00	105.00	105.00	65.00	45	64.32	64.31		0.06	0.06	
2081	0.00	105.00	105.00	65.00	45	64.37	64.37		0.06	0.06	
2082	0.00	105.00	105.00	65.00	45	64.42	64.42		0.05	0.05	
2083	0.00	105.00	105.00	65.00	45	64.47	64.47		0.05	0.05	
2084	0.00	105.00	105.00	65.00	45	64.52	64.52		0.05	0.05	
2085	0.00	105.00	105.00	65.00	45	64.57	64.56		0.04	0.04	
2086	0.00	105.00	105.00	65.00	45	64.61	64.61		0.04	0.04	
2087	0.00	105.00	105.00	65.00	45	64.65	64.64		0.04	0.04	
2088	0.00	105.00	105.00	65.00	45	64.68	64.68		0.04	0.04	
2089	0.00	105.00	105.00	65.00	45	64.72	64.72		0.03	0.03	
2090	0.00	105.00	105.00	65.00	45	64.75	64.75		0.03	0.03	
2091	0.00	105.00	105.00	65.00	45	64.78	64.78		0.03	0.03	
2092	0.00	105.00	105.00	65.00	45	64.80	64.80		0.03	0.03	
2093	0.00	105.00	105.00	65.00	45	64.83	64.83		0.02	0.02	
2094	0.00	105.00	105.00	65.00	45	64.85	64.85		0.02	0.02	
2095	0.00	105.00	105.00	65.00	45	64.87	64.87		0.02	0.02	
2096	0.00	105.00	105.00	65.00	45	64.89	64.89		0.02	0.02	
2097	0.00	105.00	105.00	65.00	45	64.91	64.90		0.02	0.02	
2098	0.00	105.00	105.00	65.00	45	64.92	64.92		0.01	0.01	
2099	0.00	105.00	105.00	65.00	45	64.93	64.93		0.01	0.01	
2100	0.00	105.00	105.00	65.00	45	64.95	64.94		0.01	0.01	

Notes: D—discovery; CD—cumulative discovery; SCD—smoothed cumulative discovery (years = number of years centred moving average); adj—adjusted (to match cumulative production maximum); predlag—predicted lag between cumulative discovery and cumulative production; raw Pred CP—prediction using direct lag of cumulative discovery by predicted lag years; Pred SCP—raw predicted CP smoothed (with years = number of years centred moving average); SCP—smoothed actual cumulative production (years = number of years centred moving average); raw Pred P—one year change in predicted smoothed cumulative production; Pred SP—smoothed raw Pred P (years = number of years centred moving average); Actual P—actual annual oil production. Shaded numbers are interpolations, extrapolations or forecasts.

Table 4.2 Mexico, gigabarrels (continued)

Year	D	CD	5 lyr SCD	Adj SCD	Predlag	Raw pred CP	7yr smth pred SCP	SCP	Raw pred P	5yr smth pred SP	Actual P
2062	0.03	69.90	69.62	83.54	40	79.37	79.37		0.15	0.16	
2063	0.02	69.92	69.65	83.58	40	79.54	79.53		0.16	0.16	
2064	0.02	69.94	69.68	83.62	40	79.70	79.69		0.17	0.16	
2065	0.02	69.96	69.71	83.65	40	79.86	79.86		0.17	0.16	
2066	0.01	69.97	69.74	83.69	40	80.02	80.02		0.16	0.16	
2067	0.01	69.98	69.76	83.72	40	80.19	80.18		0.16	0.16	
2068	0.01	69.99	69.79	83.75	40	80.34	80.34		0.16	0.16	
2069	0.00	69.99	69.81	83.77	40	80.50	80.49		0.15	0.15	
2070	0.00	69.99	69.83	83.80	40	80.65	80.64		0.15	0.15	
2071	0.01	70.00	69.85	83.82	40	80.79	80.78		0.15	0.14	
2072	0.00	70.00	69.87	83.84	40	80.93	80.92		0.14	0.14	
2073	0.00	70.00	69.88	83.86	40	81.07	81.06		0.14	0.14	
2074	0.00	70.00	69.90	83.88	40	81.20	81.19		0.13	0.13	
2075	0.00	70.00	69.91	83.89	40	81.33	81.32		0.13	0.13	
2076	0.00	70.00	69.92	83.91	40	81.46	81.45		0.13	0.13	
2077	0.00	70.00	69.94	83.92	40	81.58	81.57		0.12	0.12	
2078	0.00	70.00	69.95	83.93	40	81.70	81.69		0.12	0.12	
2079	0.00	70.00	69.95	83.94	40	81.82	81.81		0.12	0.12	
2080	0.00	70.00	69.96	83.95	40	81.93	81.92		0.11	0.11	
2081	0.00	70.00	69.97	83.96	40	82.04	82.03		0.11	0.11	
2082	0.00	70.00	69.97	83.97	40	82.14	82.13		0.10	0.10	
2083	0.00	70.00	69.98	83.98	40	82.24	82.24		0.10	0.10	
2084	0.00	70.00	69.98	83.98	40	82.34	82.33		0.10	0.10	
2085	0.00	70.00	69.99	83.99	40	82.43	82.43		0.09	0.09	
2086	0.00	70.00	69.99	83.99	40	82.52	82.52		0.09	0.09	
2087	0.00	70.00	69.99	83.99	40	82.61	82.60		0.09	0.09	
2088	0.00	70.00	70.00	83.99	40	82.70	82.69		0.08	0.08	
2089	0.00	70.00	70.00	84.00	40	82.78	82.77		0.08	0.08	
2090	0.00	70.00	70.00	84.00	40	82.85	82.85		0.08	0.08	
2091	0.00	70.00	70.00	84.00	40	82.93	82.92		0.07	0.07	
2092	0.00	70.00	70.00	84.00	40	83.00	82.99		0.07	0.07	
2093	0.00	70.00	70.00	84.00	40	83.06	83.06		0.07	0.07	
2094	0.00	70.00	70.00	84.00	40	83.13	83.12		0.06	0.06	
2095	0.00	70.00	70.00	84.00	40	83.19	83.18		0.06	0.06	
2096	0.00	70.00	70.00	84.00	40	83.25	83.24		0.06	0.06	
2097	0.00	70.00	70.00	84.00	40	83.30	83.30		0.06	0.06	
2098	0.00	70.00	70.00	84.00	40	83.36	83.35		0.05	0.05	
2099	0.00	70.00	70.00	84.00	40	83.41	83.40		0.05	0.05	
2100	0.00	70.00	70.00	84.00	40	83.45	83.45		0.05	0.05	

Notes: D—discovery; CD—cumulative discovery; SCD—smoothed cumulative discovery (years = number of years centred moving average); adj—adjusted (to match cumulative production maximum); predlag—predicted lag between cumulative discovery and cumulative production; raw Pred CP—prediction using direct lag of cumulative discovery by predicted lag years; Pred SCP—raw predicted CP smoothed (with years = number of years centred moving average); SCP—smoothed actual cumulative production (years = number of years centred moving average); raw Pred P—one year change in predicted smoothed cumulative production; Pred SP—smoothed raw Pred P (years = number of years centred moving average); Actual P—actual annual oil production. Shaded numbers are interpolations, extrapolations or forecasts.

Table 4.3 Rest of Latin America, gigabarrels (continued)

Year	D	CD	1 lyr SCD	Adj SCD	Predlag	Raw pred CP	Syr smth pred SCP	SCP	Raw pred P	Syr smth pred SP	Actual P
2062	0.00	57.00	57.00	57.00	24	56.89	56.88		0.05	0.05	
2063	0.00	57.00	57.00	57.00	24	56.92	56.92		0.04	0.04	
2064	0.00	57.00	57.00	57.00	24	56.95	56.94		0.03	0.03	
2065	0.00	57.00	57.00	57.00	24	56.97	56.96		0.02	0.02	
2066	0.00	57.00	57.00	57.00	24	56.98	56.98		0.02	0.02	
2067	0.00	57.00	57.00	57.00	24	56.99	56.99		0.01	0.01	
2068	0.00	57.00	57.00	57.00	24	57.00	57.00		0.01	0.01	
2069	0.00	57.00	57.00	57.00	24	57.00	57.00		0.00	0.00	
2070	0.00	57.00	57.00	57.00	24	57.00	57.00		0.00	0.00	
2071	0.00	57.00	57.00	57.00	24	57.00	57.00		0.00	0.00	
2072	0.00	57.00	57.00	57.00	24	57.00	57.00		0.00	0.00	
2073	0.00	57.00	57.00	57.00	24	57.00	57.00		0.00	0.00	
2074	0.00	57.00	57.00	57.00	24	57.00	57.00		0.00	0.00	
2075	0.00	57.00	57.00	57.00	24	57.00	57.00		0.00	0.00	
2076	0.00	57.00	57.00	57.00	24	57.00	57.00		0.00	0.00	
2077	0.00	57.00	57.00	57.00	24	57.00	57.00		0.00	0.00	
2078	0.00	57.00	57.00	57.00	24	57.00	57.00		0.00	0.00	
2079	0.00	57.00	57.00	57.00	24	57.00	57.00		0.00	0.00	
2080	0.00	57.00	57.00	57.00	24	57.00	57.00		0.00	0.00	
2081	0.00	57.00	57.00	57.00	24	57.00	57.00		0.00	0.00	
2082	0.00	57.00	57.00	57.00	24	57.00	57.00		0.00	0.00	
2083	0.00	57.00	57.00	57.00	24	57.00	57.00		0.00	0.00	
2084	0.00	57.00	57.00	57.00	24	57.00	57.00		0.00	0.00	
2085	0.00	57.00	57.00	57.00	24	57.00	57.00		0.00	0.00	
2086	0.00	57.00	57.00	57.00	24	57.00	57.00		0.00	0.00	
2087	0.00	57.00	57.00	57.00	24	57.00	57.00		0.00	0.00	
2088	0.00	57.00	57.00	57.00	24	57.00	57.00		0.00	0.00	
2089	0.00	57.00	57.00	57.00	24	57.00	57.00		0.00	0.00	
2090	0.00	57.00	57.00	57.00	24	57.00	57.00		0.00	0.00	
2091	0.00	57.00	57.00	57.00	24	57.00	57.00		0.00	0.00	
2092	0.00	57.00	57.00	57.00	24	57.00	57.00		0.00	0.00	
2093	0.00	57.00	57.00	57.00	24	57.00	57.00		0.00	0.00	
2094	0.00	57.00	57.00	57.00	24	57.00	57.00		0.00	0.00	
2095	0.00	57.00	57.00	57.00	24	57.00	57.00		0.00	0.00	
2096	0.00	57.00	57.00	57.00	24	57.00	57.00		0.00	0.00	
2097	0.00	57.00	57.00	57.00	24	57.00	57.00		0.00	0.00	
2098	0.00	57.00	57.00	57.00	24	57.00	57.00		0.00	0.00	
2099	0.00	57.00	57.00	57.00	24	57.00	57.00		0.00	0.00	
2100	0.00	57.00	57.00	57.00	24	57.00	57.00		0.00	0.00	

Notes: D—discovery; CD—cumulative discovery; SCD—smoothed cumulative discovery (years = number of years centred moving average); adj—adjusted (to match cumulative production maximum); predlag—predicted lag between cumulative discovery and cumulative production; raw Pred CP—prediction using direct lag of cumulative discovery by predicted lag years; Pred SCP—raw predicted CP smoothed (with years = number of years centred moving average); SCP—smoothed actual cumulative production (years = number of years centred moving average); raw Pred P—one year change in predicted smoothed cumulative production; Pred SP—smoothed raw Pred P (years = number of years centred moving average); Actual P—actual annual oil production. Shaded numbers are interpolations, extrapolations or forecasts.

Table 4.4 Latin America actual, gigabarrels (including deep and non-conventional)

Year	Venezuela	Extra heavy Venezuela	Total Venezuela	Mexico	Rest L Amer exDeep	Deep Brazil	Total rest L Amer	Total L Amer
(actual production)								
1870	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1871	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1872	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1873	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1874	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1875	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1876	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1877	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1878	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1879	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1880	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1881	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1882	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1883	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1884	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1885	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1886	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1887	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1888	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1889	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1890	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1891	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1892	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1893	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1894	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1895	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1896	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1897	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1898	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1899	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1901	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1902	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1903	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1904	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1905	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1906	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01
1907	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01
1908	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.02
1909	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.02
1910	0.03	0.00	0.03	0.00	0.00	0.00	0.00	0.03
1911	0.03	0.00	0.03	0.00	0.00	0.00	0.00	0.03
1912	0.04	0.00	0.04	0.00	0.00	0.00	0.00	0.04
1913	0.04	0.00	0.04	0.00	0.00	0.00	0.00	0.04
1914	0.05	0.00	0.05	0.00	0.00	0.00	0.00	0.05
1915	0.05	0.00	0.05	0.00	0.00	0.00	0.00	0.05
1916	0.06	0.00	0.06	0.00	0.00	0.00	0.00	0.06
1917	0.06	0.00	0.06	0.00	0.00	0.00	0.00	0.06
1918	0.07	0.00	0.07	0.00	0.00	0.00	0.00	0.07
1919	0.07	0.00	0.07	0.00	0.00	0.00	0.00	0.07
1920	0.08	0.00	0.08	0.00	0.00	0.00	0.00	0.08
1921	0.08	0.00	0.08	0.00	0.00	0.00	0.00	0.08
1922	0.09	0.00	0.09	0.00	0.00	0.00	0.00	0.09
1923	0.09	0.00	0.09	0.00	0.00	0.00	0.00	0.09
1924	0.10	0.00	0.10	0.00	0.00	0.00	0.00	0.10
1925	0.10	0.00	0.10	0.00	0.00	0.00	0.00	0.10
1926	0.11	0.00	0.11	0.01	0.00	0.00	0.00	0.12
1927	0.11	0.00	0.11	0.01	0.00	0.00	0.00	0.12
1928	0.12	0.00	0.12	0.02	0.01	0.00	0.01	0.15
1929	0.12	0.00	0.12	0.02	0.02	0.00	0.02	0.16
1930	0.13	0.00	0.13	0.04	0.03	0.00	0.03	0.19
1931	0.10	0.00	0.10	0.04	0.05	0.00	0.05	0.18
1932	0.10	0.00	0.10	0.04	0.06	0.00	0.06	0.19
1933	0.10	0.00	0.10	0.04	0.06	0.00	0.06	0.19
1934	0.11	0.00	0.11	0.04	0.06	0.00	0.06	0.20
1935	0.12	0.00	0.12	0.04	0.06	0.00	0.06	0.22
1936	0.12	0.00	0.12	0.04	0.08	0.00	0.08	0.24
1937	0.16	0.00	0.16	0.04	0.07	0.00	0.07	0.26
1938	0.16	0.00	0.16	0.04	0.09	0.00	0.09	0.29
1939	0.16	0.00	0.16	0.04	0.10	0.00	0.10	0.30
1940	0.12	0.00	0.12	0.04	0.11	0.00	0.11	0.27
1941	0.18	0.00	0.18	0.04	0.09	0.00	0.09	0.31
1942	0.12	0.00	0.12	0.04	0.09	0.00	0.09	0.25
1943	0.15	0.00	0.15	0.04	0.09	0.00	0.09	0.27
1944	0.20	0.00	0.20	0.04	0.08	0.00	0.08	0.32
1945	0.24	0.01	0.25	0.04	0.10	0.00	0.10	0.39
1946	0.30	0.02	0.32	0.05	0.11	0.00	0.11	0.47
1947	0.36	0.03	0.39	0.05	0.08	0.00	0.08	0.52
1948	0.40	0.04	0.44	0.05	0.10	0.00	0.10	0.59

(continued)

Table 4.4 Latin America actual, gigabarrels (including deep and non-conventional) (continued)

Year	Venezuela	Extra heavy Venezuela	Total Venezuela	Mexico	Rest L Amer exDeep	Deep Brazil	Total rest L Amer	Total L Amer
(actual production)								
1949	0.40	0.05	0.45	0.05	0.10	0.00	0.10	0.60
1950	0.45	0.06	0.51	0.07	0.14	0.00	0.14	0.71
1951	0.53	0.07	0.60	0.07	0.11	0.00	0.11	0.78
1952	0.55	0.08	0.63	0.08	0.11	0.00	0.11	0.82
1953	0.54	0.09	0.63	0.07	0.12	0.00	0.12	0.82
1954	0.57	0.10	0.67	0.08	0.13	0.00	0.13	0.87
1955	0.61	0.11	0.72	0.09	0.15	0.00	0.15	0.96
1956	0.70	0.12	0.82	0.09	0.16	0.00	0.16	1.07
1957	0.86	0.13	0.99	0.09	0.14	0.00	0.14	1.21
1958	0.81	0.14	0.95	0.09	0.15	0.00	0.15	1.19
1959	0.83	0.15	0.98	0.10	0.17	0.00	0.17	1.25
1960	0.88	0.16	1.04	0.10	0.22	0.00	0.22	1.36
1961	0.90	0.16	1.07	0.10	0.28	0.00	0.28	1.44
1962	0.99	0.18	1.17	0.11	0.28	0.00	0.28	1.56
1963	1.00	0.19	1.19	0.11	0.29	0.00	0.29	1.59
1964	1.05	0.19	1.24	0.11	0.28	0.00	0.28	1.63
1965	1.07	0.20	1.27	0.12	0.30	0.00	0.30	1.69
1966	1.05	0.18	1.23	0.11	0.32	0.00	0.32	1.66
1967	1.10	0.19	1.29	0.13	0.35	0.00	0.35	1.77
1968	1.12	0.19	1.31	0.14	0.36	0.00	0.36	1.81
1969	1.11	0.20	1.31	0.14	0.37	0.00	0.37	1.82
1970	1.14	0.22	1.35	0.15	0.38	0.00	0.38	1.89
1971	1.11	0.19	1.30	0.15	0.39	0.00	0.39	1.84
1972	1.00	0.18	1.18	0.16	0.42	0.00	0.42	1.76
1973	1.04	0.19	1.23	0.17	0.47	0.00	0.47	1.87
1974	0.94	0.15	1.09	0.18	0.51	0.00	0.51	1.78
1975	0.73	0.12	0.86	0.24	0.51	0.00	0.51	1.60
1976	0.72	0.12	0.84	0.29	0.48	0.00	0.48	1.60
1977	0.70	0.11	0.82	0.35	0.50	0.00	0.50	1.66
1978	0.67	0.12	0.79	0.45	0.51	0.00	0.51	1.75
1979	0.72	0.14	0.86	0.56	0.48	0.00	0.48	1.89
1980	0.67	0.12	0.79	0.73	0.57	0.00	0.57	2.09
1981	0.65	0.12	0.77	0.85	0.60	0.00	0.60	2.22
1982	0.56	0.13	0.69	1.00	0.56	0.00	0.56	2.25
1983	0.55	0.11	0.66	0.98	0.60	0.00	0.60	2.23
1984	0.54	0.12	0.66	0.98	0.65	0.00	0.65	2.28
1985	0.51	0.10	0.61	1.02	0.69	0.00	0.69	2.32
1986	0.51	0.14	0.65	0.90	0.76	0.00	0.76	2.31
1987	0.49	0.15	0.64	0.93	0.68	0.00	0.68	2.25
1988	0.52	0.18	0.69	0.93	0.69	0.01	0.70	2.32
1989	0.54	0.16	0.70	0.96	0.73	0.01	0.74	2.39
1990	0.62	0.16	0.78	0.96	0.82	0.02	0.83	2.57
1991	0.73	0.14	0.87	1.01	0.75	0.02	0.77	2.65
1992	0.72	0.15	0.87	0.98	0.79	0.03	0.82	2.66
1993	0.73	0.17	0.89	0.97	0.78	0.04	0.82	2.69
1994	0.77	0.18	0.94	0.98	0.78	0.07	0.85	2.77
1995	0.81	0.20	1.00	1.00	0.85	0.08	0.93	2.94
1996	0.89	0.19	1.07	1.08	0.91	0.10	1.01	3.16
1997	0.98	0.22	1.20	1.10	0.97	0.13	1.09	3.39
1998	0.97	0.19	1.16	1.12	0.99	0.17	1.16	3.44
1999	0.88	0.15	1.03	1.07	0.98	0.21	1.19	3.29
2000	0.94	0.21	1.15	1.10	0.89	0.28	1.17	3.42
2001	0.89	0.21	1.10	1.14	0.87	0.31	1.18	3.42
2002	0.73	0.22	0.95	1.16	0.92	0.37	1.29	3.40
2003	0.63	0.22	0.85	1.23	0.89	0.37	1.26	3.34
2004	0.68	0.25	0.93	1.24	0.88	0.58	1.46	3.63
2005	0.68	0.25	0.94	1.22	0.90	0.59	1.49	3.64
2006	0.67	0.25	0.92	1.19	0.94	0.60	1.54	3.65

Notes: ex—excluding; L Amer—Latin America.

Table 4.4 Latin America predicted, gigabarrels (including deep and non-conventional)

Year	Venezuela	Extra heavy Venezuela	Total Venezuela	Mexico	Rest L Amer exDeep	Deep Brazil	Total Rest L Amer	Total L Amer
(predicted production)								
1870	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1871	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1872	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1873	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1874	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1875	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1876	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1877	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1878	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1879	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1880	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1881	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1882	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1883	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1884	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1885	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1886	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1887	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1888	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1889	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1890	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1891	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1892	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1893	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1894	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1895	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1896	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1897	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1898	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1899	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1901	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1902	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1903	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1904	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01
1905	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01
1906	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01
1907	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.02
1908	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.02
1909	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.02
1910	0.03	0.00	0.03	0.00	0.00	0.00	0.00	0.03
1911	0.04	0.00	0.04	0.00	0.00	0.00	0.00	0.04
1912	0.04	0.00	0.04	0.00	0.00	0.00	0.00	0.04
1913	0.04	0.00	0.04	0.00	0.00	0.00	0.00	0.04
1914	0.05	0.00	0.05	0.00	0.00	0.00	0.00	0.05
1915	0.05	0.00	0.05	0.00	0.00	0.00	0.00	0.05
1916	0.06	0.00	0.06	0.00	0.00	0.00	0.00	0.06
1917	0.06	0.00	0.06	0.00	0.00	0.00	0.00	0.06
1918	0.07	0.00	0.07	0.00	0.00	0.00	0.00	0.07
1919	0.07	0.00	0.07	0.00	0.00	0.00	0.00	0.07
1920	0.07	0.00	0.07	0.00	0.00	0.00	0.00	0.07
1921	0.08	0.00	0.08	0.00	0.00	0.00	0.00	0.08
1922	0.09	0.00	0.09	0.00	0.00	0.00	0.00	0.09
1923	0.09	0.00	0.09	0.00	0.00	0.00	0.00	0.09
1924	0.09	0.00	0.09	0.00	0.00	0.00	0.00	0.09
1925	0.08	0.00	0.08	0.01	0.00	0.00	0.00	0.09
1926	0.07	0.00	0.07	0.01	0.00	0.00	0.00	0.09
1927	0.06	0.00	0.06	0.02	0.01	0.00	0.01	0.08
1928	0.06	0.00	0.06	0.02	0.01	0.00	0.01	0.09
1929	0.06	0.00	0.06	0.02	0.02	0.00	0.02	0.10
1930	0.07	0.00	0.07	0.03	0.03	0.00	0.03	0.13
1931	0.09	0.00	0.09	0.03	0.04	0.00	0.04	0.16
1932	0.12	0.00	0.12	0.03	0.05	0.00	0.05	0.19
1933	0.14	0.00	0.14	0.03	0.05	0.00	0.05	0.22
1934	0.15	0.00	0.15	0.03	0.06	0.00	0.06	0.25
1935	0.16	0.00	0.16	0.03	0.07	0.00	0.07	0.27
1936	0.17	0.00	0.17	0.03	0.08	0.00	0.08	0.28
1937	0.18	0.00	0.18	0.03	0.08	0.00	0.08	0.30
1938	0.19	0.00	0.19	0.04	0.09	0.00	0.09	0.31
1939	0.20	0.00	0.20	0.04	0.09	0.00	0.09	0.33
1940	0.21	0.00	0.21	0.04	0.09	0.00	0.09	0.35
1941	0.23	0.00	0.23	0.04	0.10	0.00	0.10	0.36
1942	0.24	0.00	0.24	0.04	0.10	0.00	0.10	0.38
1943	0.26	0.00	0.26	0.04	0.09	0.00	0.09	0.39
1944	0.29	0.00	0.29	0.04	0.09	0.00	0.09	0.42
1945	0.32	0.01	0.33	0.05	0.09	0.00	0.09	0.47
1946	0.36	0.02	0.38	0.05	0.09	0.00	0.09	0.51
1947	0.40	0.03	0.43	0.05	0.09	0.00	0.09	0.57
1948	0.43	0.04	0.47	0.06	0.11	0.00	0.11	0.64

(continued)

Table 4.4 Latin America predicted, gigabarrels (including deep and non-conventional) (continued)

Year	Venezuela	Extra heavy Venezuela	Total Venezuela	Mexico	Rest L Amer exDeep	Deep Brazil	Total Rest L Amer	Total L Amer
(predicted production)								
1949	0.47	0.05	0.52	0.06	0.11	0.00	0.11	0.69
1950	0.51	0.06	0.57	0.06	0.12	0.00	0.12	0.74
1951	0.53	0.07	0.60	0.06	0.12	0.00	0.12	0.78
1952	0.55	0.08	0.63	0.06	0.12	0.00	0.12	0.81
1953	0.56	0.09	0.65	0.07	0.12	0.00	0.12	0.84
1954	0.57	0.10	0.67	0.07	0.13	0.00	0.13	0.86
1955	0.59	0.11	0.70	0.07	0.13	0.00	0.13	0.89
1956	0.61	0.12	0.73	0.08	0.14	0.00	0.14	0.94
1957	0.65	0.13	0.78	0.08	0.15	0.00	0.15	1.01
1958	0.72	0.14	0.86	0.09	0.17	0.00	0.17	1.12
1959	0.79	0.15	0.94	0.09	0.19	0.00	0.19	1.22
1960	0.84	0.16	1.00	0.10	0.22	0.00	0.22	1.31
1961	0.89	0.16	1.06	0.10	0.24	0.00	0.24	1.40
1962	0.92	0.18	1.09	0.11	0.27	0.00	0.27	1.47
1963	0.92	0.19	1.11	0.11	0.28	0.00	0.28	1.50
1964	0.94	0.19	1.12	0.11	0.29	0.00	0.29	1.53
1965	0.97	0.20	1.16	0.12	0.31	0.00	0.31	1.59
1966	1.00	0.18	1.18	0.13	0.32	0.00	0.32	1.63
1967	1.02	0.19	1.21	0.14	0.33	0.00	0.33	1.69
1968	1.07	0.19	1.26	0.14	0.37	0.00	0.37	1.77
1969	1.10	0.20	1.30	0.15	0.40	0.00	0.40	1.85
1970	1.10	0.22	1.32	0.16	0.42	0.00	0.42	1.90
1971	1.09	0.19	1.28	0.17	0.44	0.00	0.44	1.89
1972	1.08	0.18	1.25	0.18	0.45	0.00	0.45	1.88
1973	1.00	0.19	1.19	0.20	0.44	0.00	0.44	1.84
1974	0.92	0.15	1.07	0.22	0.45	0.00	0.45	1.73
1975	0.84	0.12	0.96	0.26	0.47	0.00	0.47	1.69
1976	0.76	0.12	0.88	0.31	0.48	0.00	0.48	1.68
1977	0.68	0.11	0.79	0.38	0.50	0.00	0.50	1.67
1978	0.63	0.12	0.75	0.46	0.54	0.00	0.54	1.75
1979	0.59	0.14	0.73	0.56	0.57	0.00	0.57	1.86
1980	0.55	0.12	0.67	0.66	0.57	0.00	0.57	1.90
1981	0.54	0.12	0.66	0.76	0.59	0.00	0.59	2.01
1982	0.55	0.13	0.69	0.86	0.63	0.00	0.63	2.18
1983	0.57	0.11	0.68	0.92	0.65	0.00	0.65	2.25
1984	0.62	0.12	0.74	0.96	0.65	0.00	0.65	2.35
1985	0.66	0.10	0.76	0.98	0.68	0.00	0.68	2.43
1986	0.68	0.14	0.82	0.99	0.71	0.00	0.71	2.53
1987	0.69	0.15	0.84	0.98	0.69	0.01	0.70	2.52
1988	0.70	0.18	0.88	0.95	0.71	0.01	0.72	2.55
1989	0.66	0.16	0.82	0.93	0.74	0.02	0.75	2.50
1990	0.65	0.16	0.81	0.94	0.72	0.02	0.74	2.49
1991	0.66	0.14	0.80	0.95	0.72	0.03	0.75	2.51
1992	0.66	0.15	0.81	0.96	0.76	0.04	0.80	2.58
1993	0.69	0.17	0.86	0.97	0.79	0.05	0.84	2.67
1994	0.76	0.18	0.93	1.00	0.83	0.07	0.90	2.83
1995	0.80	0.20	1.00	1.02	0.90	0.09	1.00	3.02
1996	0.83	0.19	1.02	1.03	0.95	0.12	1.07	3.12
1997	0.86	0.22	1.07	1.06	0.97	0.15	1.12	3.25
1998	0.86	0.19	1.05	1.11	0.97	0.18	1.15	3.31
1999	0.84	0.15	0.99	1.14	0.95	0.22	1.17	3.30
2000	0.82	0.21	1.03	1.15	0.92	0.27	1.19	3.37
2001	0.79	0.21	1.00	1.16	0.90	0.32	1.22	3.38
2002	0.76	0.22	0.98	1.17	0.90	0.38	1.28	3.43
2003	0.73	0.22	0.95	1.18	0.91	0.46	1.37	3.50
2004	0.71	0.25	0.96	1.18	0.93	0.53	1.46	3.60
2005	0.68	0.25	0.93	1.17	0.96	0.60	1.56	3.67
2006	0.66	0.25	0.91	1.15	0.98	0.69	1.68	3.74
2007	0.64	0.30	0.95	1.16	1.01	0.76	1.76	3.87
2008	0.62	0.35	0.98	1.16	1.03	0.79	1.82	3.95
2009	0.60	0.40	1.00	1.16	1.03	0.82	1.85	4.01
2010	0.58	0.45	1.03	1.18	1.02	0.81	1.83	4.03
2011	0.56	0.47	1.03	1.20	1.00	0.76	1.76	3.99
2012	0.53	0.49	1.03	1.22	0.97	0.69	1.66	3.91
2013	0.51	0.52	1.03	1.24	0.93	0.62	1.55	3.82
2014	0.49	0.54	1.03	1.24	0.89	0.55	1.44	3.71
2015	0.45	0.56	1.01	1.24	0.85	0.51	1.36	3.61
2016	0.41	0.58	0.99	1.23	0.81	0.50	1.32	3.54
2017	0.36	0.60	0.96	1.21	0.78	0.52	1.31	3.48
2018	0.30	0.63	0.93	1.19	0.75	0.57	1.32	3.43
2019	0.25	0.65	0.90	1.18	0.72	0.61	1.33	3.41
2020	0.22	0.67	0.89	1.18	0.69	0.67	1.36	3.43
2021	0.20	0.68	0.88	1.21	0.67	0.74	1.41	3.49
2022	0.19	0.70	0.88	1.21	0.63	0.83	1.47	3.56
2023	0.19	0.71	0.90	1.19	0.61	0.94	1.55	3.64
2024	0.19	0.72	0.92	1.18	0.59	1.08	1.67	3.76
2025	0.20	0.74	0.93	1.14	0.56	1.20	1.75	3.83

(continued)

Table 4.4 Latin America predicted, gigabarrels (including deep and non-conventional) (continued)

Year	Venezuela	Extra heavy Venezuela	Total Venezuela	Mexico	Rest L Amer exDeep	Deep Brazil	Total Rest L Amer	Total L Amer
(predicted production)								
2026	0.20	0.75	0.95	1.10	0.53	1.28	1.81	3.85
2027	0.20	0.76	0.96	1.07	0.50	1.34	1.84	3.86
2028	0.20	0.77	0.97	1.06	0.46	1.37	1.82	3.86
2029	0.20	0.79	0.99	1.07	0.42	1.36	1.78	3.84
2030	0.20	0.80	1.00	1.11	0.39	1.35	1.74	3.85
2031	0.20	0.80	1.00	1.14	0.37	1.32	1.69	3.83
2032	0.20	0.80	1.00	1.15	0.35	1.27	1.62	3.77
2033	0.20	0.80	1.00	1.15	0.34	1.19	1.53	3.68
2034	0.20	0.80	1.00	1.13	0.33	1.09	1.42	3.54
2035	0.20	0.80	1.00	1.09	0.32	0.96	1.27	3.36
2036	0.20	0.80	1.00	1.05	0.31	0.85	1.15	3.20
2037	0.20	0.80	1.00	1.01	0.30	0.76	1.06	3.07
2038	0.21	0.80	1.01	0.97	0.29	0.70	0.99	2.97
2039	0.21	0.80	1.01	0.94	0.28	0.66	0.94	2.89
2040	0.21	0.80	1.01	0.90	0.27	0.65	0.92	2.83
2041	0.21	0.80	1.01	0.84	0.26	0.64	0.90	2.76
2042	0.21	0.80	1.01	0.77	0.25	0.63	0.88	2.67
2043	0.21	0.80	1.01	0.69	0.24	0.62	0.86	2.56
2044	0.20	0.80	1.00	0.61	0.23	0.61	0.84	2.45
2045	0.18	0.80	0.98	0.52	0.22	0.60	0.82	2.32
2046	0.16	0.80	0.96	0.44	0.21	0.59	0.80	2.20
2047	0.14	0.80	0.94	0.38	0.20	0.58	0.78	2.10
2048	0.12	0.80	0.92	0.35	0.19	0.57	0.76	2.03
2049	0.11	0.80	0.91	0.32	0.18	0.56	0.74	1.97
2050	0.10	0.80	0.90	0.30	0.17	0.55	0.72	1.93
2051	0.10	0.80	0.90	0.28	0.16	0.54	0.70	1.89
2052	0.10	0.80	0.90	0.27	0.15	0.53	0.68	1.86
2053	0.10	0.80	0.90	0.26	0.14	0.52	0.66	1.82
2054	0.10	0.80	0.90	0.24	0.13	0.51	0.64	1.79
2055	0.10	0.80	0.90	0.23	0.12	0.50	0.62	1.75
2056	0.10	0.80	0.90	0.21	0.11	0.49	0.60	1.71
2057	0.10	0.80	0.90	0.19	0.10	0.48	0.58	1.67
2058	0.10	0.80	0.90	0.17	0.09	0.47	0.56	1.63
2059	0.10	0.80	0.90	0.16	0.08	0.46	0.54	1.60
2060	0.10	0.80	0.90	0.16	0.07	0.45	0.51	1.57
2061	0.10	0.80	0.90	0.15	0.06	0.44	0.49	1.55
2062	0.10	0.80	0.90	0.16	0.05	0.43	0.47	1.53
2063	0.10	0.80	0.90	0.16	0.04	0.42	0.46	1.51
2064	0.10	0.80	0.90	0.16	0.03	0.41	0.44	1.50
2065	0.10	0.80	0.90	0.16	0.02	0.40	0.42	1.48
2066	0.10	0.80	0.90	0.16	0.02	0.39	0.40	1.46
2067	0.10	0.80	0.90	0.16	0.01	0.38	0.39	1.44
2068	0.09	0.80	0.89	0.16	0.01	0.37	0.37	1.42
2069	0.09	0.80	0.89	0.15	0.00	0.36	0.36	1.40
2070	0.09	0.80	0.89	0.15	0.00	0.35	0.35	1.39
2071	0.08	0.80	0.88	0.14	0.00	0.34	0.34	1.37
2072	0.08	0.80	0.88	0.14	0.00	0.33	0.33	1.35
2073	0.08	0.80	0.88	0.14	0.00	0.32	0.32	1.33
2074	0.08	0.80	0.88	0.13	0.00	0.31	0.31	1.32
2075	0.07	0.80	0.87	0.13	0.00	0.30	0.30	1.30
2076	0.07	0.80	0.87	0.13	0.00	0.29	0.29	1.28
2077	0.07	0.80	0.87	0.12	0.00	0.28	0.28	1.27
2078	0.06	0.80	0.86	0.12	0.00	0.27	0.27	1.25
2079	0.06	0.80	0.86	0.12	0.00	0.25	0.25	1.23
2080	0.06	0.80	0.86	0.11	0.00	0.24	0.24	1.22
2081	0.06	0.80	0.86	0.11	0.00	0.23	0.23	1.20
2082	0.05	0.80	0.85	0.10	0.00	0.22	0.22	1.18
2083	0.05	0.80	0.85	0.10	0.00	0.21	0.21	1.17
2084	0.05	0.80	0.85	0.10	0.00	0.20	0.20	1.15
2085	0.04	0.80	0.84	0.09	0.00	0.19	0.19	1.13
2086	0.04	0.80	0.84	0.09	0.00	0.18	0.18	1.12
2087	0.04	0.80	0.84	0.09	0.00	0.17	0.17	1.10
2088	0.04	0.80	0.84	0.08	0.00	0.16	0.16	1.08
2089	0.03	0.80	0.83	0.08	0.00	0.15	0.15	1.07
2090	0.03	0.80	0.83	0.08	0.00	0.14	0.14	1.05
2091	0.03	0.80	0.83	0.07	0.00	0.13	0.13	1.04
2092	0.03	0.80	0.83	0.07	0.00	0.12	0.12	1.02
2093	0.02	0.80	0.82	0.07	0.00	0.11	0.11	1.00
2094	0.02	0.80	0.82	0.06	0.00	0.10	0.10	0.99
2095	0.02	0.80	0.82	0.06	0.00	0.09	0.09	0.97
2096	0.02	0.80	0.82	0.06	0.00	0.08	0.08	0.96
2097	0.02	0.80	0.82	0.06	0.00	0.07	0.07	0.94
2098	0.01	0.80	0.81	0.05	0.00	0.06	0.06	0.93
2099	0.01	0.80	0.81	0.05	0.00	0.05	0.05	0.92
2100	0.01	0.80	0.81	0.05	0.00	0.04	0.04	0.90

Notes: ex—excluding; L Amer—Latin America.

bitre

Chapter 5

Africa



Chapter 5 Africa

Africa will be analysed as eight major oil-producing subregions: conventional oil production in Libya, Nigeria, Algeria, Egypt, Angola and the Rest of Africa, and deep water production in Nigeria and Angola. The six conventional areas will be analysed first. Deep water prospects will be examined in more detail in Chapter 11, but the results of that analysis as concerns Africa will be summarised at the end of this chapter.

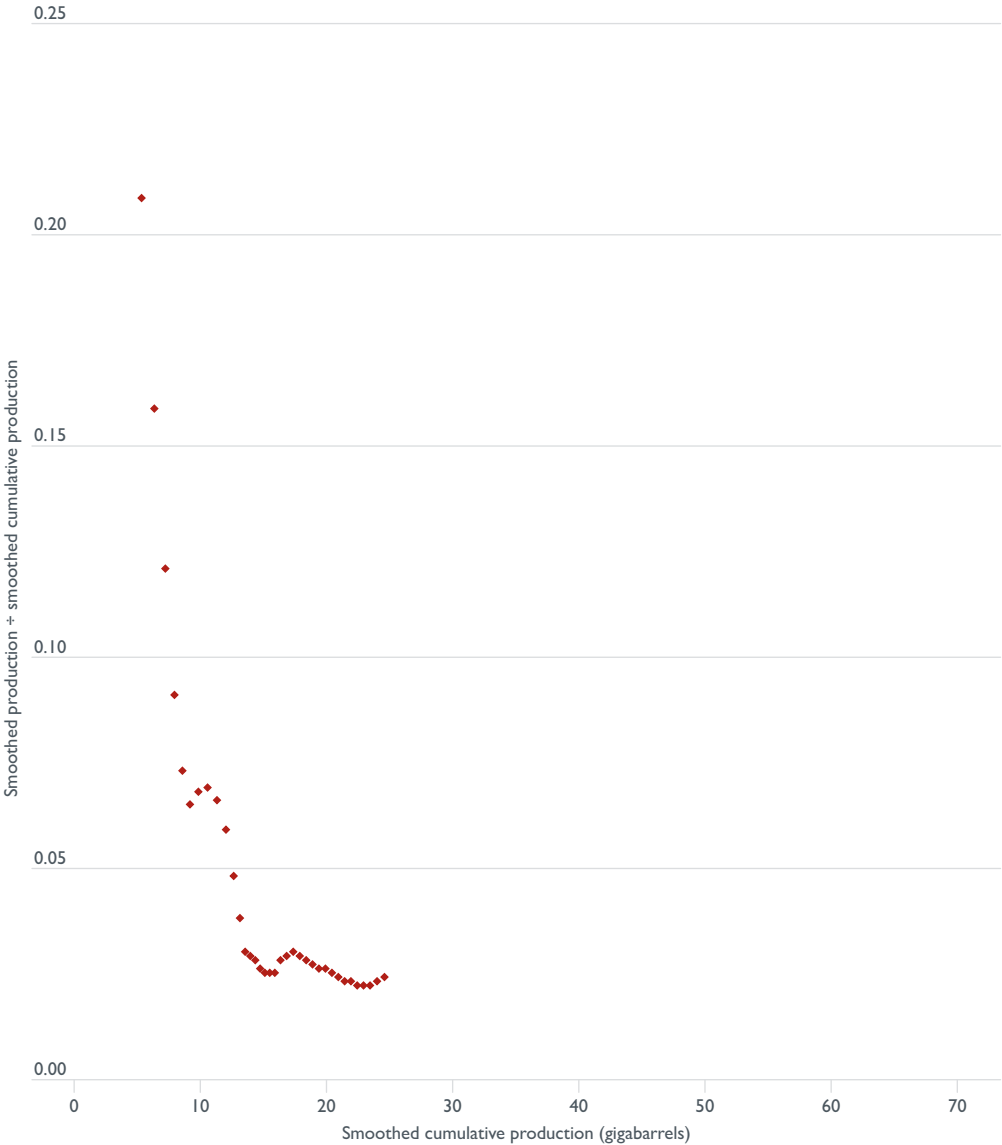
Libya

Table 5.1 sets out the calculations from the 11 steps to a forecast of production of Libyan oil production.

The first steps are to estimate the ultimate recoverable resource (U) from patterns of growth in production.

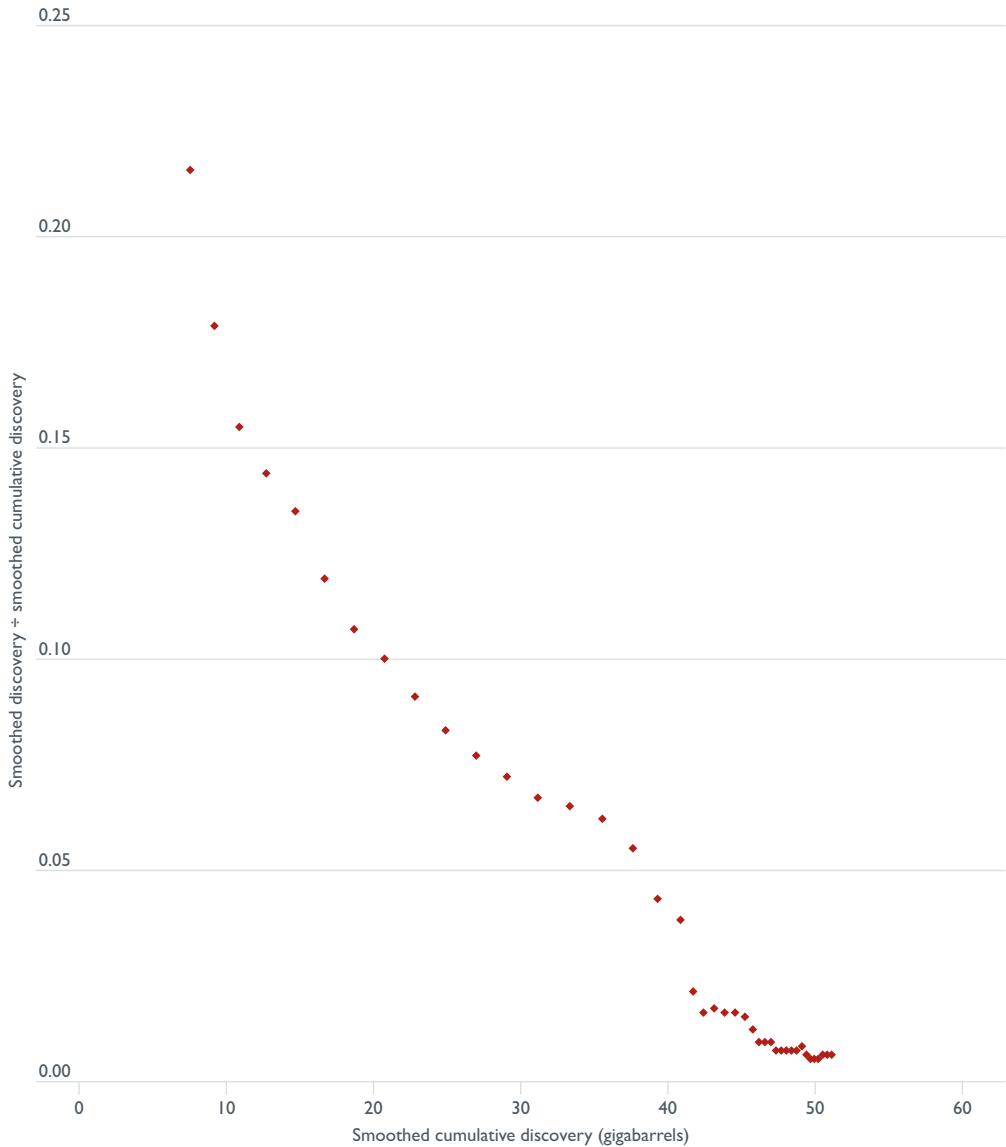
1. First, annual production (P) and cumulative production (CP) are smoothed with a three year average, generating SP and SCP (see Table 5.1).
2. Then the fractional growth in production (SP/SCP) is calculated and plotted against last year's cumulative production. This plot is shown in Figure 5.1.
3. The plot is then examined and a best guess at an ultimate cumulative production (U) is made. In this case, it is 63 gigabarrels.
4. Discovery (D) and cumulative discovery (CD) are smoothed with a 21 year moving average.
5. Then the fractional growth in discovery (SD/SCD) is calculated and plotted against last year's smoothed cumulative discovery. This plot is shown in Figure 5.2.

Figure 5.1 Libyan cumulative production growth curve



6. The plot is examined and a best guess at an ultimate discovery (UD) is made. In this case it is 60 gigabarrels.

Figure 5.2 Libyan cumulative discovery growth curve



- 7. Cumulative discovery in 2006 is then projected to UD by bringing SD estimated for 2006 to zero in 2075. For Libyan oil, the projection of the cumulative discovery curve is shown in Figure 5.3.
- 8. Next, the height of the cumulative discovery curve has to be adjusted to equal the more reliable cumulative production estimate. In this case, the adjustment is minor, amounting to multiplying by 63/60.

Figure 5.3 **Libya cumulative discovery projection**

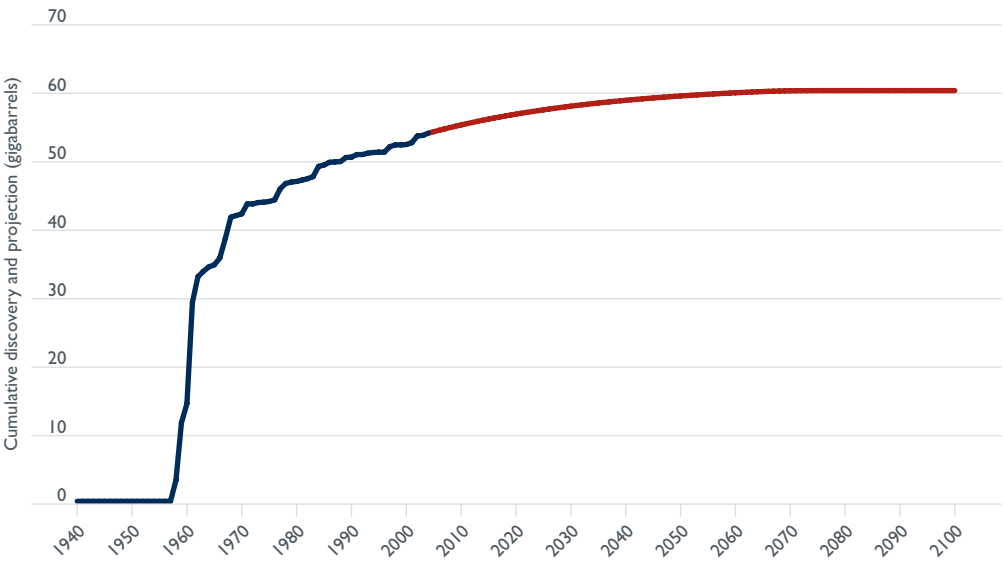
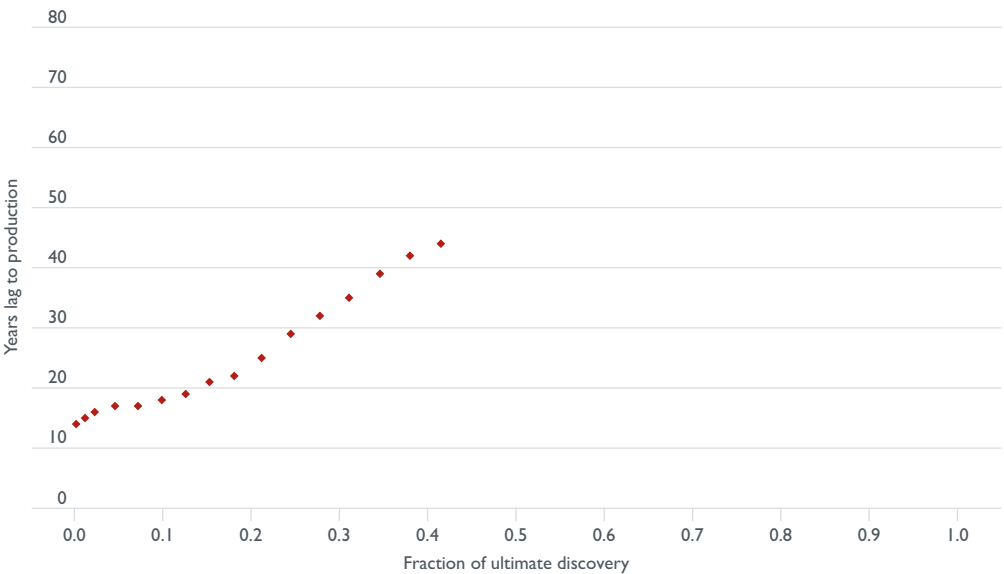


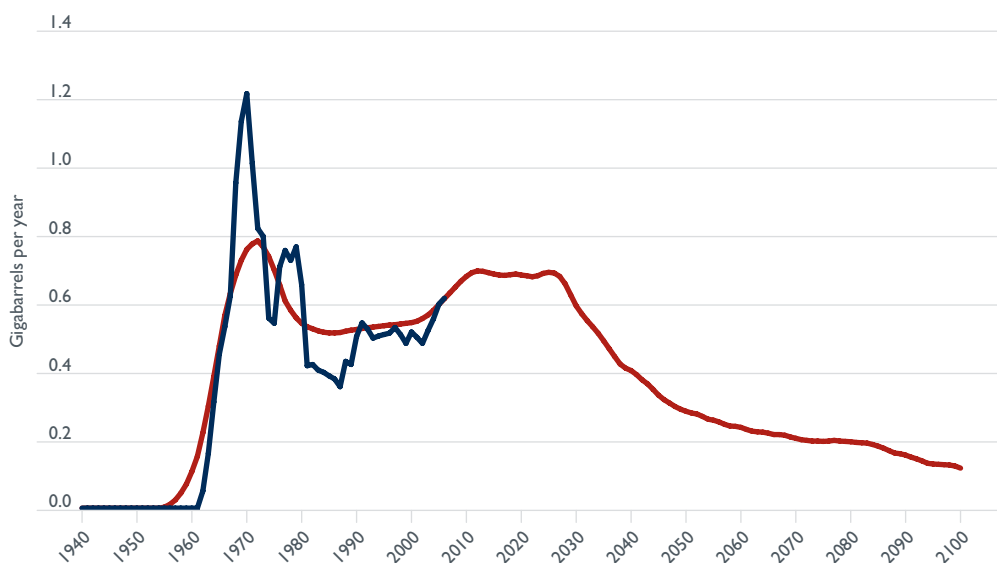
Figure 5.4 **Libyan stretch lag curve**



9. Next, the historical stretch lag between the cumulative discovery and production curves is calculated, and plotted against the fraction of cumulative discovery. This plot for Libya is shown in Figure 5.4. It is apparent that there is a regular relationship. After some noise in the range of zero to 0.1, the stretch lag exhibits a period of moderate increase, followed by a period of sharper increases after the OPEC slowdown in production. Lately increases in the lag have again begun to slow. Extrapolating the trend to 80 years at 1.0 allows the rest of the cumulative production curve to be forecast from the extrapolated discovery curve and the predicted lags.

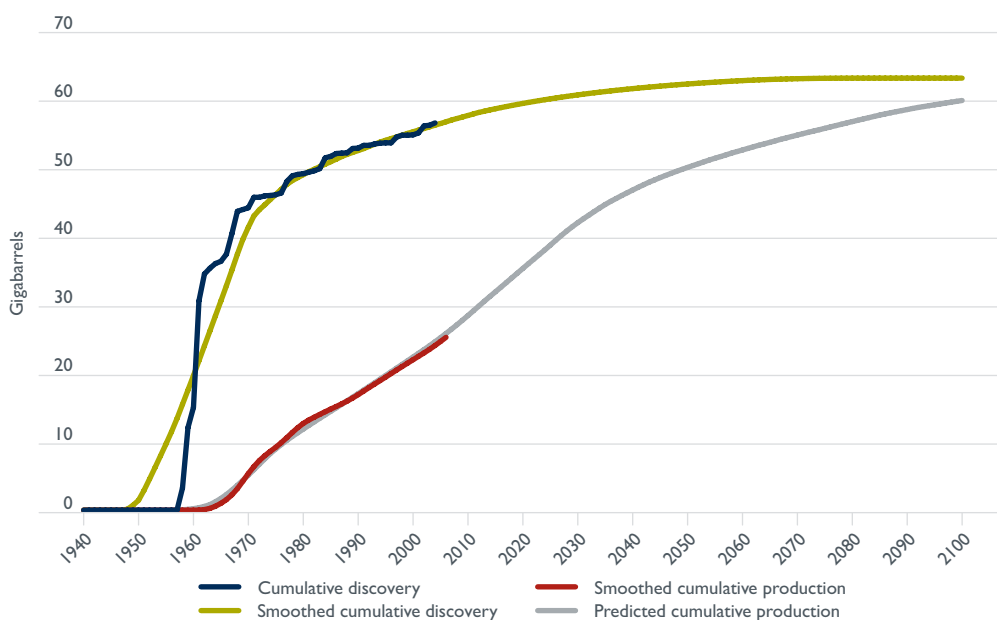
10. The predicted cumulative production curve is smoothed with an 11 year average and then differenced to give a raw predicted annual production. This is then averaged over five years to give a final annual production forecast. This is shown in Figure 5.5.

Figure 5.5 Actual and predicted Libyan crude oil production



11. Finally the cumulative discovery and production curves (actual and forecast) are plotted in Figure 5.6. This allows a spatial understanding of the relationship between production and discovery.

Figure 5.6 Libyan cumulative discovery and cumulative production curves



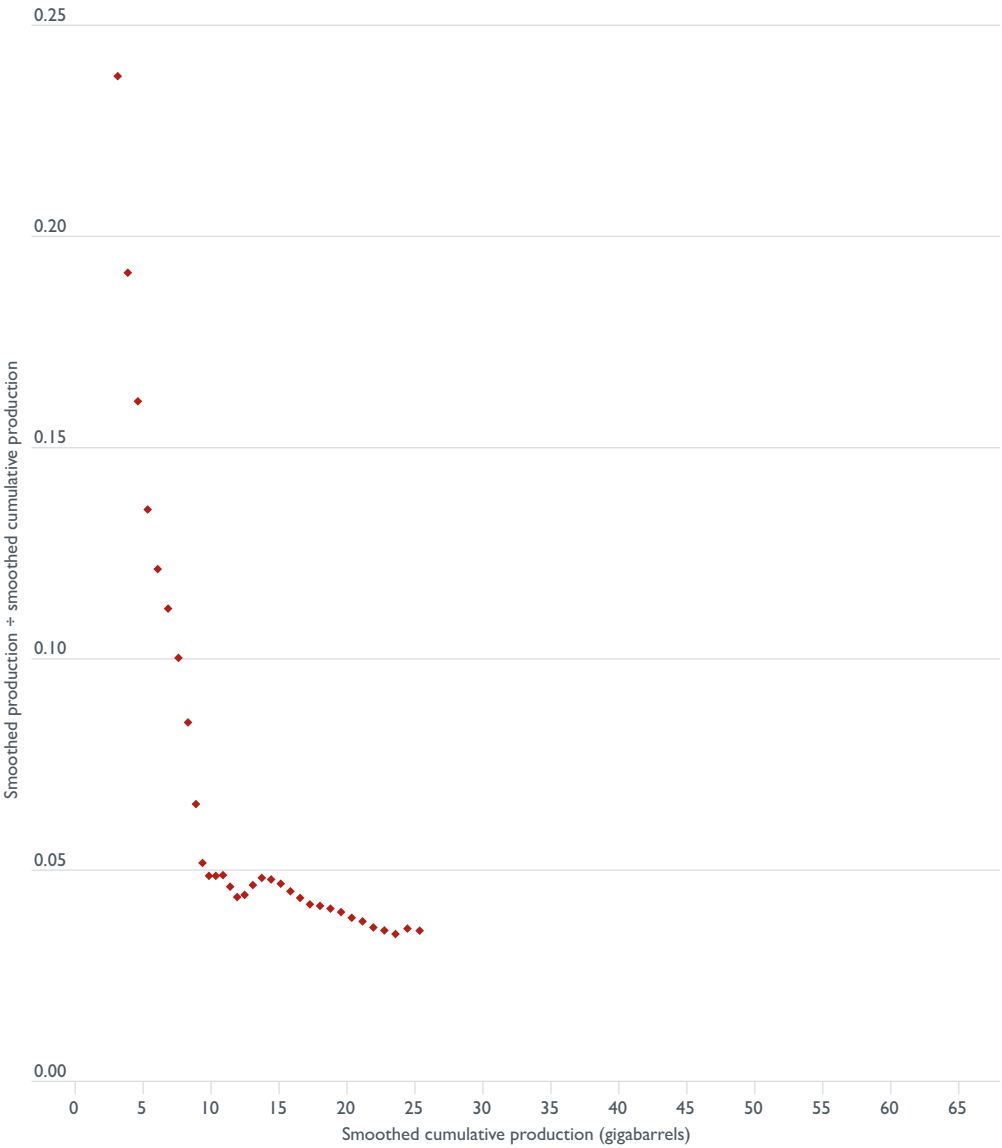
Nigeria

Table 5.2 sets out the calculations from the 11 steps to a forecast of production of Nigerian oil.

The first steps are to estimate the ultimate recoverable resource (U) from patterns of growth in production.

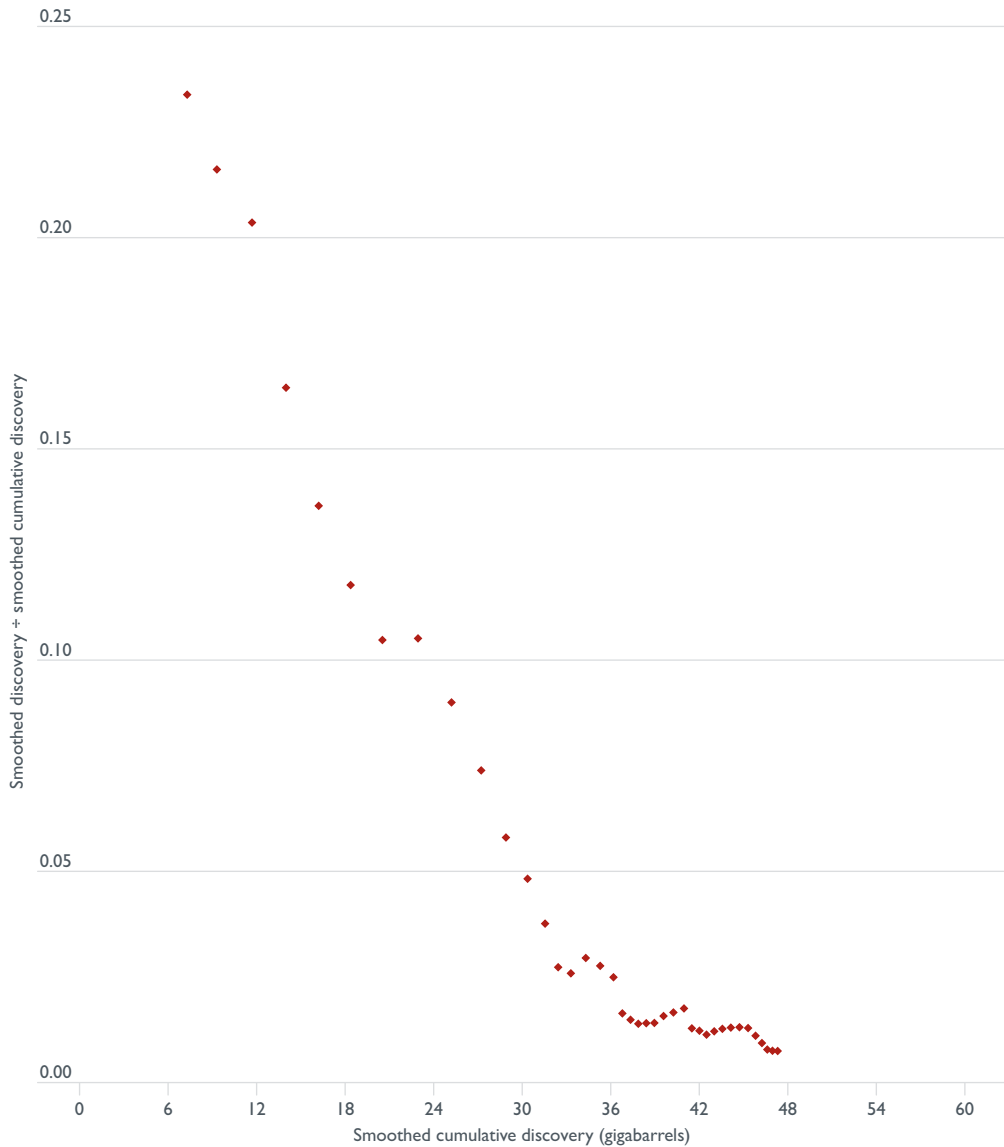
- 1. First, annual production (P) and cumulative production (CP) are smoothed with a three year average, generating SP and SCP (see Table 5.2).
- 2. Then the fractional growth in production (SP/SCP) is calculated and plotted against last year's cumulative production. This plot is shown in Figure 5.7.

Figure 5.7 Nigerian cumulative production growth curve



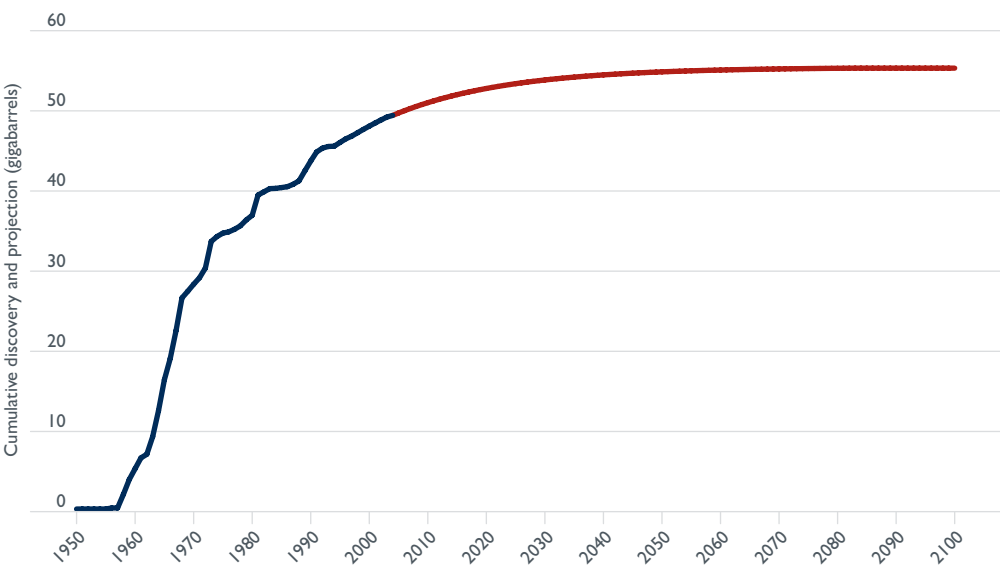
3. The plot is then examined and a best guess at an ultimate cumulative production (U) is made. In this case, it is 65 gigabarrels.
4. Discovery (D) and cumulative discovery (CD) are smoothed with an 11 year moving average.
5. Then the fractional growth in discovery (SD/SCD) is calculated and plotted against last year's smoothed cumulative discovery. This plot is shown in Figure 5.8.

Figure 5.8 Nigerian cumulative discovery growth curve



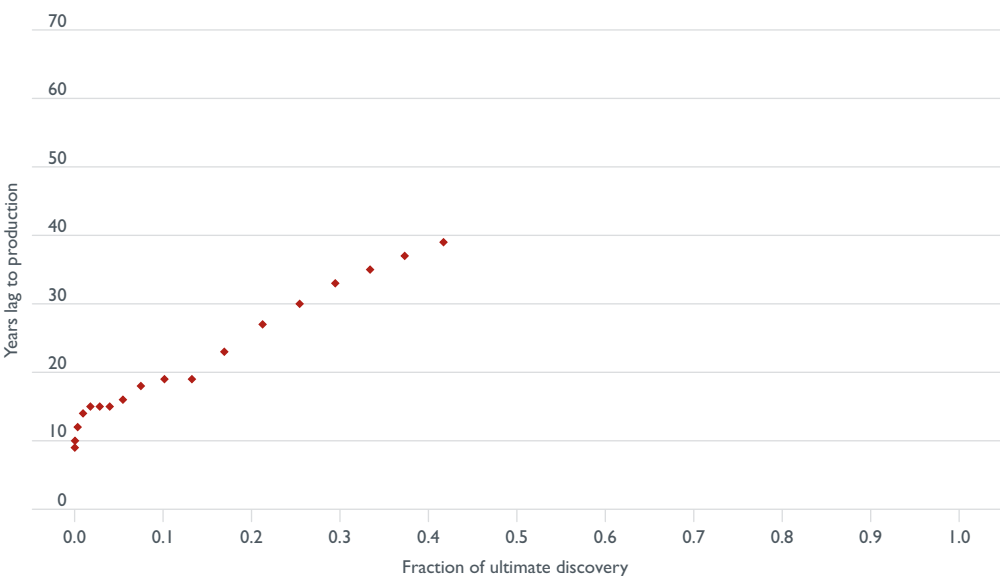
6. The plot is examined and a best guess at an ultimate discovery (UD) is made. In this case it is 55 gigabarrels.
7. Cumulative discovery in 2006 is then projected to UD by bringing SD estimated for 2006 to zero in 2084. For Nigerian oil, the projection of the cumulative discovery curve is shown in Figure 5.9.

Figure 5.9 Nigerian cumulative discovery projection



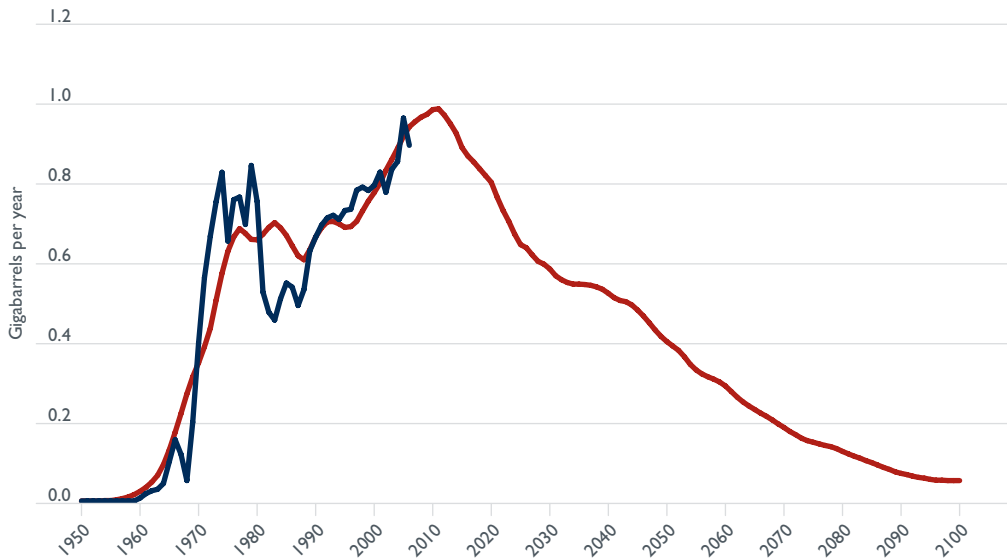
8. Next, the height of the cumulative discovery curve has to be adjusted to equal the more reliable cumulative production estimate. In this case, the adjustment is upward, amounting to multiplying by 65/55.
9. Next, the historical stretch lag between the cumulative discovery and production curves is calculated, and plotted against the fraction of cumulative discovery. This plot for Nigeria is shown in Figure 5.10. After some noise in the range of zero to 0.15, the stretch lag rises, strongly with the OPEC slowdown, and then more slowly. Extrapolating the trend to 55 years at 1.0 allows the rest of the cumulative production curve to be forecast from the extrapolated discovery curve and the predicted lags.

Figure 5.10 Nigerian stretch lag curve



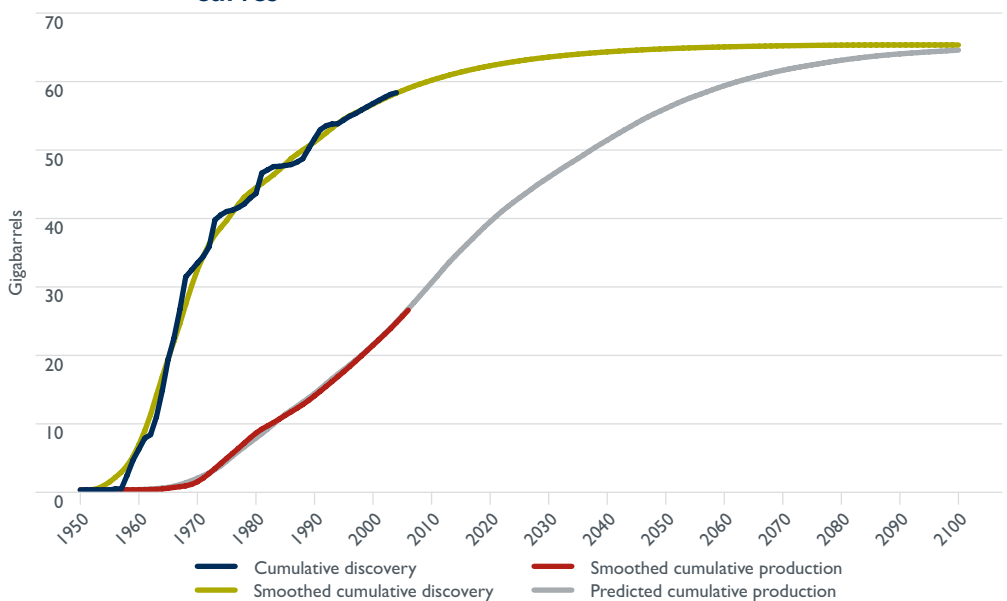
10. The predicted cumulative production curve is smoothed with an 11 year average and then differenced to give a raw predicted annual production. This is then averaged over five years to give a final annual production forecast. This is shown in Figure 5.11.

Figure 5.11 Actual and predicted Nigerian crude oil production



11. Finally the cumulative discovery and production curves (actual and forecast) are plotted in Figure 5.12. This allows a spatial understanding of the relationship between production and discovery.

Figure 5.12 Nigerian cumulative discovery and cumulative production curves

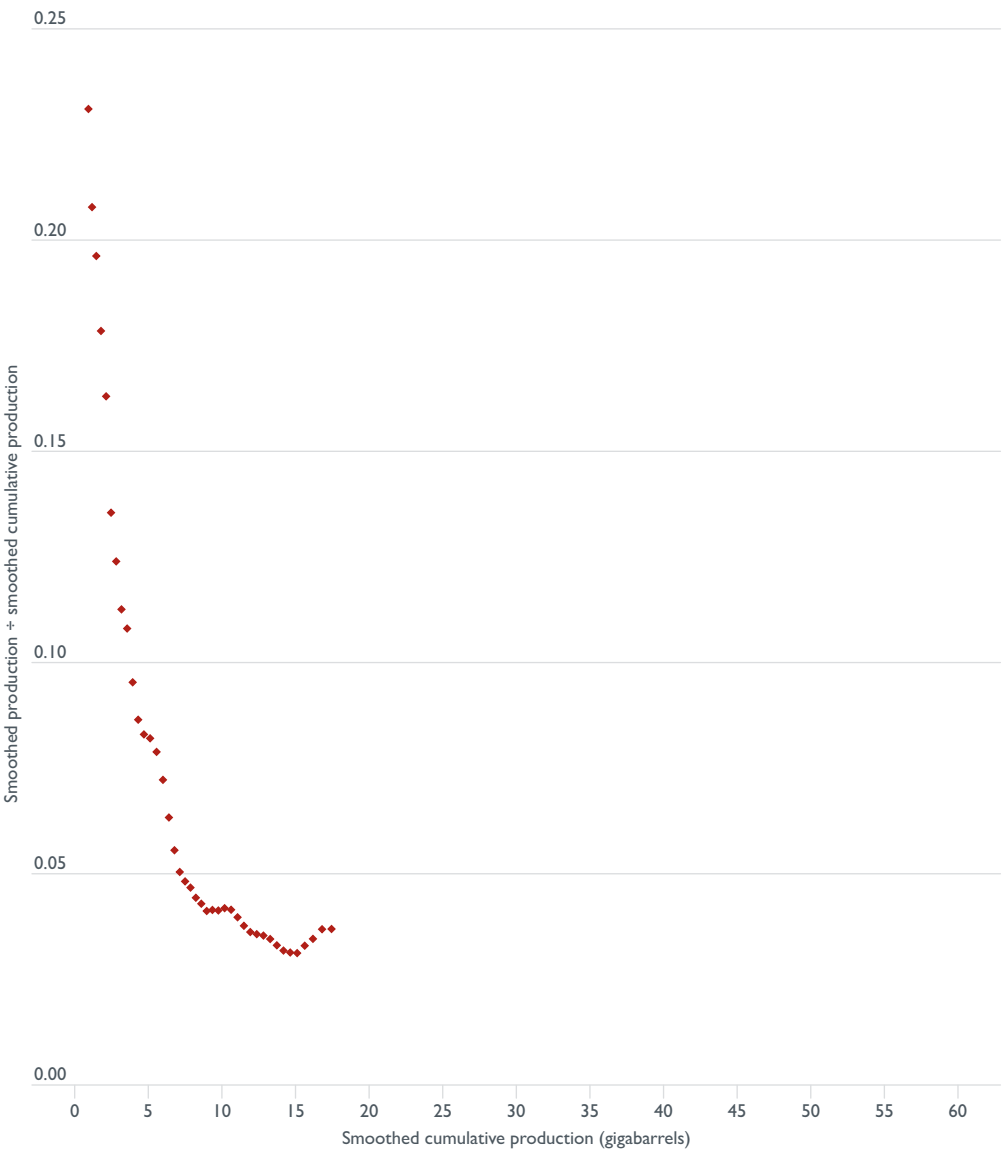


Algeria

Table 5.3 sets out the calculations from the 11 steps to a forecast of Algerian oil production.

- 1. First, annual production (P) and cumulative production (CP) are smoothed with a three year average, generating SP and SCP (see Table 5.3).
- 2. Then the fractional growth in production (SP/SCP) is calculated and plotted against last year's cumulative production, as shown in Figure 5.13.

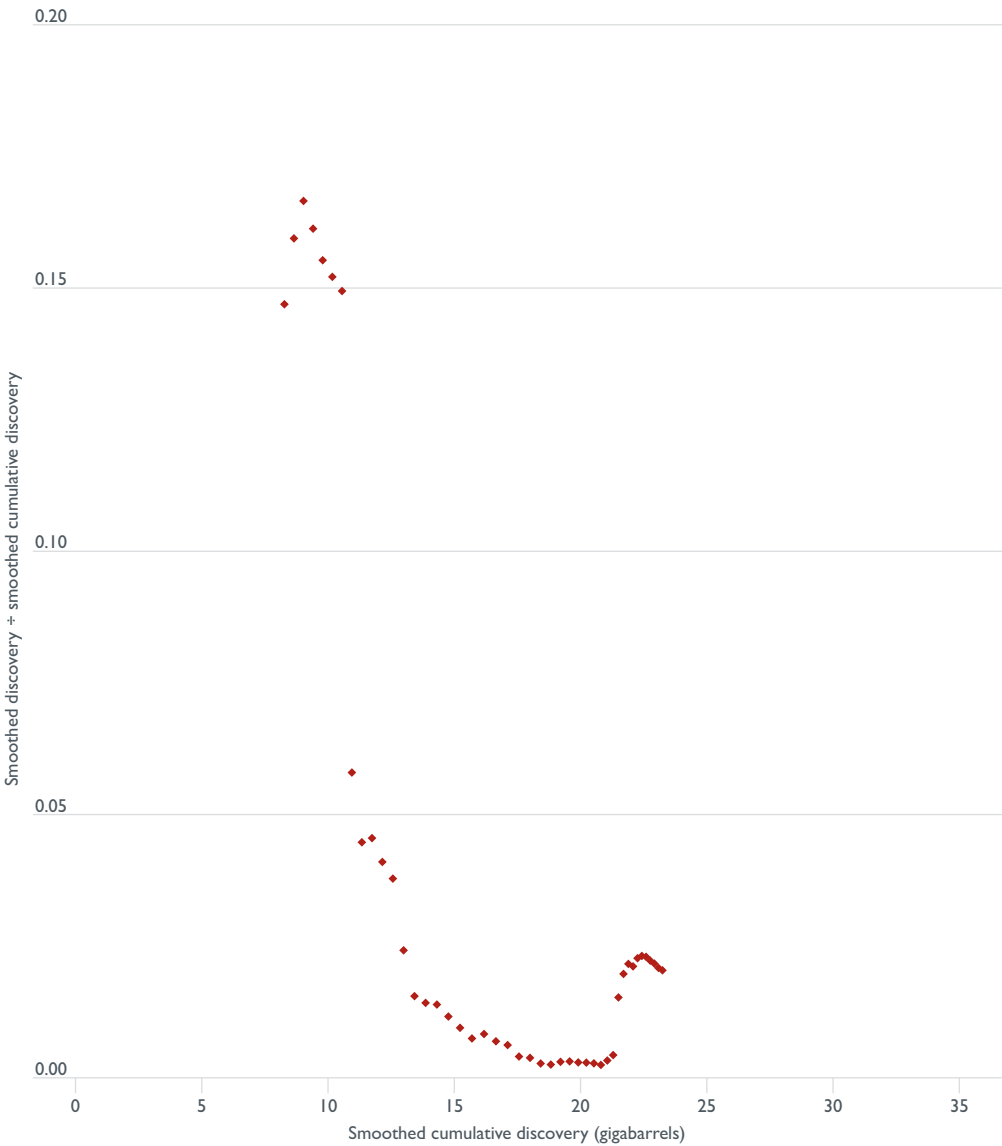
Figure 5.13 Algerian cumulative production growth curve



- 3. The plot is then examined and a best guess at an ultimate cumulative production (U) is made. In this case, it is 48 gigabarrels.

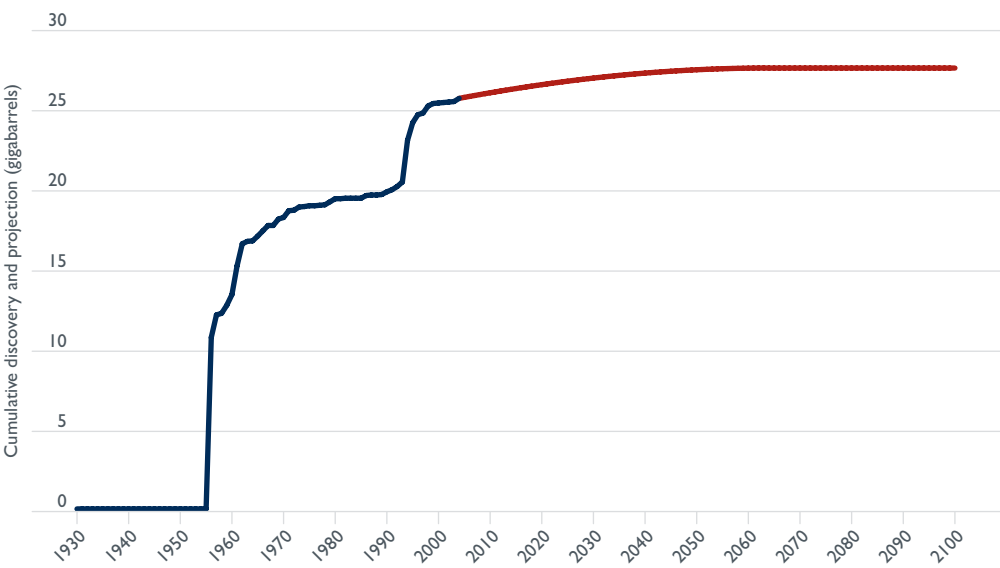
- 4. Discovery (D) is smoothed with an 11 year moving average and cumulative discovery (CD) is smoothed with successive 9 and 51 year moving averages.
- 5. Then the fractional growth in discovery (SD/SCD) is calculated and plotted against last year's smoothed cumulative discovery (Figure 5.14).

Figure 5.14 Algerian cumulative discovery growth curve



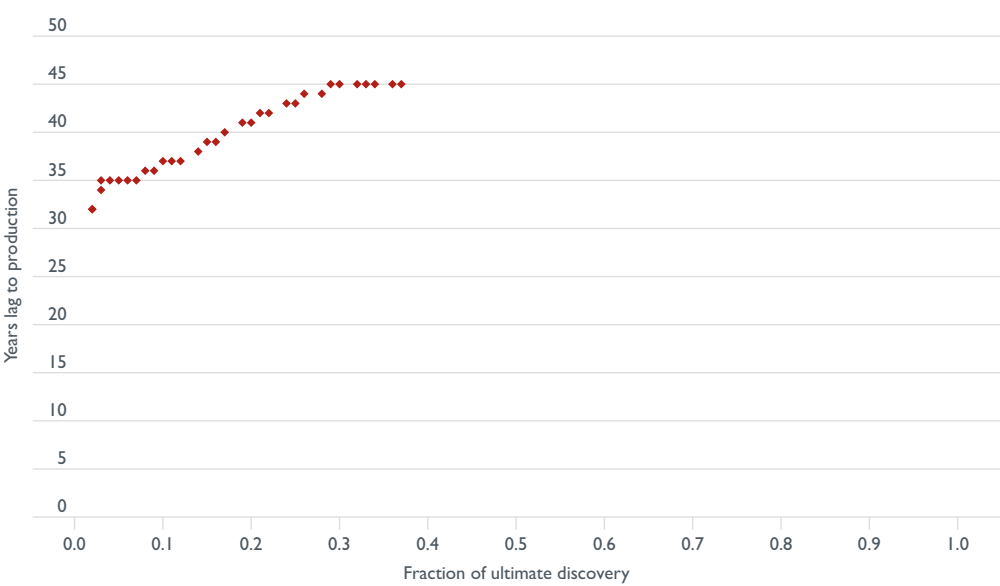
- 6. The plot is examined and a best guess at an ultimate discovery (UD) is made. In this case it is 27.5 gigabarrels.
- 7. Cumulative discovery in 2006 is then projected to UD by bringing SD estimated for 2006 to zero in 2060. For Algerian oil, the projection of the cumulative discovery curve is shown in Figure 5.15.

Figure 5.15 Algerian cumulative discovery projection



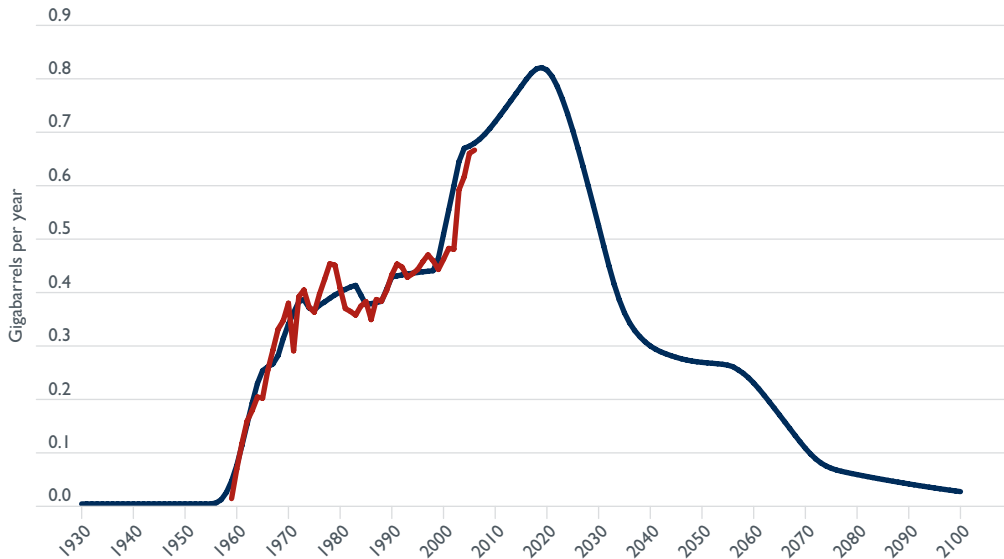
- 8. Next, the height of the cumulative discovery curve has to be adjusted to equal the more reliable cumulative production estimate. In this case, the adjustment is upward, amounting to multiplying by 48/27.5.
- 9. Next, the historical stretch lag between the cumulative discovery and production curves is calculated, and plotted against the fraction of cumulative discovery. This plot for Algeria is shown in Figure 5.16. The stretch lag steady rises and then enters a flat period. Extrapolating the trend to 45 years at 1.0 allows the rest of the cumulative production lag curve to be forecast from the extrapolated discovery curve and the predicted lags.

Figure 5.16 Algerian stretch lag curve



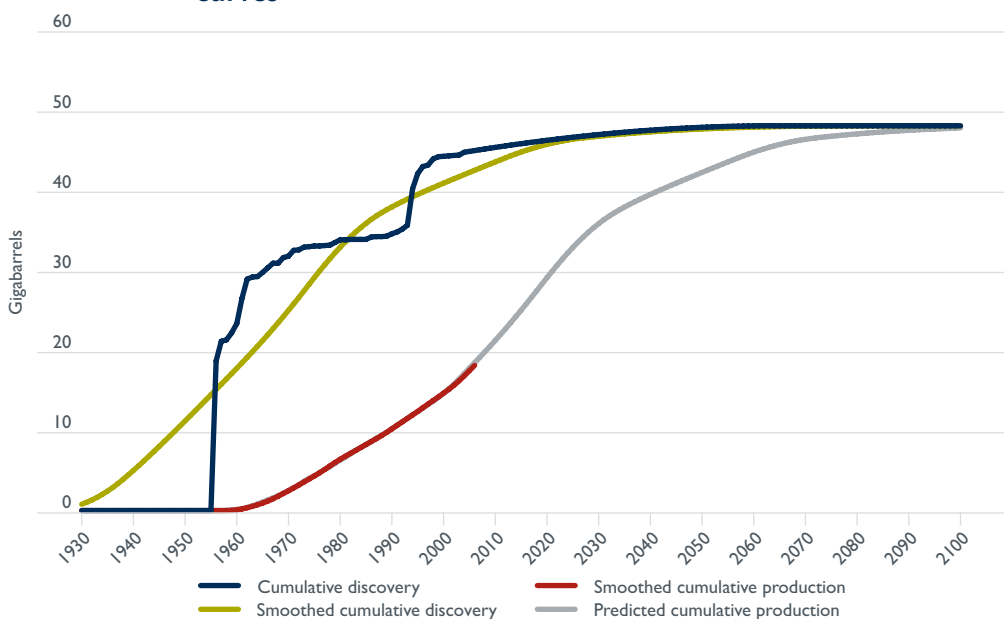
10. The predicted cumulative production curve is smoothed with a five year average and then differenced to give a raw predicted annual production. This is then averaged over five years to give a final annual production forecast. This is shown in Figure 5.17.

Figure 5.17 Actual and predicted Algerian crude oil production



11. Finally the cumulative discovery and production curves (actual and forecast) are plotted in Figure 5.18. This allows a spatial understanding of the relationship between production and discovery.

Figure 5.18 Algerian cumulative discovery and cumulative production curves

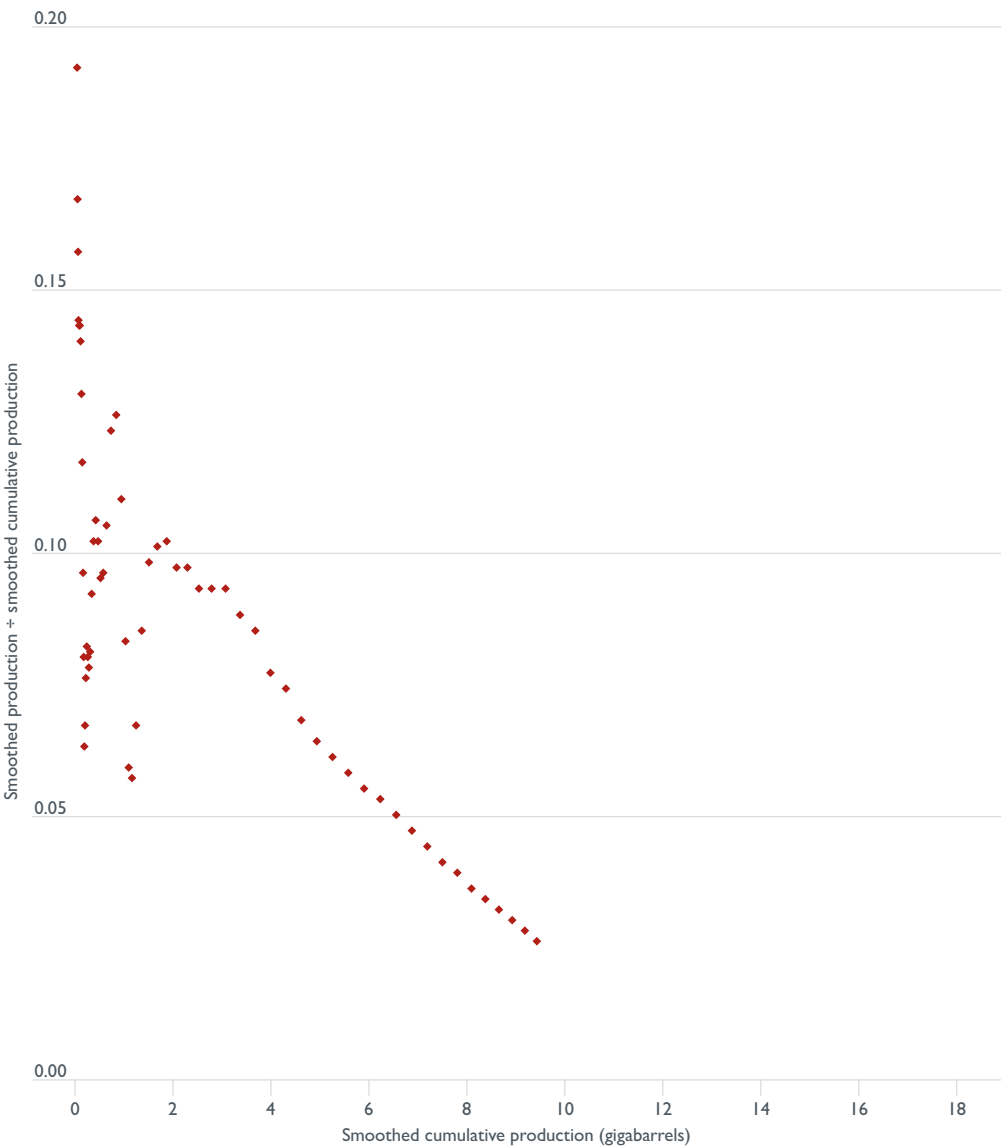


Egypt

Table 5.4 sets out the calculations from the 11 steps to a forecast of production of Egyptian oil.

- 1. First, annual production (P) and cumulative production (CP) are smoothed with a three year average, generating SP and SCP (see Table 5.4).
- 2. Then the fractional growth in production (SP/SCP) is calculated and plotted against last year's cumulative production, as shown in Figure 5.19.

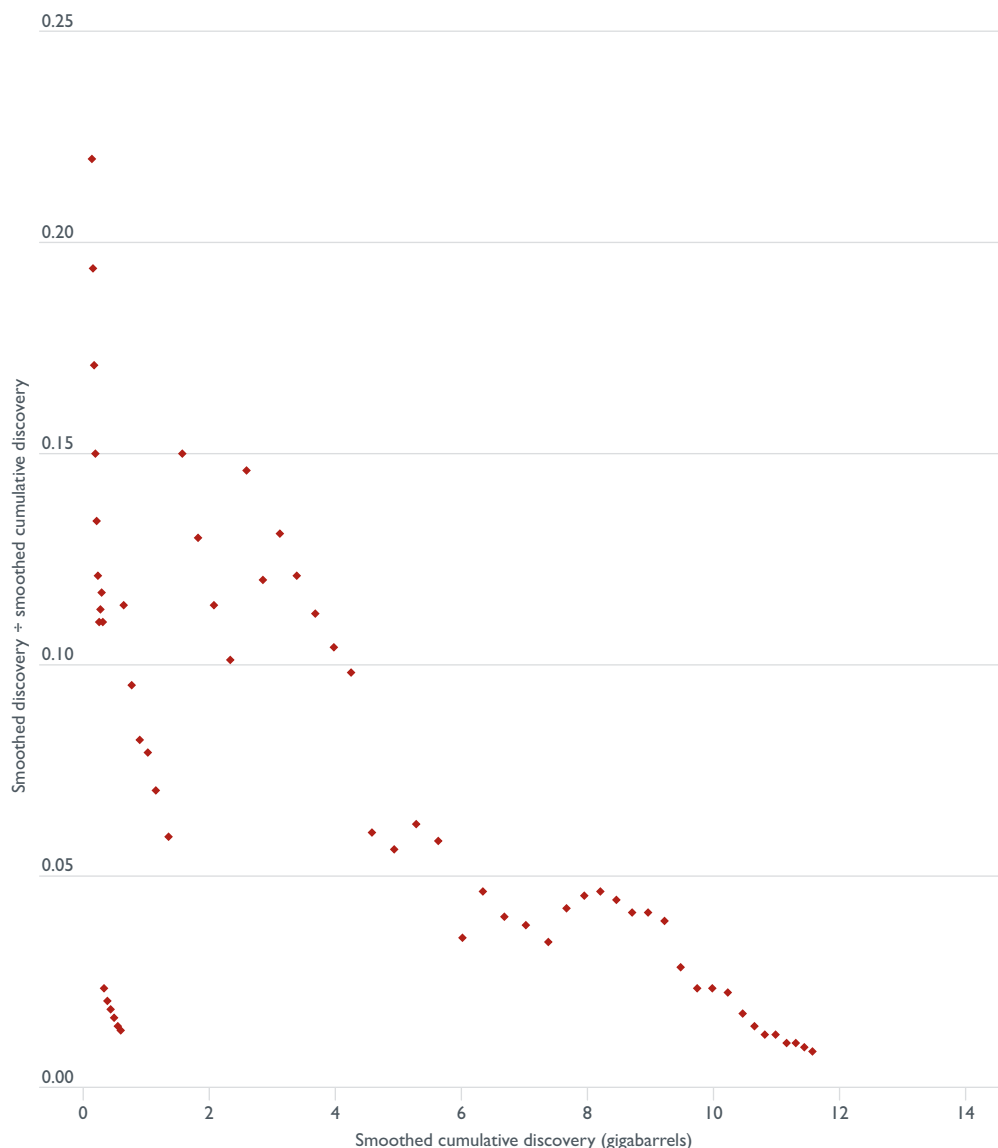
Figure 5.19 Egyptian cumulative production growth curve



- 3. The plot is then examined and a best guess at an ultimate cumulative production (U) is made. In this case, it is 16 gigabarrels.

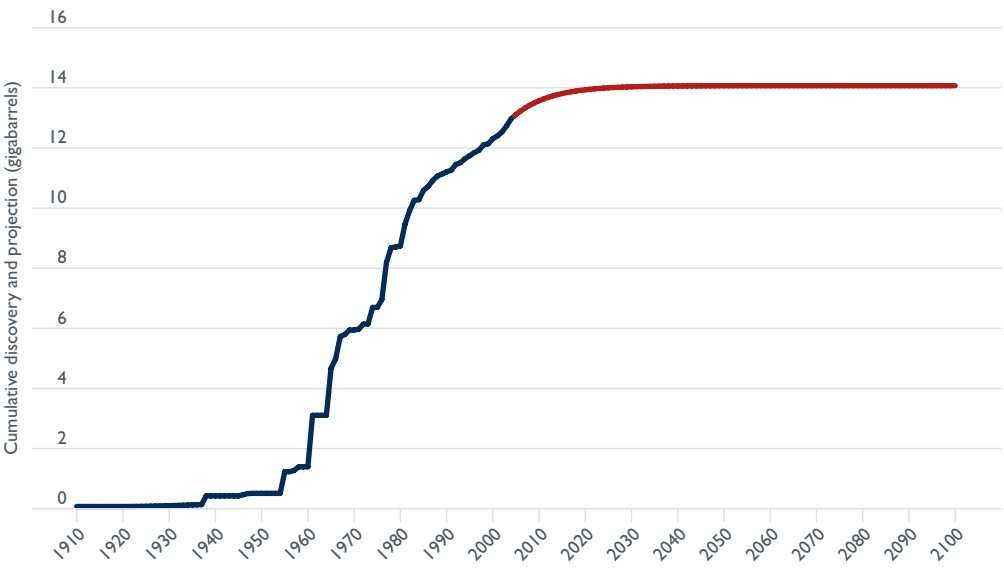
4. Discovery (D) is smoothed with an 11 year moving average and cumulative discovery (CD) is smoothed with a 21 year moving average.
5. Then the fractional growth in discovery (SD/SCD) is calculated and plotted against last year's smoothed cumulative discovery (Figure 5.20).

Figure 5.20 Egyptian cumulative discovery growth curve



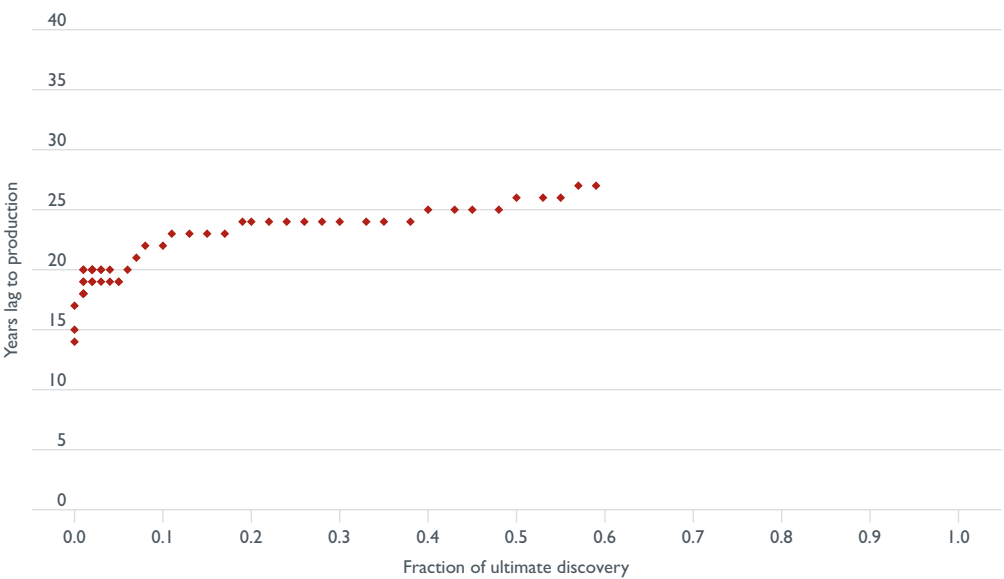
6. The plot is examined and a best guess at an ultimate discovery (UD) is made. In this case it is 14 gigabarrels.
7. Cumulative discovery in 2006 is then projected to UD by bringing SD estimated for 2006 to zero in 2046. For Egyptian oil, the projection of the cumulative discovery curve is shown in Figure 5.21.

Figure 5.21 Egyptian cumulative discovery projection



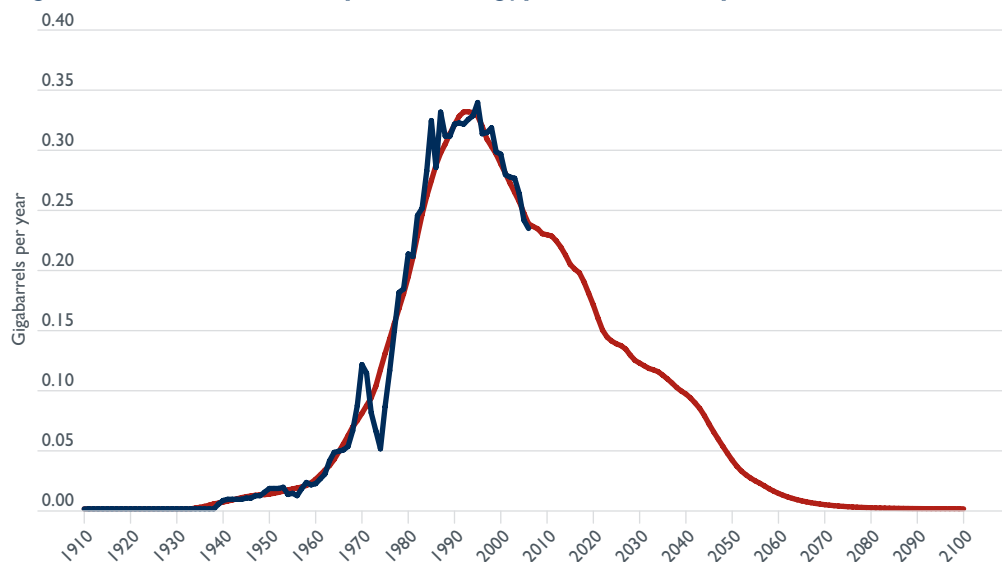
- 8. Next, the height of the cumulative discovery curve has to be adjusted to equal the more reliable cumulative production estimate. In this case, the adjustment is upward, amounting to multiplying by 16/14.
- 9. The stretch lag between the cumulative discovery and production curves is calculated, and plotted against the fraction of cumulative discovery. This plot for Egypt is shown in Figure 5.22. After some noise in the range of zero to 0.1, the stretch lag rises slowly. Extrapolating the trend to 33 years at 1.0 gives the rest of the cumulative production curve derived from the extrapolated discovery curve and the predicted lags.

Figure 5.22 Egyptian stretch lag curve



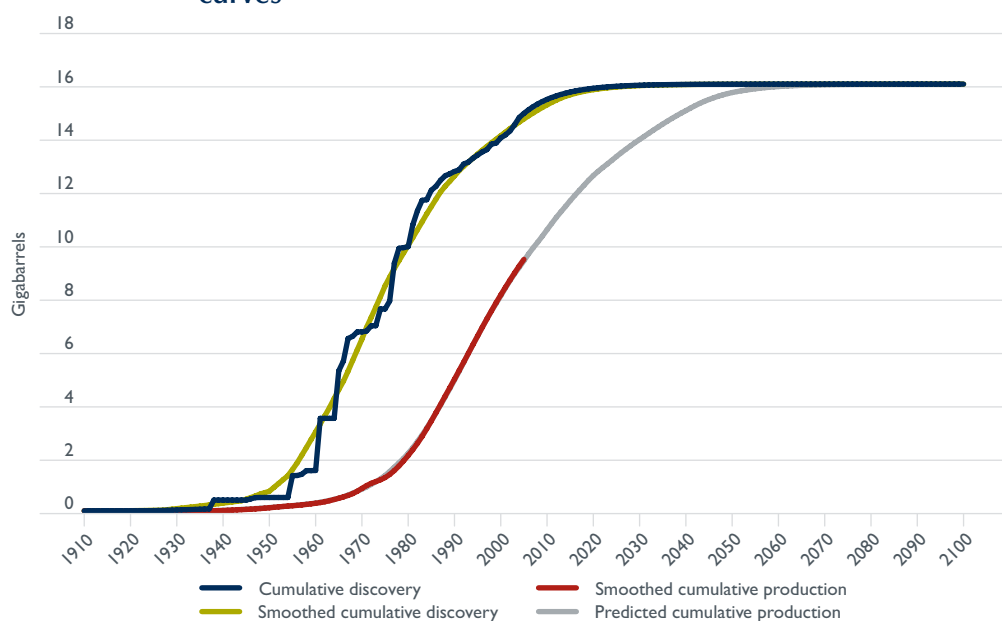
10. The predicted cumulative production curve is smoothed with an 11 year average and then differenced to give a raw predicted annual production. This is then averaged over five years to give a final annual production forecast. This is shown in Figure 5.23.

Figure 5.23 Actual and predicted Egyptian crude oil production



11. Finally the cumulative discovery and production curves (actual and forecast) are plotted in Figure 5.24. This allows a spatial understanding of the relationship between production and discovery.

Figure 5.24 Egyptian cumulative discovery and cumulative production curves

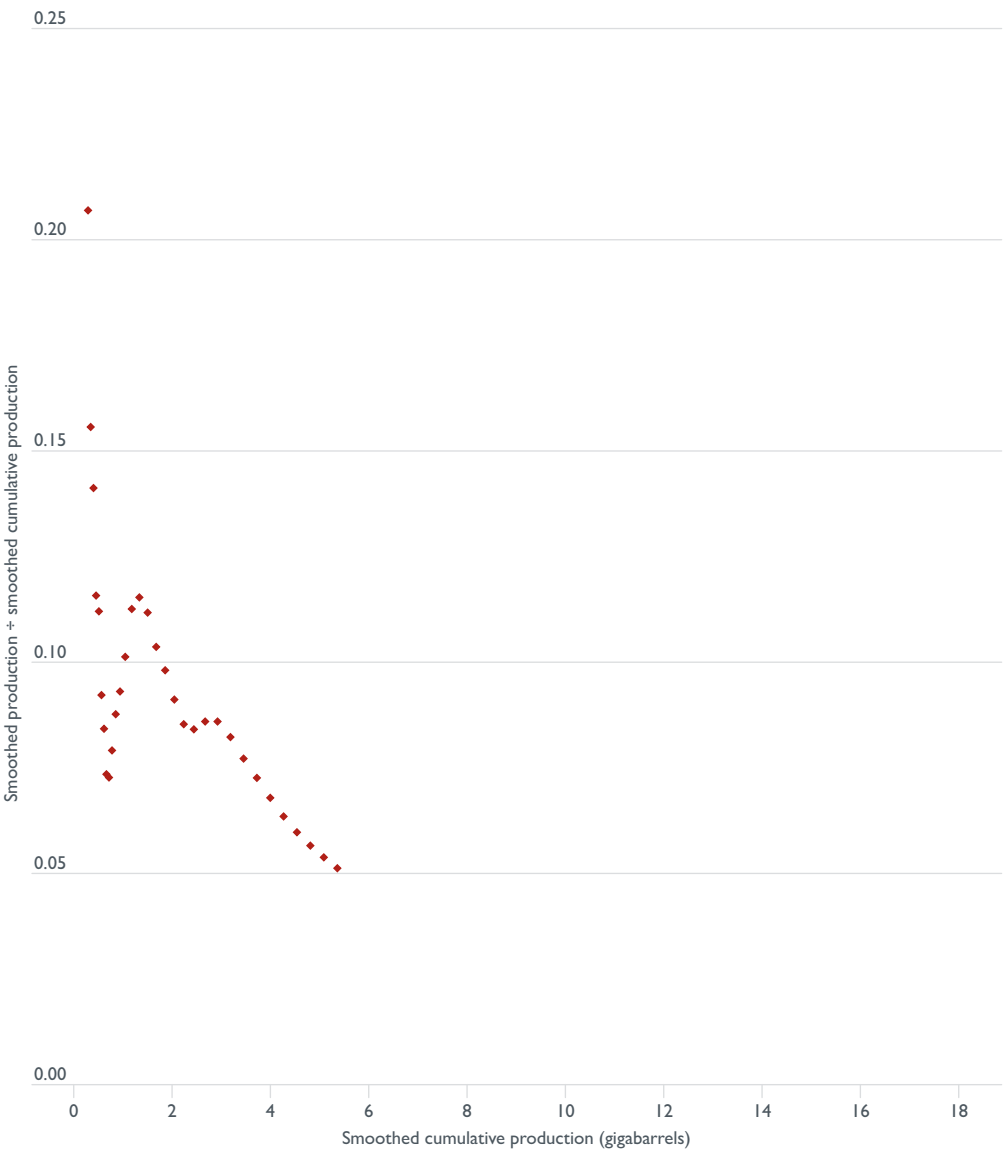


Angola

Table 5.5 sets out the calculations from the 11 steps to a forecast of Angolan production of oil.

- 1. First, annual production (P) and cumulative production (CP) are smoothed with a three year average, generating SP and SCP (see Table 5.5).
- 2. Then the fractional growth in production (SP/SCP) is calculated and plotted against last year's cumulative production, as shown in Figure 5.25.

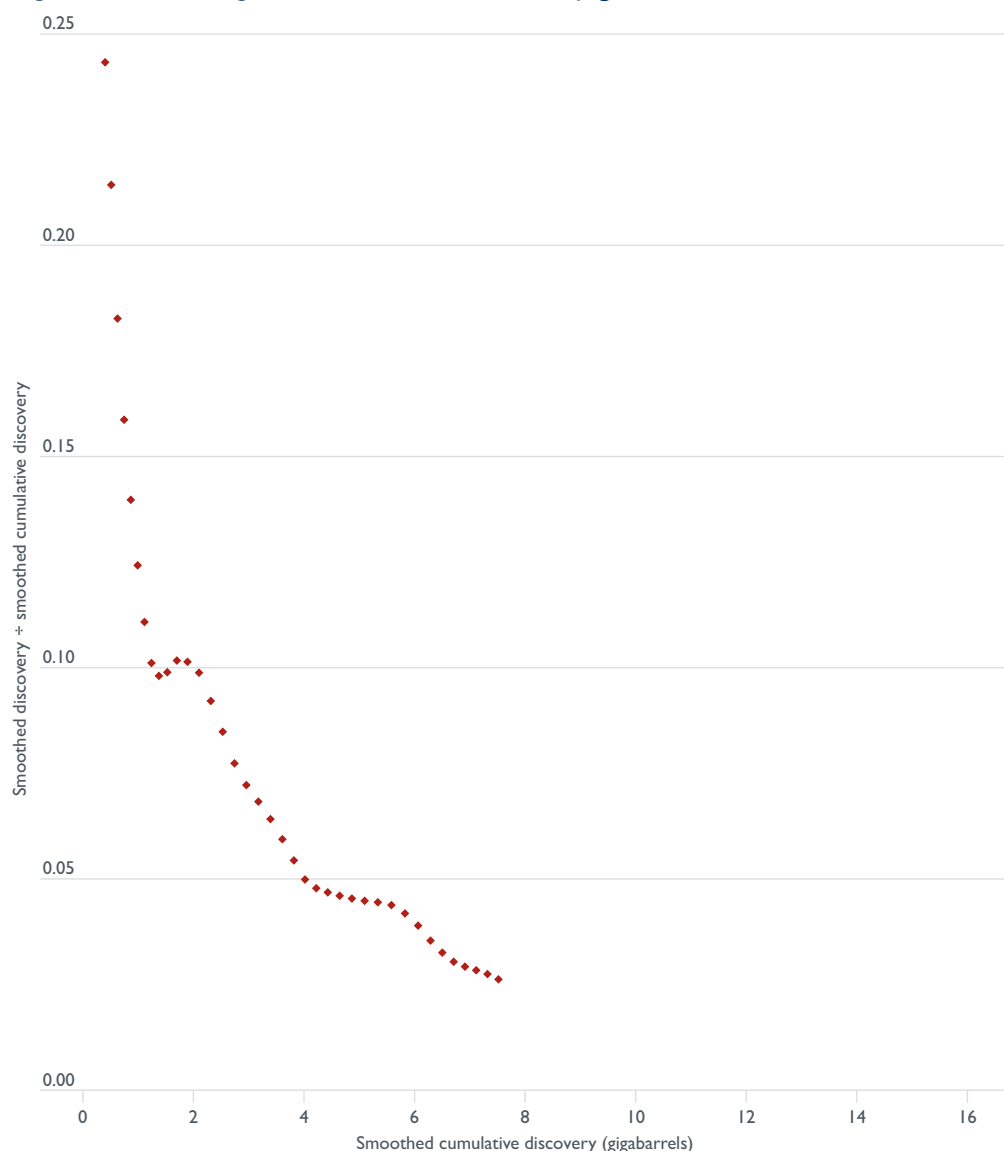
Figure 5.25 Angolan cumulative production growth curve



- 3. The plot is then examined and a best guess at an ultimate cumulative production (U) is made. In this case, it is 18 gigabarrels.

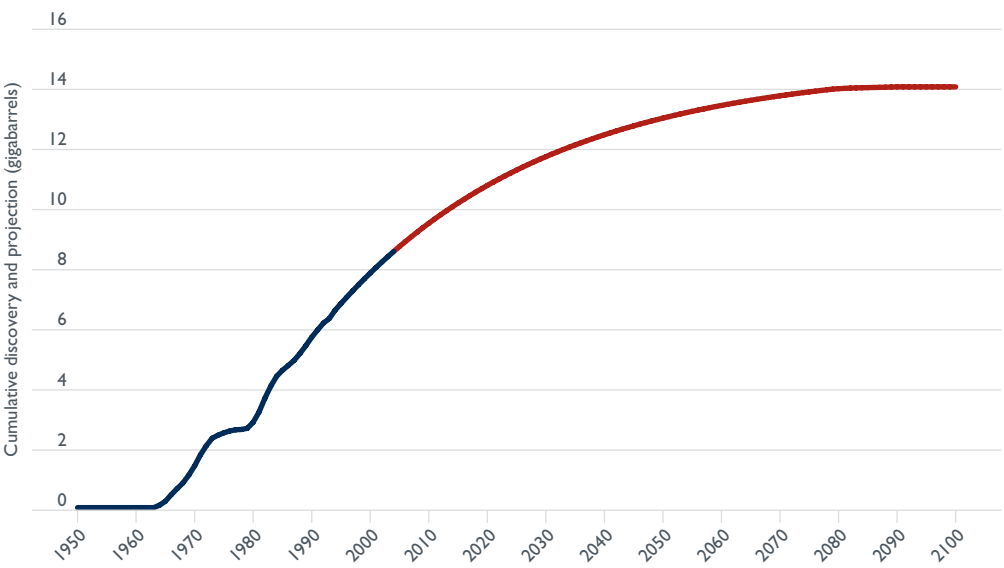
4. Discovery (D) and cumulative discovery (CD) are smoothed with 21 year moving averages.
5. The fractional growth in discovery (SD/SCD) is calculated and plotted against last year's smoothed cumulative discovery (shown in Figure 5.26).

Figure 5.26 Angolan cumulative discovery growth curve



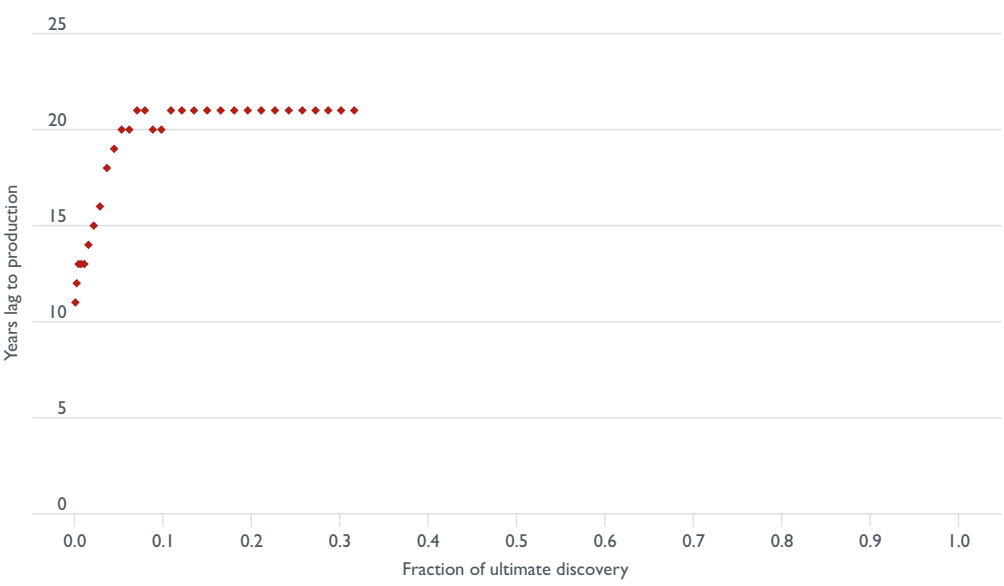
6. The plot is examined and a best guess at an ultimate discovery (UD) is made. In this case it is 14 gigabarrels.
7. Cumulative discovery in 2006 is then projected to UD by bringing SD estimated for 2006 to zero in 2090. For Angolan oil, the projection of the cumulative discovery curve is shown in Figure 5.27.

Figure 5.27 Angolan cumulative discovery projection



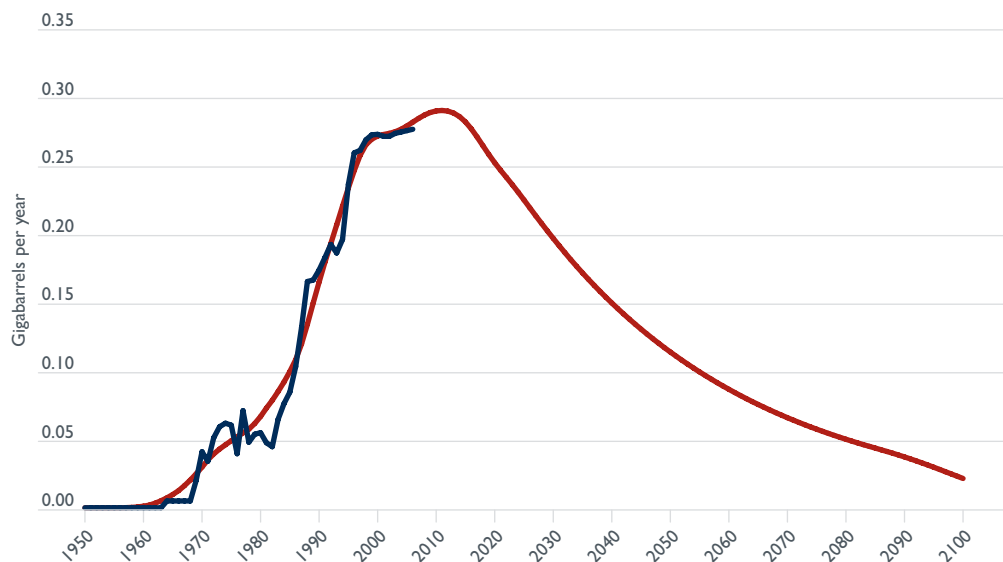
- 8. Next, the height of the cumulative discovery curve has to be adjusted to equal the more reliable cumulative production estimate. In this case, the adjustment is upward, amounting to multiplying by 18/14.
- 9. The stretch lag between the cumulative discovery and production curves is calculated, and plotted against the fraction of cumulative discovery, as shown in Figure 5.28. After some noise in the range of zero to 0.1, the stretch lag settles at 21 years. Extrapolating this trend to 1.0 allows the rest of the cumulative production curve to be forecast from the extrapolated discovery curve and the predicted lag.

Figure 5.28 Angolan stretch lag curve



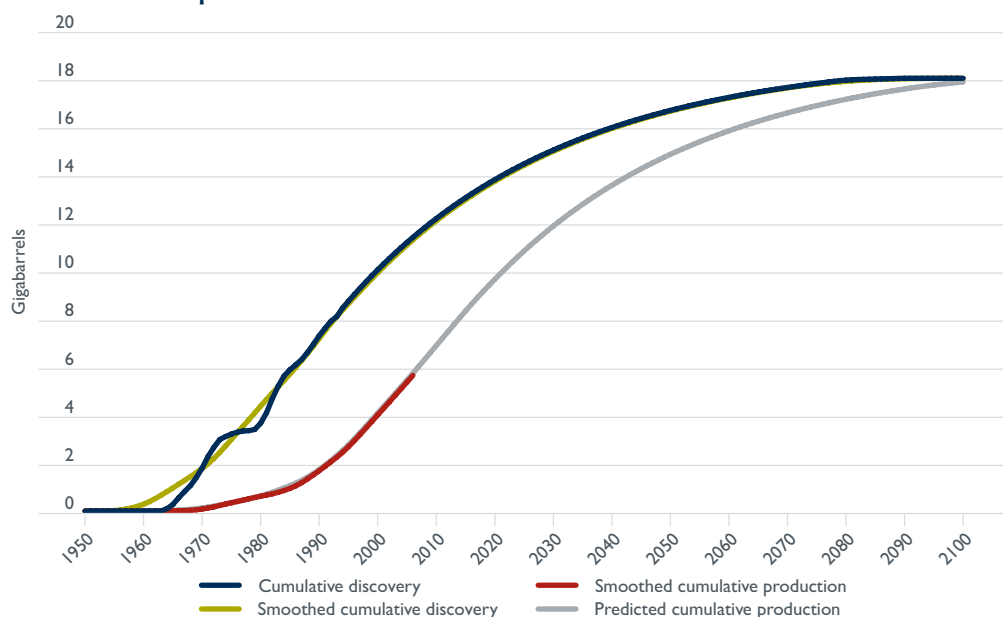
10. The predicted cumulative production curve is smoothed with an 11 year average and then differenced to give a raw predicted annual production. This is then averaged over five years to give a final annual production forecast. This is shown in Figure 5.29.

Figure 5.29 Actual and predicted Angolan conventional crude oil production



11. Finally the cumulative discovery and production curves (actual and forecast) are plotted in Figure 5.30. This allows a spatial understanding of the relationship between production and discovery.

Figure 5.30 Angolan conventional oil cumulative discovery and cumulative production curves

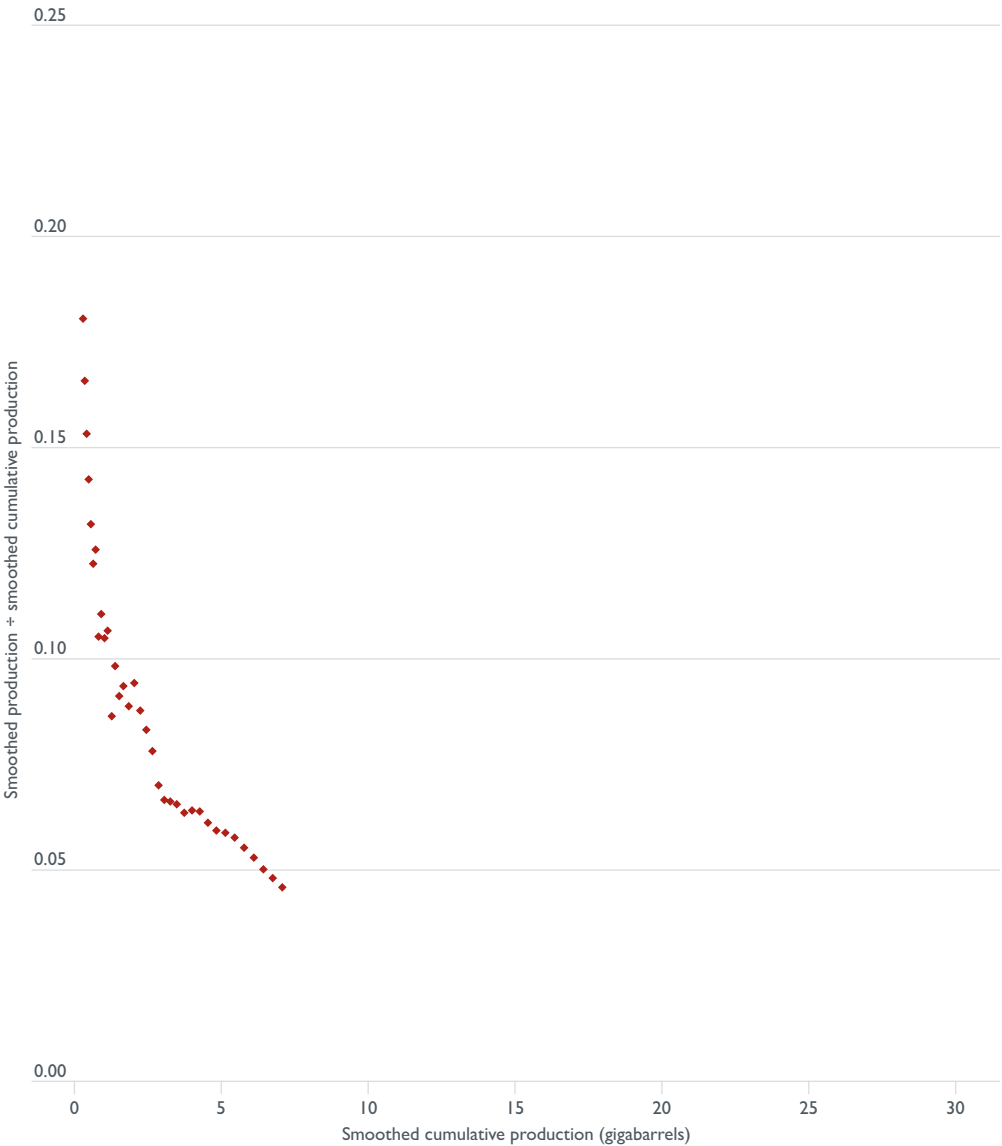


The Rest of Africa

Table 5.6 sets out the calculations from the 11 steps to a forecast of oil production from the Rest of Africa.

- 1. First, annual production (P) and cumulative production (CP) are smoothed with five and three year averages, generating SP and SCP (Table 5.6).
- 2. The fractional growth in production (SP/SCP) is calculated and plotted against last year's cumulative production in Figure 5.31.

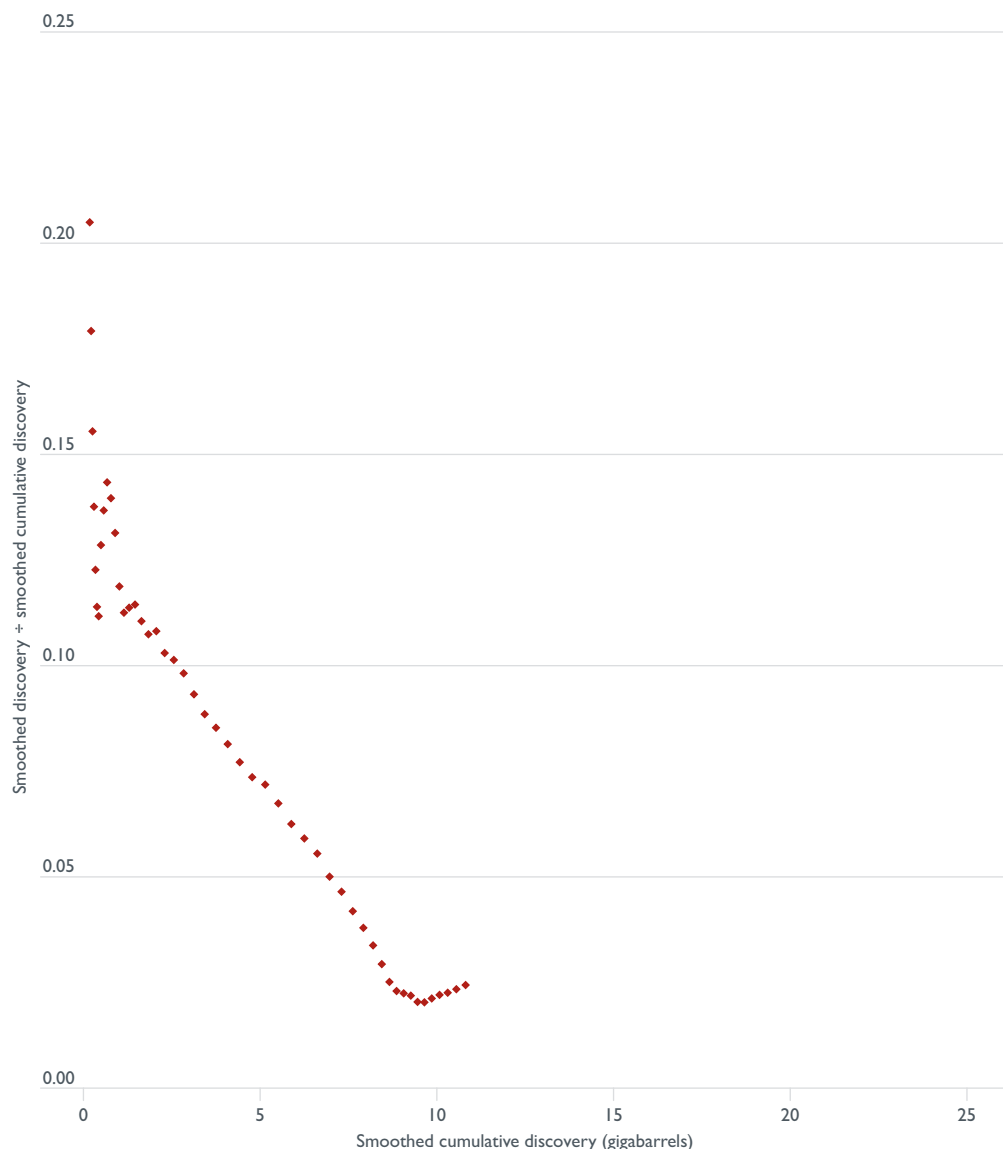
Figure 5.31 Cumulative production growth curve for the Rest of Africa



- 3. The plot is then examined and a best guess at an ultimate cumulative production (U) is made. In this case, it is 30 gigabarrels.

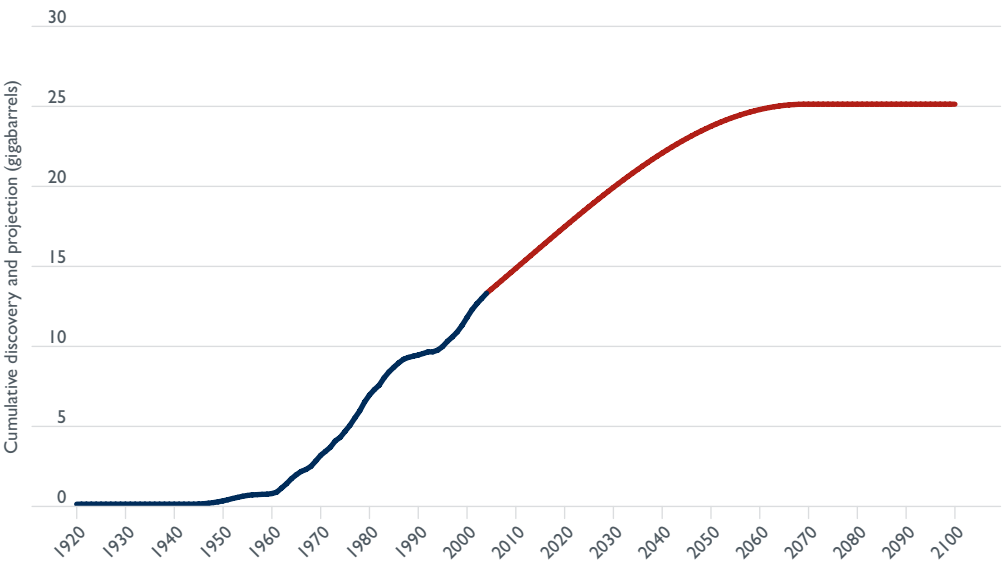
4. Discovery (D) and cumulative discovery (CD) are smoothed with 15 year moving averages.
5. The fractional growth in discovery (SD/SCD) is calculated and plotted against last year's smoothed cumulative discovery (Figure 5.32).

Figure 5.32 Cumulative discovery growth curve for the Rest of Africa



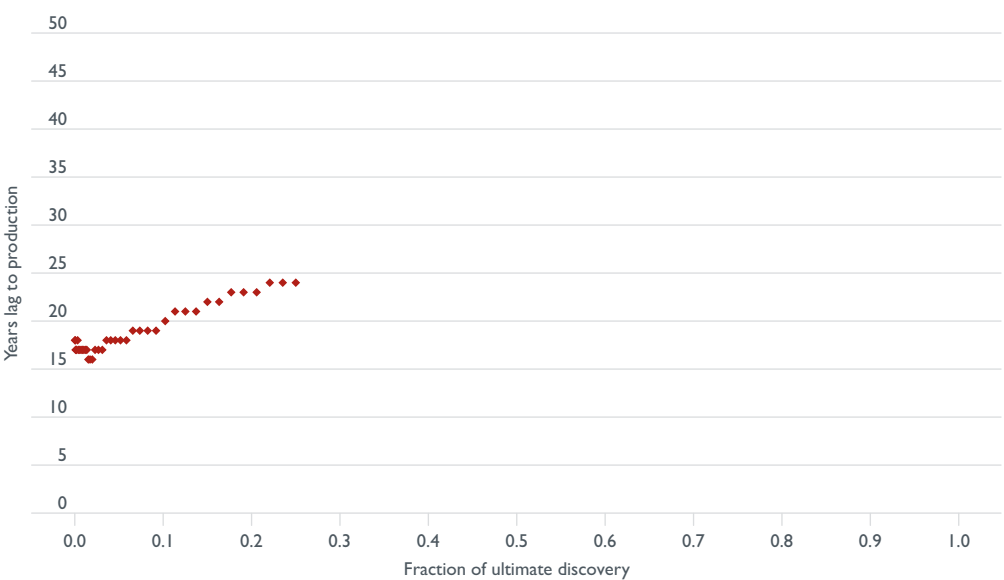
6. The plot is examined and a best guess at an ultimate discovery (UD) is made. In this case it is 25 gigabarrels.
7. Cumulative discovery in 2006 is then projected to UD by bringing SD estimated for 2006 to zero in 2070. For Rest of Africa oil, the projection of the cumulative discovery curve is shown in Figure 5.33.

Figure 5.33 Cumulative discovery projection for the Rest of Africa



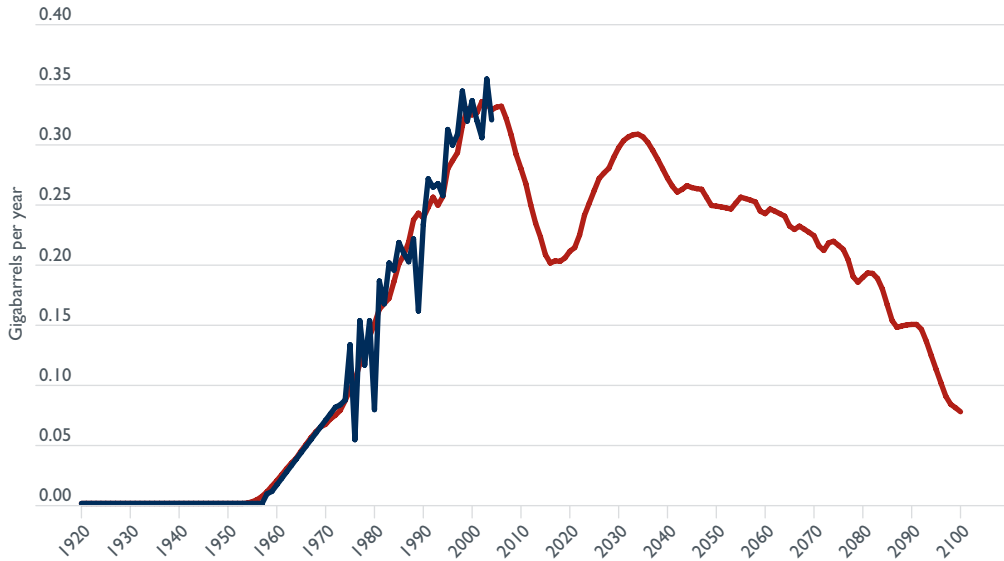
- 8. Next, the height of the cumulative discovery curve has to be adjusted to equal the more reliable cumulative production estimate. In this case, the adjustment is upward, amounting to multiplying by 30/25.
- 9. Next, the historical stretch lag between the cumulative discovery and production curves is calculated, and plotted against the fraction of cumulative discovery. This plot is shown in Figure 5.34. The stretch lag exhibits a fairly consistent rise. Extrapolating the trend to 40 years at 1.0 allows the rest of the cumulative production curve to be forecast from the extrapolated discovery curve and the predicted lags.

Figure 5.34 Stretch lag curve for the Rest of Africa



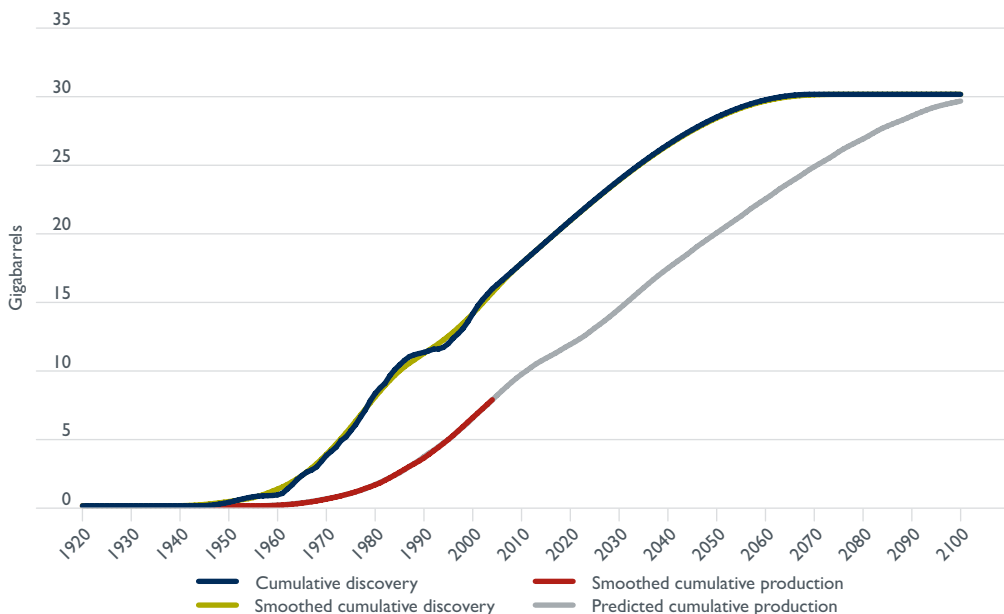
10. The predicted cumulative production curve is smoothed with an 11 year average and then differenced to give a raw predicted annual production. This is then averaged over five years to give a final annual production forecast. This is shown in Figure 5.35.

Figure 5.35 Actual and predicted crude oil production for the Rest of Africa



11. Finally the cumulative discovery and production curves (actual and forecast) are plotted in Figure 5.36. This allows a spatial understanding of the relationship between production and discovery.

Figure 5.36 Cumulative discovery and cumulative production curves for the Rest of Africa



African deep water oil

Projected production of Nigerian deep water oil is shown in Figure 5.37. Details of the projection are given in Chapter 11.

Figure 5.37 Projections of Nigerian deep water oil production

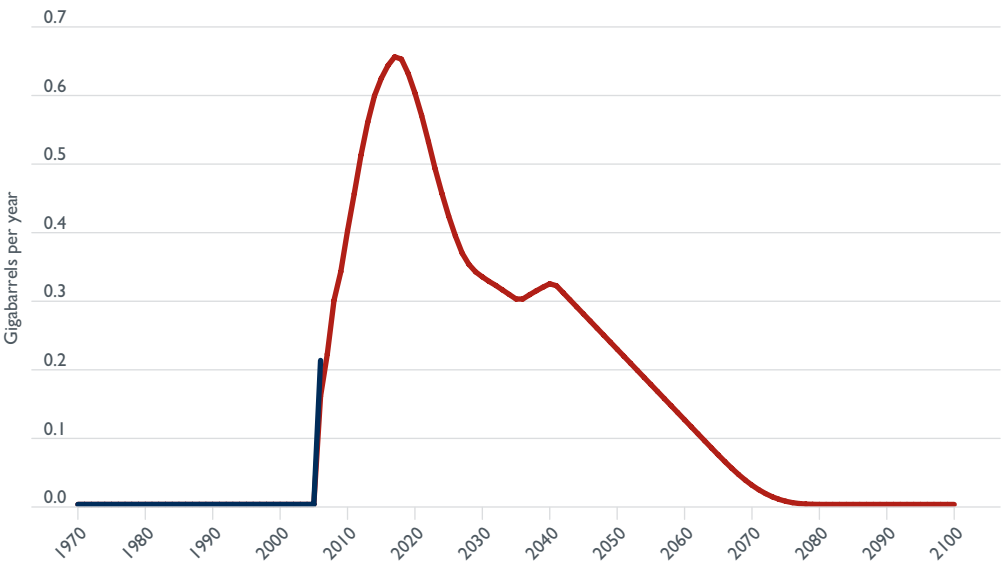
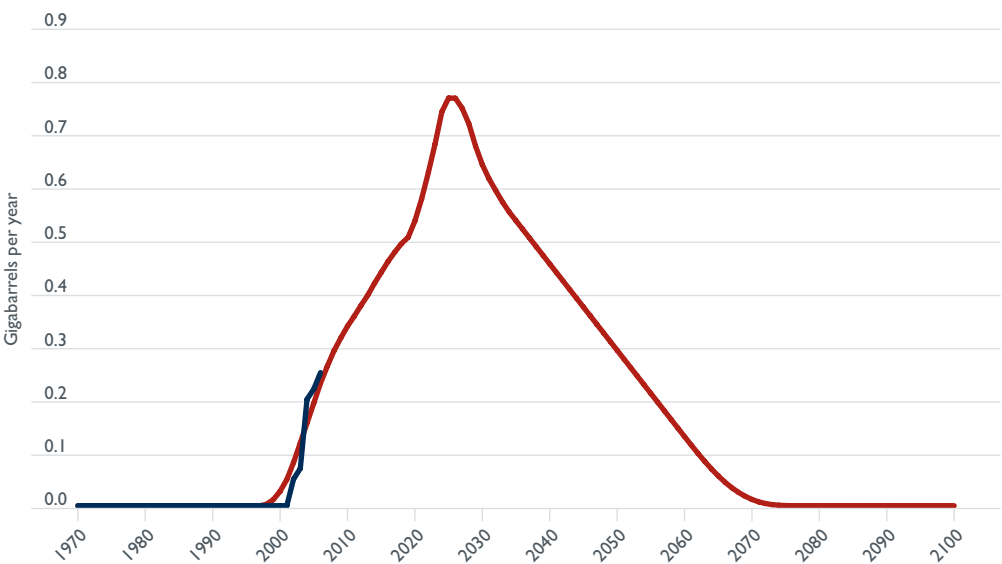


Figure 5.38 presents the same sort of projection for Angolan deep water production.

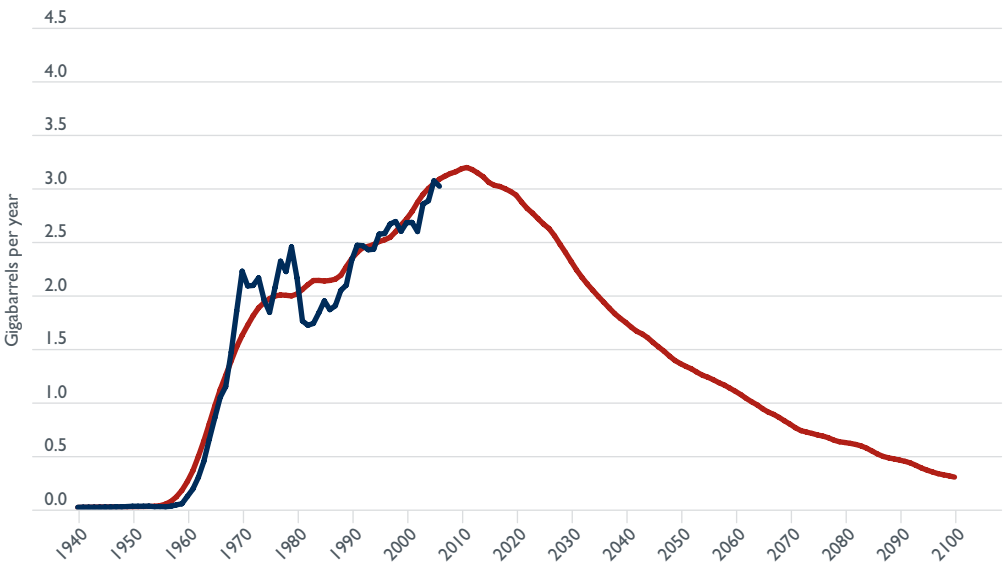
Figure 5.38 Projections of Angolan deep water oil production



Africa summary

On its own, conventional oil production in Africa would be likely to decline after 2015 (see Figure 5.39).

Figure 5.39 Actual and predicted African conventional crude oil production



But the advent of deep water production likely to peak in 2025 suggests that any decline in African oil production will be delayed until 2020. In the meantime, production is likely to rise by 0.6 gigabarrels per year in the period to 2020 as deep water production continues to expand. Figure 5.40 shows the composition of African oil production and the importance in the medium term of deep water production. Table 5.7 sets out the summary statistics for Africa.

Figure 5.40 Components of African total crude oil production

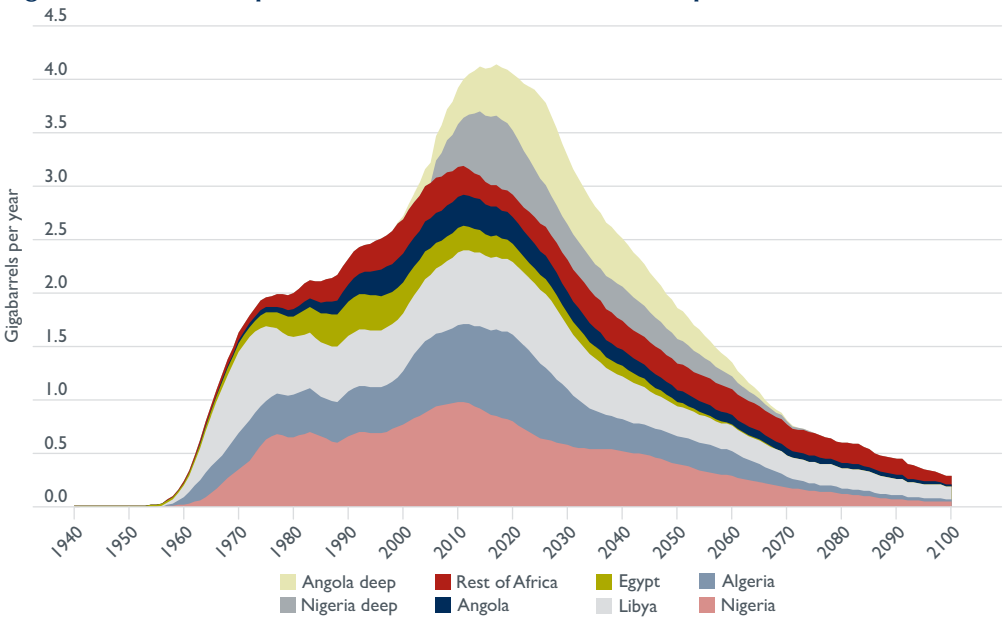


Table 5.1 Libya, gigabarrels (continued)

Year	D	CD	21yr SCD	Adj SCD	Predlag	Raw pred CP	11yr smth pred SCP	SCP	Raw pred P	5yr smth pred SP	Actual P
2091	0.00	60.00	60.00	63.00	80	58.53	58.58		0.16	0.15	
2092	0.00	60.00	60.00	63.00	80	58.70	58.72		0.15	0.14	
2093	0.00	60.00	60.00	63.00	80	58.86	58.85		0.13	0.14	
2094	0.00	60.00	60.00	63.00	80	59.01	58.98		0.13	0.13	
2095	0.00	60.00	60.00	63.00	80	59.16	59.11		0.12	0.13	
2096	0.00	60.00	60.00	63.00	80	59.31	59.23		0.13	0.13	
2097	0.00	60.00	60.00	63.00	80	59.38	59.36		0.13	0.13	
2098	0.00	60.00	60.00	63.00	80	59.45	59.49		0.13	0.13	
2099	0.00	60.00	60.00	63.00	80	59.59	59.62		0.12	0.12	
2100	0.00	60.00	60.00	63.00	80	59.72	59.74		0.12	0.12	

Notes: D—discovery; CD—cumulative discovery; SCD—smoothed cumulative discovery (years = number of years centred moving average); adj—adjusted (to match cumulative production maximum); predlag—predicted lag between cumulative discovery and cumulative production; raw Pred CP—prediction using direct lag of cumulative discovery by predicted lag years; Pred SCP—raw predicted CP smoothed (with years = number of years centred moving average); SCP—smoothed actual cumulative production (years = number of years centred moving average); raw Pred P—one year change in predicted smoothed cumulative production; Pred SP—smoothed raw Pred P (years = number of years centred moving average); Actual P—actual annual oil production. Shaded numbers are interpolations, extrapolations or forecasts.

Table 5.3 Algeria, gigabarrels (continued)

Year	D	CD	9,51yr SCD	Adj SCD	Predlag	Raw pred CP	5yr smth pred SCP	SCP	Raw pred P	5yr smth pred SP	Actual P
2092	0.00	27.50	27.50	48.00	45	47.51	47.51		0.03	0.03	
2093	0.00	27.50	27.50	48.00	45	47.54	47.54		0.03	0.03	
2094	0.00	27.50	27.50	48.00	45	47.58	47.57		0.03	0.03	
2095	0.00	27.50	27.50	48.00	45	47.61	47.60		0.03	0.03	
2096	0.00	27.50	27.50	48.00	45	47.63	47.63		0.03	0.03	
2097	0.00	27.50	27.50	48.00	45	47.66	47.66		0.03	0.03	
2098	0.00	27.50	27.50	48.00	45	47.69	47.69		0.03	0.03	
2099	0.00	27.50	27.50	48.00	45	47.71	47.71		0.02	0.02	
2100	0.00	27.50	27.50	48.00	45	47.73	47.73		0.02	0.02	

Notes: D—discovery; CD—cumulative discovery; SCD—smoothed cumulative discovery (years = number of years centred moving average); adj—adjusted (to match cumulative production maximum); predlag—predicted lag between cumulative discovery and cumulative production; raw Pred CP—prediction using direct lag of cumulative discovery by predicted lag years; Pred SCP—raw predicted CP smoothed (with years = number of years centred moving average); SCP—smoothed actual cumulative production (years = number of years centred moving average); raw Pred P—one year change in predicted smoothed cumulative production; Pred SP—smoothed raw Pred P (years = number of years centred moving average); Actual P—actual annual oil production. Shaded numbers are interpolations, extrapolations or forecasts.

Table 5.4 Egypt, gigabarrels (continued)

Year	D	CD	2/yr SCD	Adj SCD	Predlag	Raw pred CP	1/yr smth pred SCP	3yr SCP	Raw pred P	5yr smth pred SP	Actual P
2072	0.00	14.00	14.00	16.00	33	15.98	15.98		0.00	0.00	
2073	0.00	14.00	14.00	16.00	33	15.98	15.98		0.00	0.00	
2074	0.00	14.00	14.00	16.00	33	15.99	15.98		0.00	0.00	
2075	0.00	14.00	14.00	16.00	33	15.99	15.99		0.00	0.00	
2076	0.00	14.00	14.00	16.00	33	15.99	15.99		0.00	0.00	
2077	0.00	14.00	14.00	16.00	33	15.99	15.99		0.00	0.00	
2078	0.00	14.00	14.00	16.00	33	15.99	15.99		0.00	0.00	
2079	0.00	14.00	14.00	16.00	33	15.99	15.99		0.00	0.00	
2080	0.00	14.00	14.00	16.00	33	15.99	15.99		0.00	0.00	
2081	0.00	14.00	14.00	16.00	33	15.99	15.99		0.00	0.00	
2082	0.00	14.00	14.00	16.00	33	15.99	15.99		0.00	0.00	
2083	0.00	14.00	14.00	16.00	33	16.00	16.00		0.00	0.00	
2084	0.00	14.00	14.00	16.00	33	16.00	16.00		0.00	0.00	
2085	0.00	14.00	14.00	16.00	33	16.00	16.00		0.00	0.00	
2086	0.00	14.00	14.00	16.00	33	16.00	16.00		0.00	0.00	
2087	0.00	14.00	14.00	16.00	33	16.00	16.00		0.00	0.00	
2088	0.00	14.00	14.00	16.00	33	16.00	16.00		0.00	0.00	
2089	0.00	14.00	14.00	16.00	33	16.00	16.00		0.00	0.00	
2090	0.00	14.00	14.00	16.00	33	16.00	16.00		0.00	0.00	
2091	0.00	14.00	14.00	16.00	33	16.00	16.00		0.00	0.00	
2092	0.00	14.00	14.00	16.00	33	16.00	16.00		0.00	0.00	
2093	0.00	14.00	14.00	16.00	33	16.00	16.00		0.00	0.00	
2094	0.00	14.00	14.00	16.00	33	16.00	16.00		0.00	0.00	
2095	0.00	14.00	14.00	16.00	33	16.00	16.00		0.00	0.00	
2096	0.00	14.00	14.00	16.00	33	16.00	16.00		0.00	0.00	
2097	0.00	14.00	14.00	16.00	33	16.00	16.00		0.00	0.00	
2098	0.00	14.00	14.00	16.00	33	16.00	16.00		0.00	0.00	
2099	0.00	14.00	14.00	16.00	33	16.00	16.00		0.00	0.00	
2100	0.00	14.00	14.00	16.00	33	16.00	16.00		0.00	0.00	

Notes: D—discovery; CD—cumulative discovery; SCD—smoothed cumulative discovery (years = number of years centred moving average); adj—adjusted (to match cumulative production maximum); predlag—predicted lag between cumulative discovery and cumulative production; raw Pred CP—prediction using direct lag of cumulative discovery by predicted lag years; Pred SCP—raw predicted CP smoothed (with years = number of years centred moving average); SCP—smoothed actual cumulative production (years = number of years centred moving average); raw Pred P—one year change in predicted smoothed cumulative production; Pred SP—smoothed raw Pred P (years = number of years centred moving average); Actual P—actual annual oil production. Shaded numbers are interpolations, extrapolations or forecasts.

Table 5.6 Rest Africa, gigabarrels (continued)

Year	D	CD	15yr SCD	Adj SCD	Predlag	Raw pred CP	1 lyr smth pred SCP	SCP	Raw pred P	5yr smth pred SP	Actual P
2082	0.00	25.00	25.00	30.00	40	27.15	27.15		0.21	0.19	
2083	0.00	25.00	25.00	30.00	40	27.36	27.35		0.20	0.19	
2084	0.00	25.00	25.00	30.00	40	27.55	27.53		0.18	0.18	
2085	0.00	25.00	25.00	30.00	40	27.74	27.68		0.15	0.17	
2086	0.00	25.00	25.00	30.00	40	27.83	27.83		0.15	0.15	
2087	0.00	25.00	25.00	30.00	40	27.92	27.97		0.14	0.15	
2088	0.00	25.00	25.00	30.00	40	28.10	28.11		0.14	0.15	
2089	0.00	25.00	25.00	30.00	40	28.27	28.26		0.15	0.15	
2090	0.00	25.00	25.00	30.00	40	28.43	28.42		0.16	0.15	
2091	0.00	25.00	25.00	30.00	40	28.58	28.57		0.15	0.15	
2092	0.00	25.00	25.00	30.00	40	28.73	28.72		0.14	0.14	
2093	0.00	25.00	25.00	30.00	40	28.86	28.85		0.14	0.13	
2094	0.00	25.00	25.00	30.00	40	28.99	28.98		0.13	0.12	
2095	0.00	25.00	25.00	30.00	40	29.11	29.09		0.11	0.11	
2096	0.00	25.00	25.00	30.00	40	29.23	29.19		0.09	0.10	
2097	0.00	25.00	25.00	30.00	40	29.28	29.27		0.09	0.09	
2098	0.00	25.00	25.00	30.00	40	29.33	29.36		0.08	0.08	
2099	0.00	25.00	25.00	30.00	40	29.43	29.43		0.07	0.08	
2100	0.00	25.00	25.00	30.00	40	29.51	29.51		0.08	0.08	

Notes: D—discovery; CD—cumulative discovery; SCD—smoothed cumulative discovery (years = number of years centred moving average); adj—adjusted (to match cumulative production maximum); predlag—predicted lag between cumulative discovery and cumulative production; raw Pred CP—prediction using direct lag of cumulative discovery by predicted lag years; Pred SCP—raw predicted CP smoothed (with years = number of years centred moving average); SCP—smoothed actual cumulative production (years = number of years centred moving average); raw Pred P—one year change in predicted smoothed cumulative production; Pred SP—smoothed raw Pred P (years = number of years centred moving average); Actual P—actual annual oil production. Shaded numbers are interpolations, extrapolations or forecasts.

Table 5.7 Africa, gigabarrels (continued)

Year	Ex deep Nigeria	Deep water Nigeria	Incl deep Nigeria	Algeria	Libya	Egypt	Ex deep Angola	Deep water Angola	Incl deep Angola	Rest of Africa	Total Africa
<i>(predicted production)</i>											
2097	0.05	0.00	0.05	0.03	0.13	0.00	0.03	0.00	0.03	0.09	0.32
2098	0.05	0.00	0.05	0.03	0.13	0.00	0.02	0.00	0.02	0.08	0.31
2099	0.05	0.00	0.05	0.02	0.12	0.00	0.02	0.00	0.02	0.08	0.30
2100	0.05	0.00	0.05	0.02	0.12	0.00	0.02	0.00	0.02	0.08	0.29

Notes: ex—excluding; inc—including; Actual Prod—actual annual production.

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Chapter 6

Europe



Chapter 6 Europe

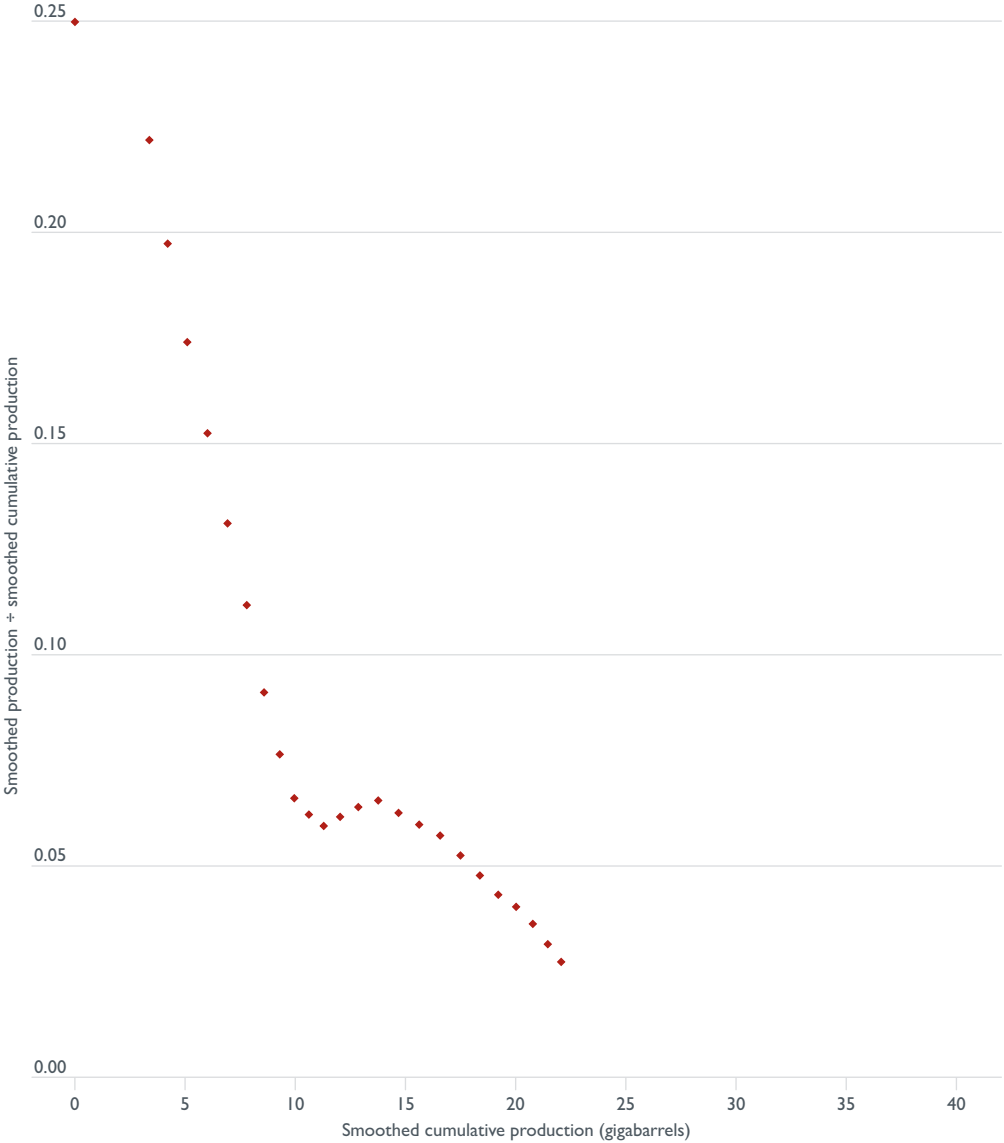
Europe will be analysed as three major oil-producing subregions: the UK, Norway and the Rest of Europe. In addition, France, though a very small producer, will be analysed separately because of its interesting bi-modal discovery and production pattern.

United Kingdom

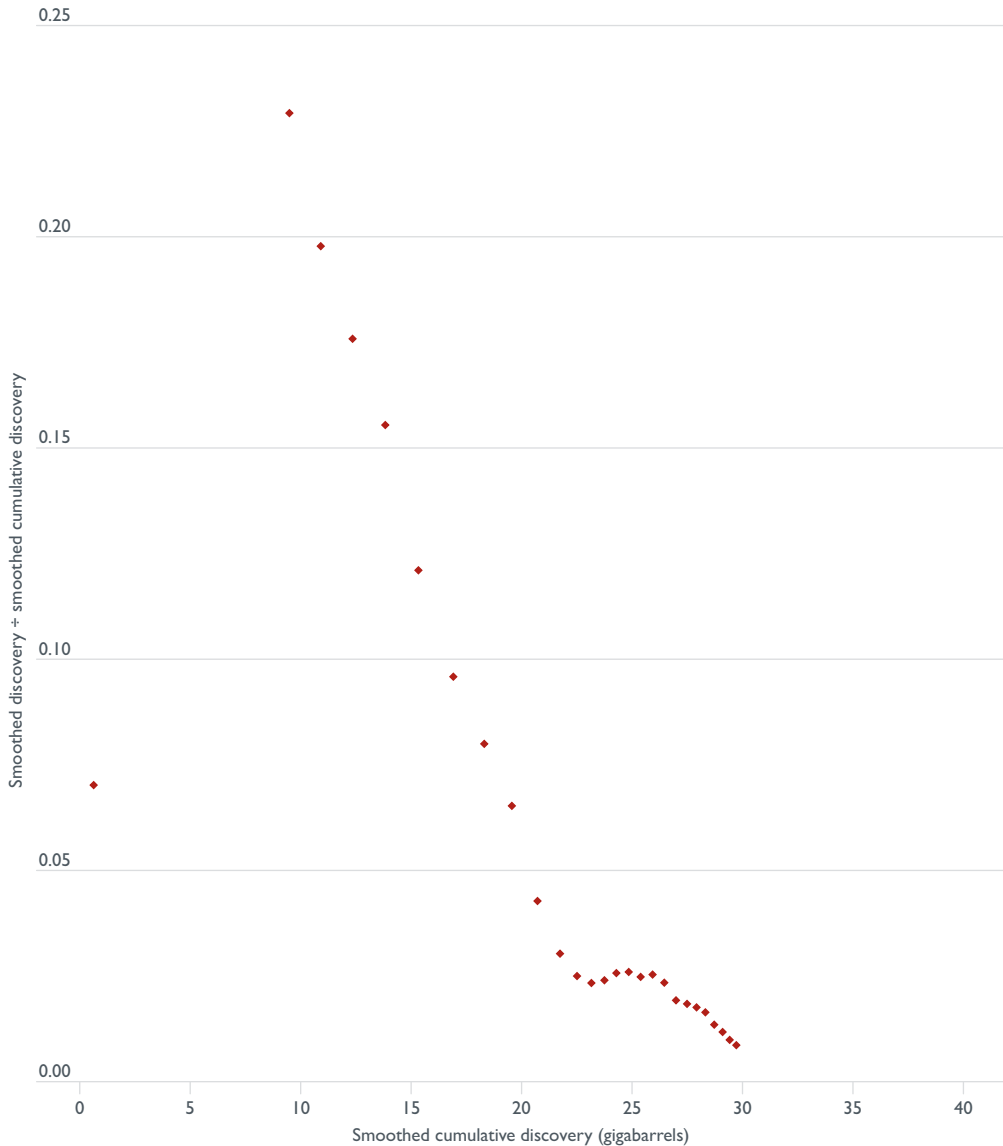
Table 6.1 sets out the calculations from the 11 steps to a forecast of production of British oil.

1. First, annual production (P) and cumulative production (CP) are smoothed with a three year average, generating SP and SCP (see Table 6.1).
2. The fractional growth in production (SP/SCP) is calculated and plotted against last year's cumulative production. This plot is shown in Figure 6.1. The slump in the range $9\frac{1}{2}$ to $12\frac{1}{2}$ is related to the five years of disruption following the 1988 Piper Alpha disaster.
3. The plot is then examined and a best guess at an ultimate cumulative production (U) is made. In this case, it is 38 gigabarrels.
4. Discovery (D) and cumulative discovery (CD) are smoothed with 11 year moving averages.
5. Then the fractional growth in discovery (SD/SCD) is calculated and plotted against last year's smoothed cumulative discovery. This plot is shown in Figure 6.2.

Figure 6.1 UK cumulative production growth curve



6. The plot is examined and a best guess at an ultimate discovery (UD) is made. In this case it is also 38 gigabarrels.
7. Cumulative discovery in 2006 is then projected to UD by bringing SD estimated for 2006 to zero in 2061. For British oil, the projection of the cumulative discovery curve is shown in Figure 6.3.

Figure 6.2 UK cumulative discovery growth curve

8. There is no adjustment necessary to align cumulative discovery and production.
9. Next, the historical stretch lag between the cumulative discovery and production curves is calculated, and plotted against the fraction of cumulative discovery. This plot for the UK is shown in Figure 6.4. It is apparent that there is a regular relationship. The stretch lag exhibits a fairly constant rise. Extrapolating the trend to 30 years at 1.0 allows the rest of the cumulative production curve to be forecast from the extrapolated discovery curve and the predicted lags.

Figure 6.3 UK cumulative discovery projection

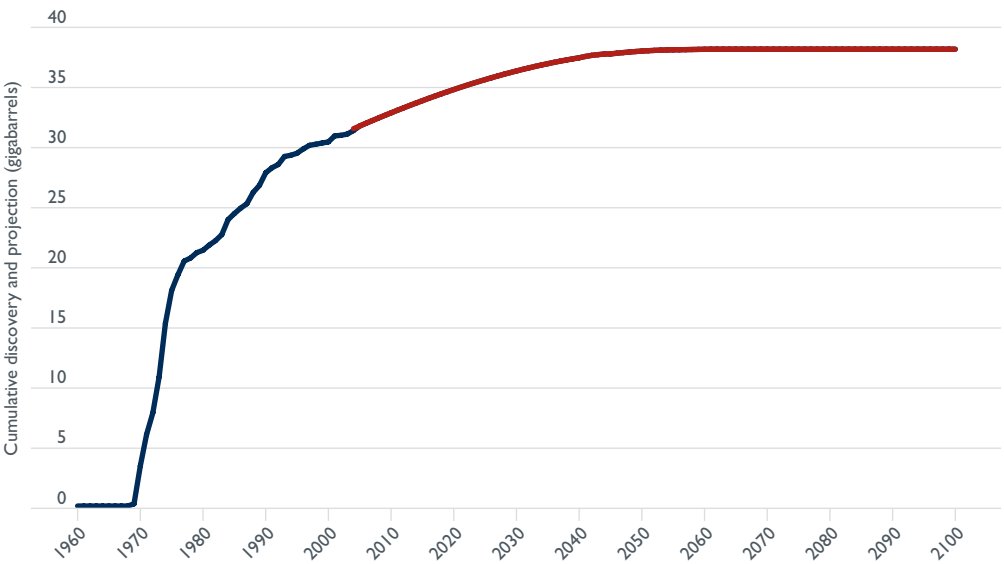
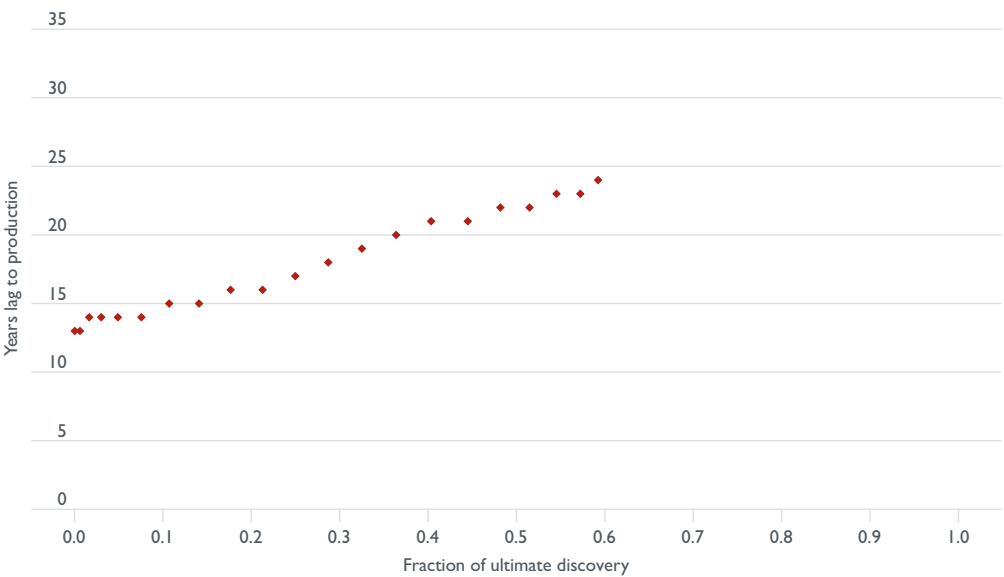
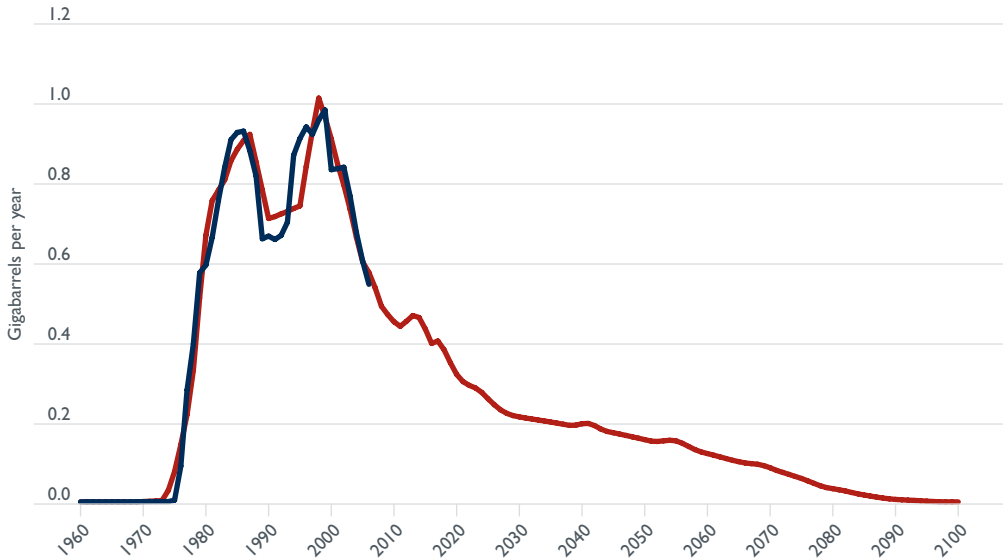


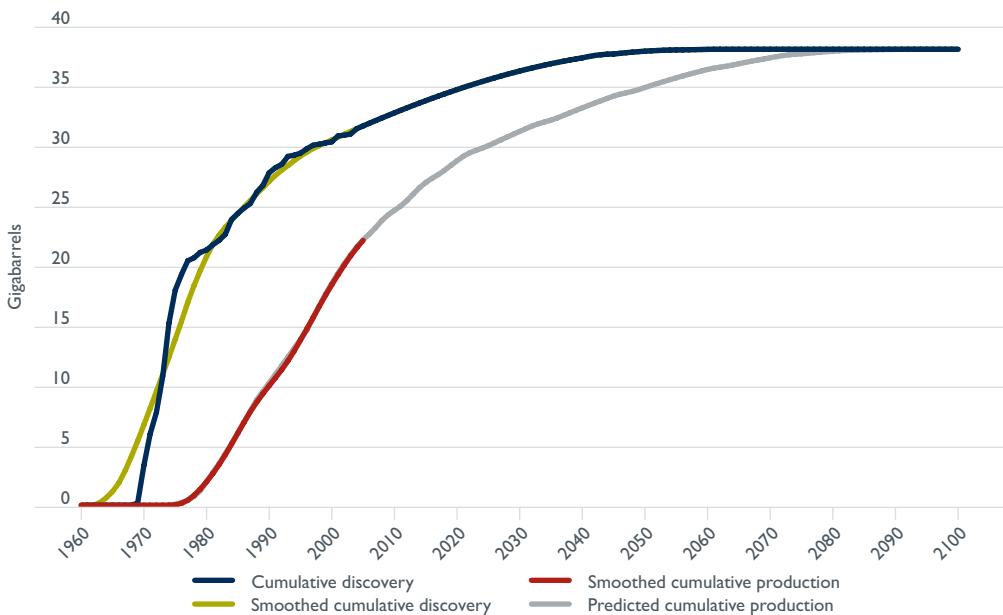
Figure 6.4 UK stretch lag curve



10. The predicted cumulative production curve is smoothed with a three year average and then differenced to give a raw predicted annual production. This is then averaged over 3, 5 (after 2006) and then 11 years (after 2017) to give a final annual production forecast (see Figure 6.5).

Figure 6.5 Actual and predicted UK crude oil production

11. Finally the cumulative discovery and production curves (actual and forecast) are plotted in Figure 6.6. This allows a spatial understanding of the relationship between production and discovery.

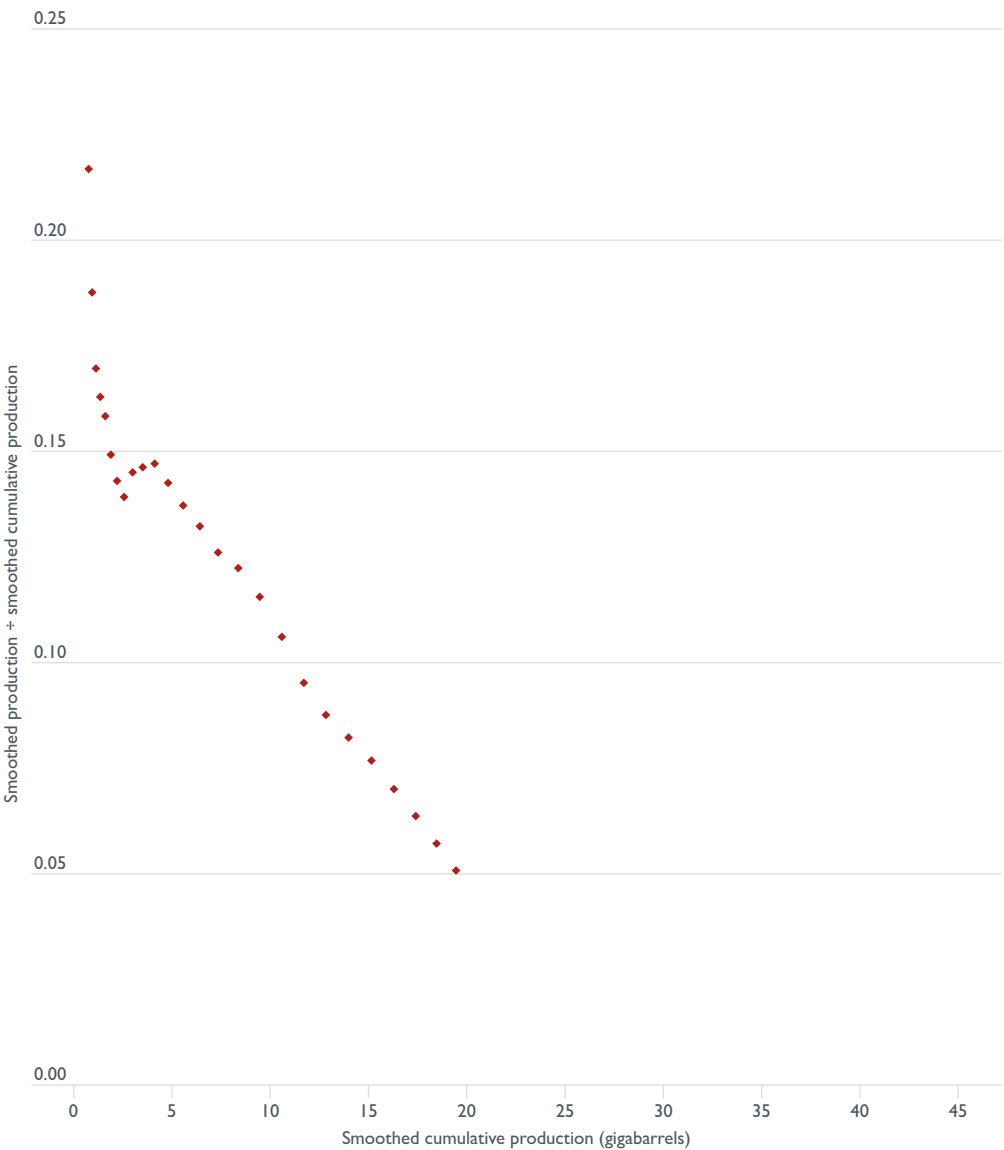
Figure 6.6 UK cumulative discovery and cumulative production curves

Norway

Table 6.2 sets out the calculations from the 11 steps to a forecast of production of Norwegian oil.

- 1. First, annual production (P) and cumulative production (CP) are smoothed with a three year average, generating SP and SCP (see Table 6.2).
- 2. The fractional growth in production (SP/SCP) is calculated and plotted against last year's cumulative production. This plot is shown in Figure 6.7.

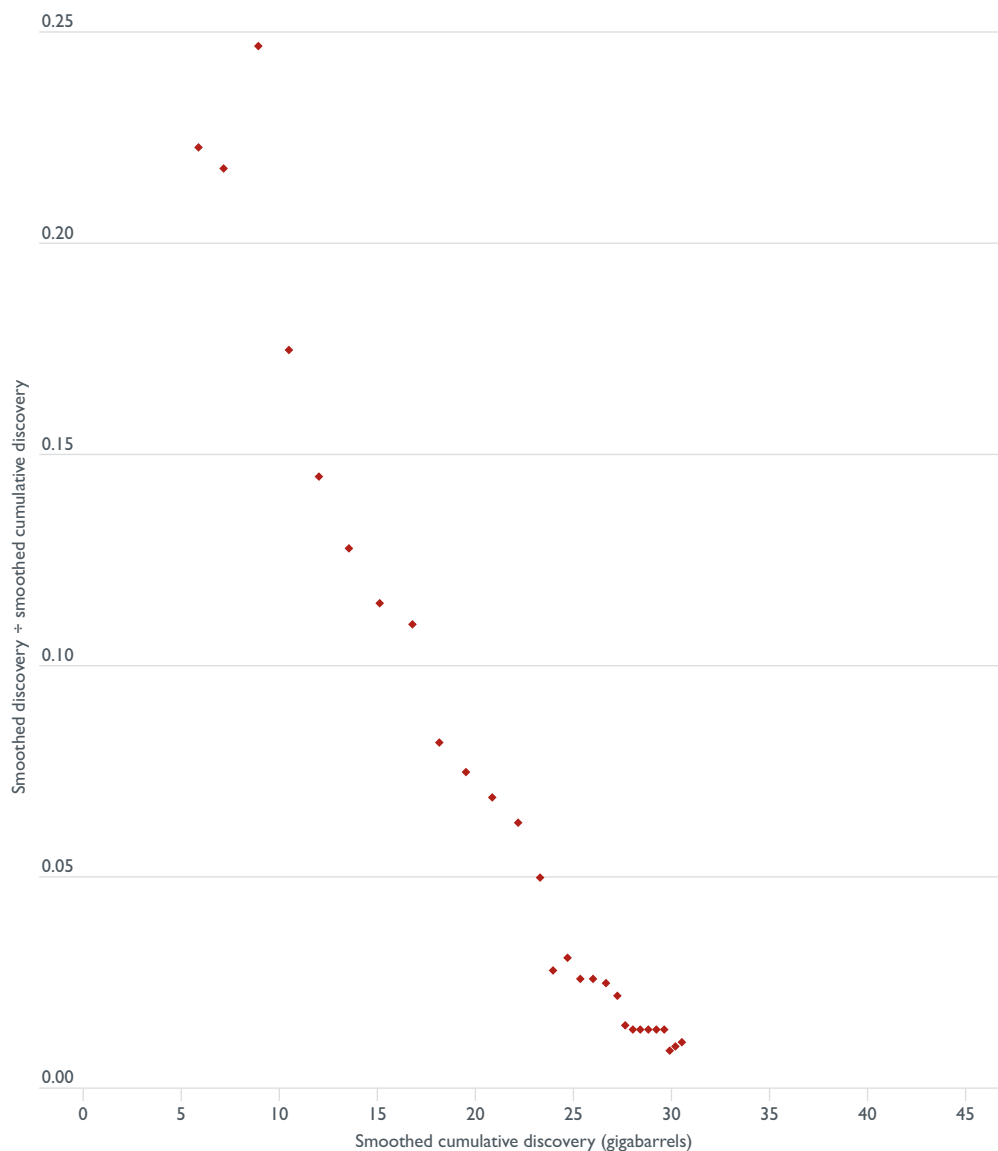
Figure 6.7 Norwegian cumulative production growth curve



- 3. The plot is then examined and a best guess at an ultimate cumulative production (U) is made. In this case, it is 37 gigabarrels.

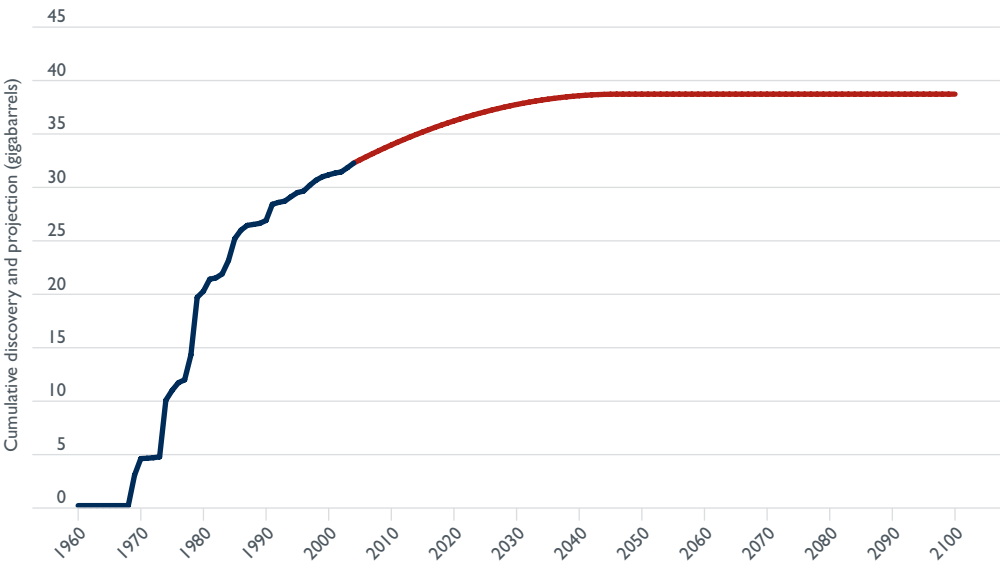
4. Discovery (D) and cumulative discovery (CD) are smoothed with 11 year moving averages.
5. The fractional growth in discovery (SD/SCD) is calculated and plotted against last year's smoothed cumulative discovery, as in Figure 6.8.

Figure 6.8 Norwegian cumulative discovery growth curve



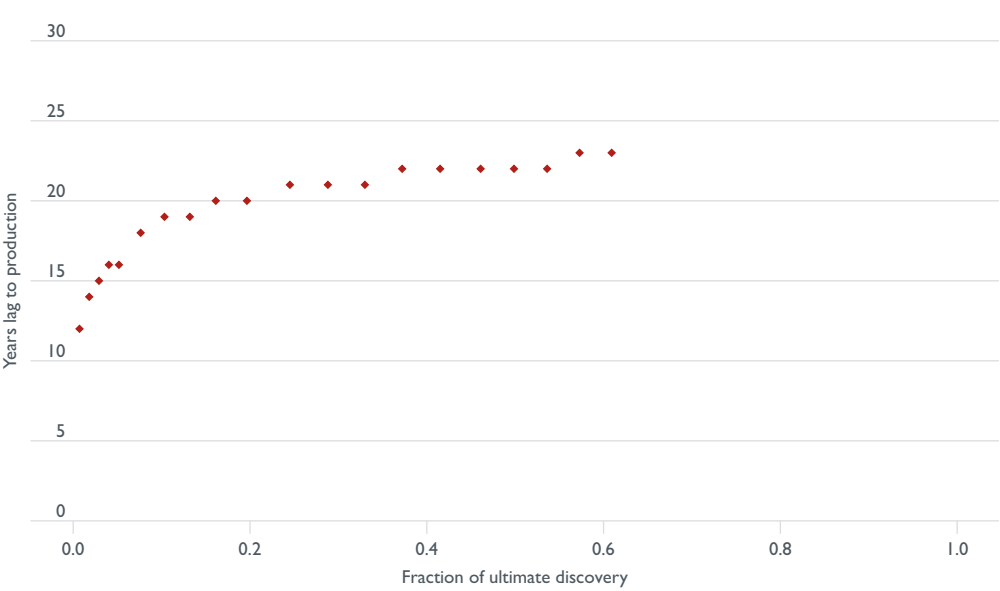
6. The plot is examined and a best guess at an ultimate discovery (UD) is made. In this case it is 38.5 gigabarrels.
7. Cumulative discovery in 2006 is then projected to UD by bringing SD estimated for 2006 to zero in 2047. For Norwegian oil, the projection of the cumulative discovery curve is shown in Figure 6.9.

Figure 6.9 Norwegian cumulative discovery projection



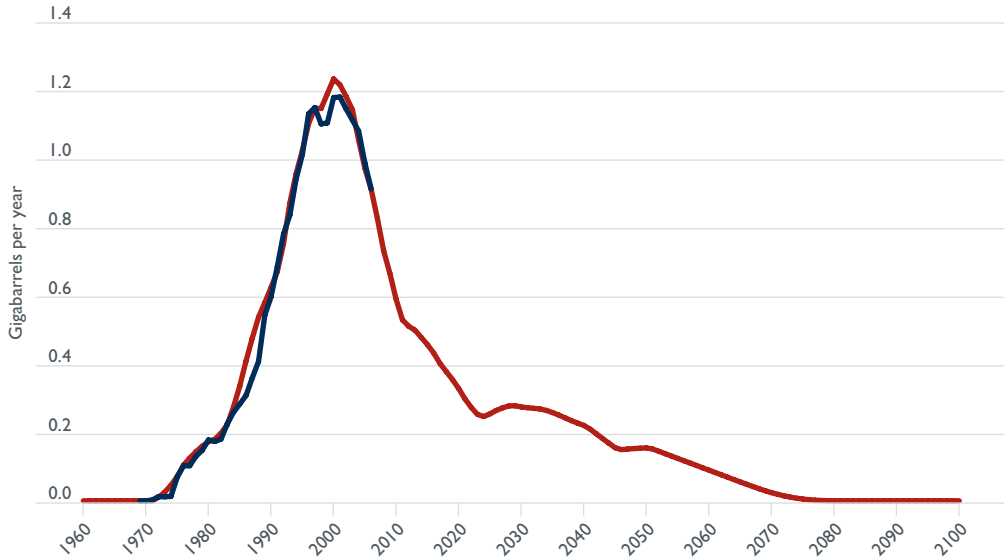
- 8. Next, the height of the cumulative discovery curve has to be adjusted to equal the more reliable cumulative production estimate. In this case, the adjustment is downward, amounting to multiplying by 37/38.5.
- 9. Next, the historical stretch lag between the cumulative discovery and production curves is calculated, and plotted against the fraction of cumulative discovery (Figure 6.10). After some noise in the range of zero to 0.1, the stretch lag exhibits rise steadily. Extrapolating the trend to 26 years at 1.0 allows the rest of the cumulative production curve to be forecast from the extrapolated discovery curve and the predicted lags.

Figure 6.10 Norwegian stretch lag curve



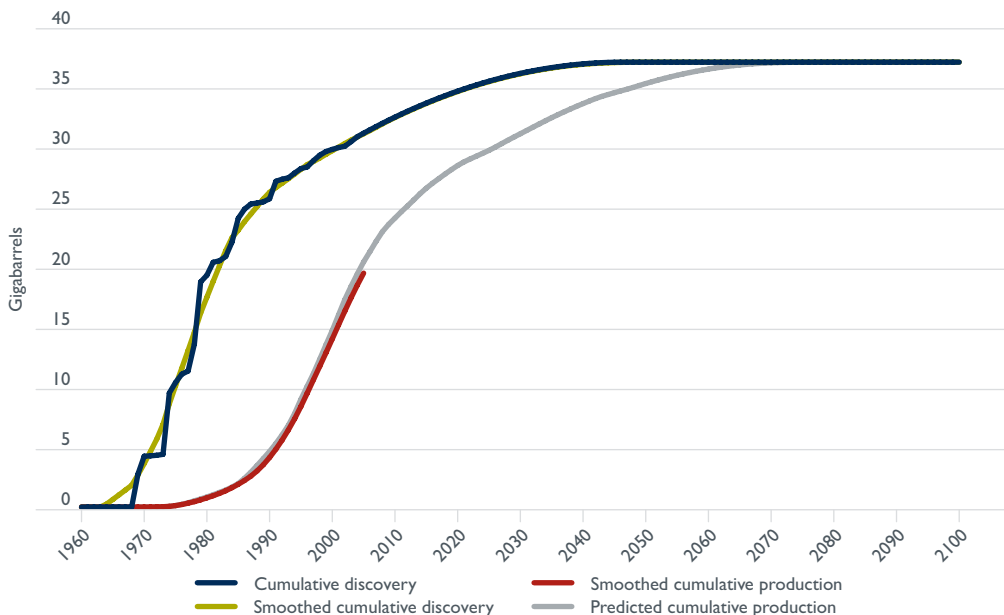
10. The predicted cumulative production curve is smoothed with a five year average and then differenced to give a raw predicted annual production. This is then averaged over five years to give a final annual production forecast. This is shown in Figure 6.11.

Figure 6.11 Actual and predicted Norwegian crude oil production



11. Finally the cumulative discovery and production curves (actual and forecast) are plotted in Figure 6.12. This allows a spatial understanding of the relationship between production and discovery.

Figure 6.12 Norwegian cumulative discovery and cumulative production curves

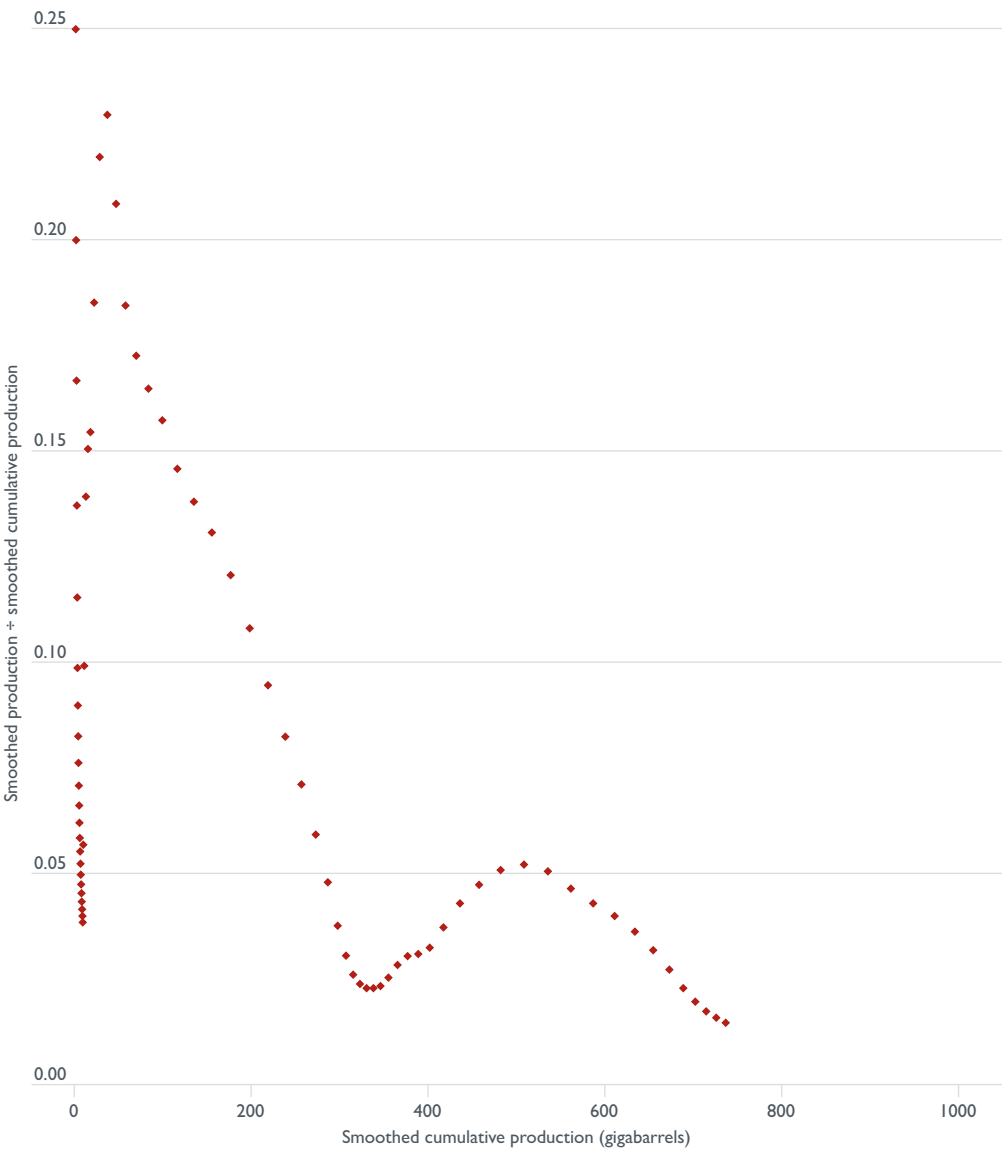


France

France is a small producer, but its bi-modal production pattern makes it a very interesting case. Table 6.3 sets out the calculations from the steps to a forecast of production of French oil (given in million barrels).

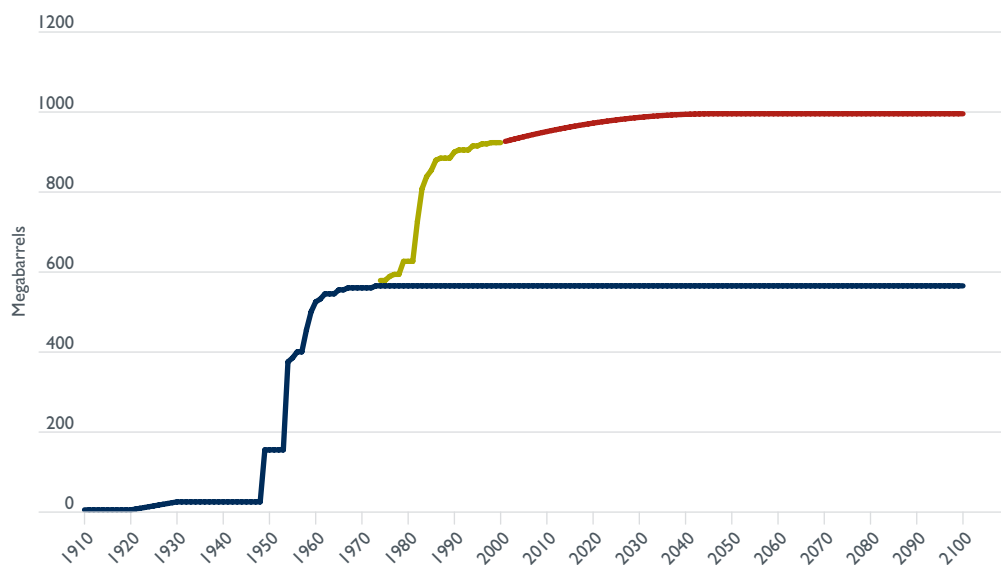
- 1. First, annual production (P) and cumulative production (CP) are smoothed with three year averages, generating SP and SCP (see Table 6.3).
- 2. The fractional growth in production (SP/SCP) is calculated and plotted against last year's cumulative production, as shown in Figure 6.13.

Figure 6.13 French cumulative production growth curve



3. There are two phases, with a first ultimate cumulative production (U) heading toward 350 million barrels, before the second round of discoveries moved it on to around 900 million barrels.
4. Cumulative discovery (CD) is split into two distinct parts—up to 560 million barrels and above—and the upper part is projected to an ultimate discovery (UD) of 990 (see Figure 6.14).

Figure 6.14 French cumulative discovery, partitioned and projected



5. Next, the two halves of the cumulative discovery curve have to be adjusted to equal the more reliable cumulative production estimates. In this case, the adjustment for the first half is downward, amounting to multiplying by 350/560. The second half of the discovery curve is adjusted upwards, multiplying by 550/430. Then the adjusted halves of the cumulative discovery curve are reassembled, and smoothed with consecutive 9 and 19 year moving averages.
6. Next, the historical stretch lag between the cumulative discovery and production curves is calculated, and plotted against the fraction of cumulative discovery. This plot for France is shown in Figure 6.15. After steadily falling to 8 years, the lag has begun an upward trend. Extrapolating the trend to 14 years at 1.0 allows the rest of the cumulative production curve to be forecast from the extrapolated discovery curve and the predicted lags. France has a very short lag distribution.
7. The predicted cumulative production curve is smoothed with a five year average and then differenced to give a raw predicted annual production. This is then averaged over five years to give a final annual production forecast. This is shown in Figure 6.16.

Figure 6.15 French stretch lag curve

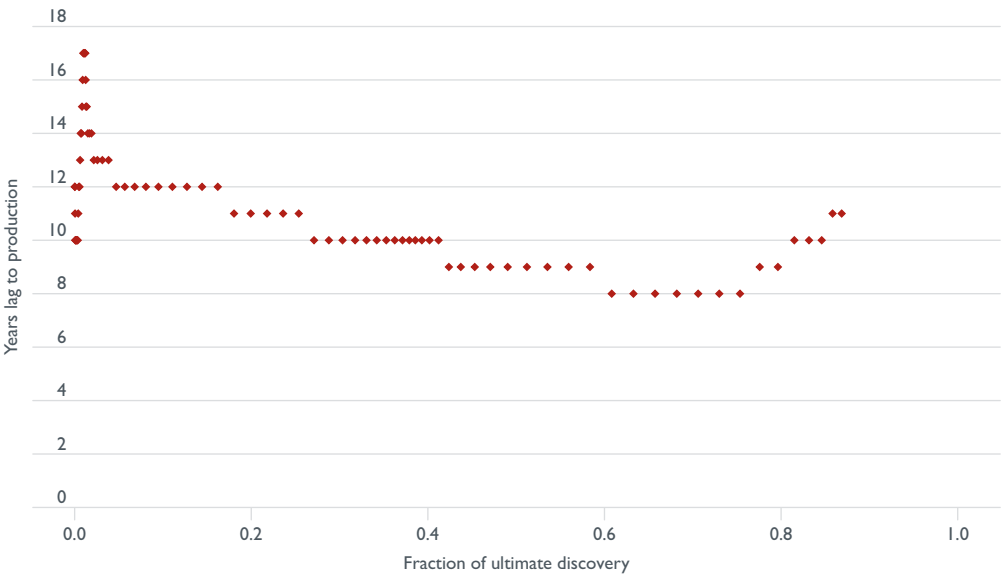
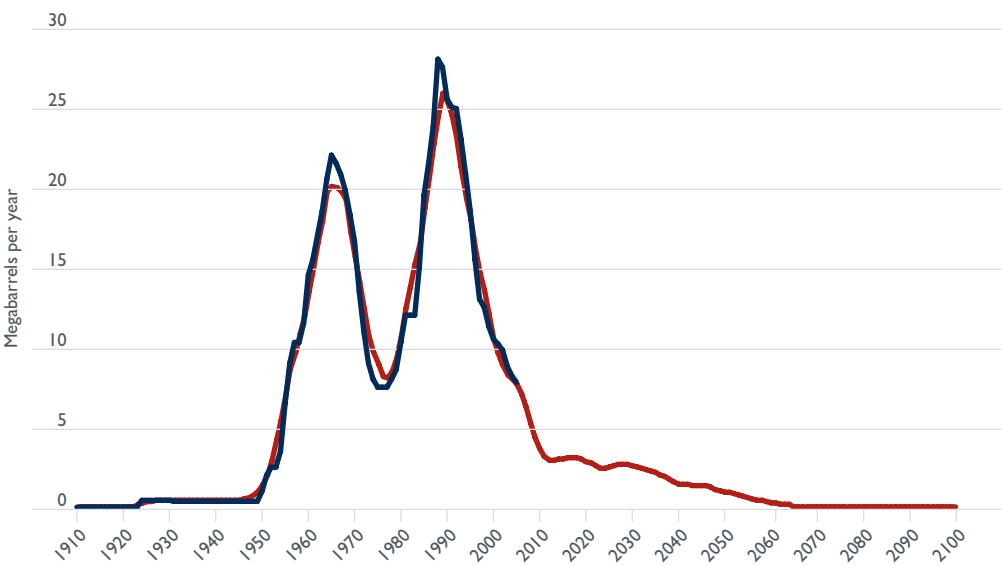
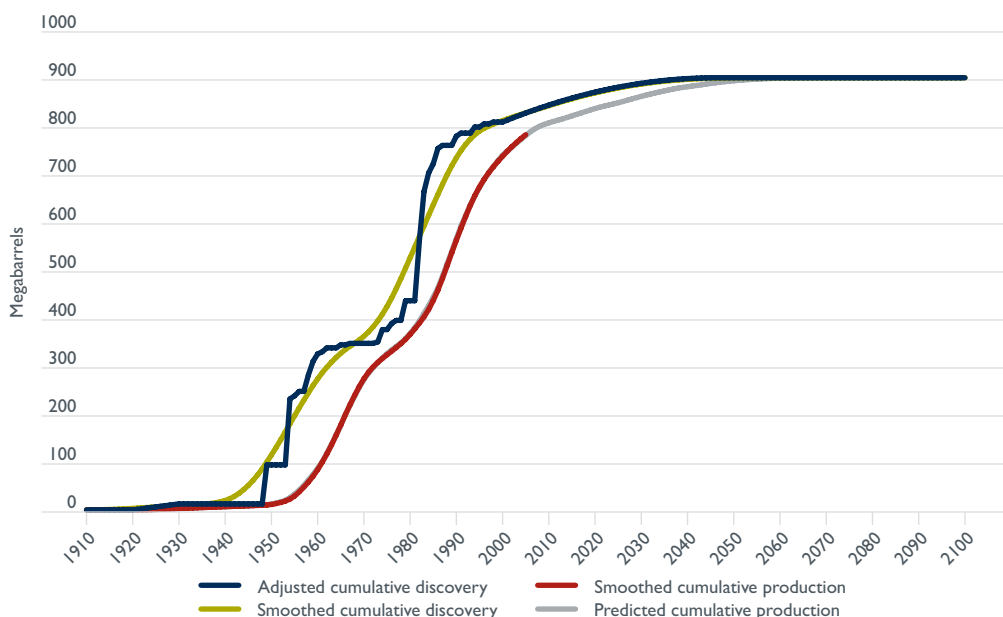


Figure 6.16 Actual and predicted French crude oil production



8. Finally the cumulative discovery and production curves (actual and forecast) are plotted in Figure 6.17. This allows a spatial understanding of the relationship between production and discovery.

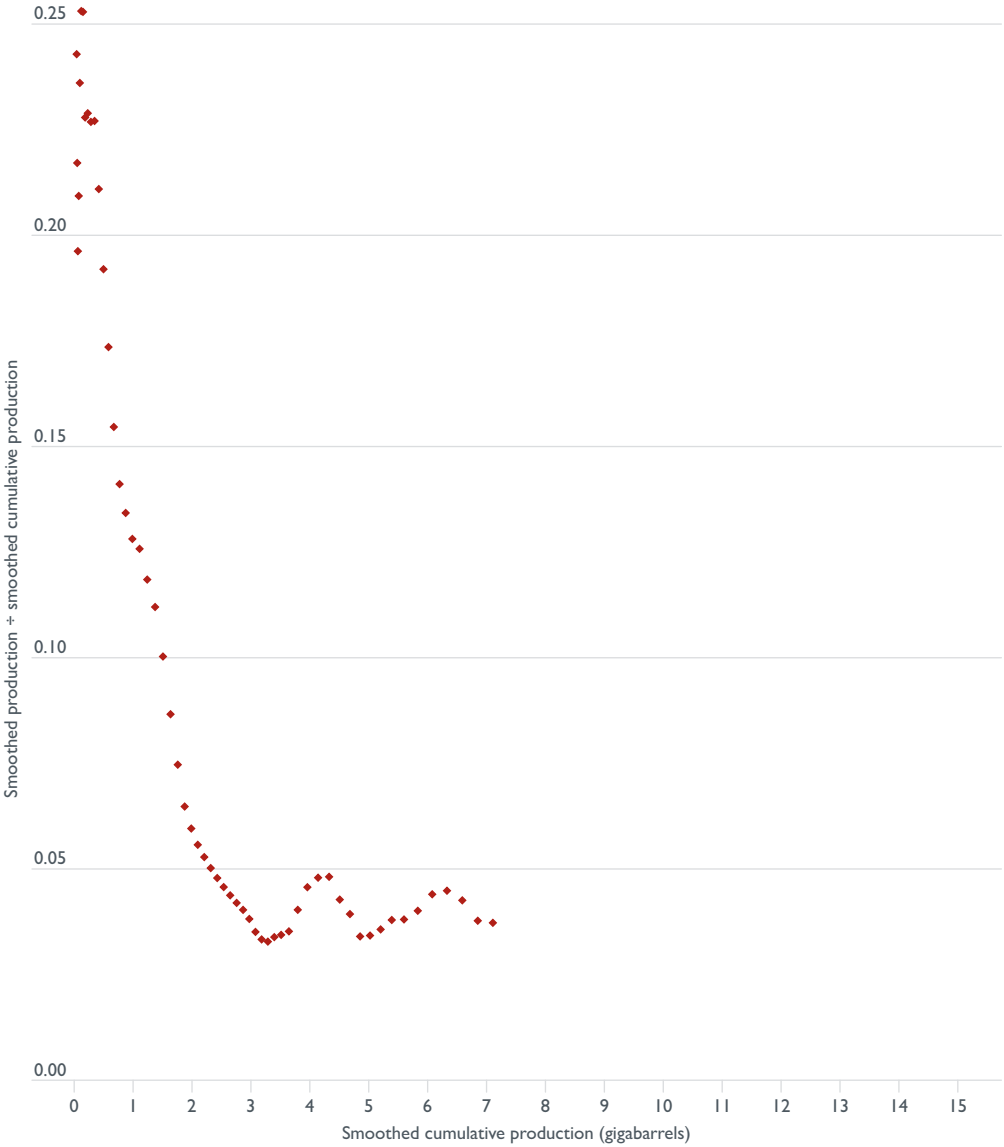
Figure 6.17 French cumulative discovery and cumulative production curves

The Rest of Europe

The Rest of Europe includes countries such as Germany, Italy, the Netherlands and Austria, and also includes France for this analysis. Table 6.4 sets out the calculations from the 11 steps to a forecast of oil production in the Rest of Europe.

1. Annual production (P) and cumulative production (CP) are smoothed with three and five year averages, generating SP and SCP (see Table 6.4).
2. The fractional growth in production (SP/SCP) is calculated and plotted against last year's cumulative production, as shown in Figure 6.18.
3. The plot is then examined and a best guess at an ultimate cumulative production (U) is made. In this case, it is 15 gigabarrels.
4. Discovery (D) is smoothed with a 11 year moving average and cumulative discovery (CD) is smoothed with a 17 year moving average.
5. The fractional growth in discovery (SD/SCD) is calculated and plotted against last year's smoothed cumulative discovery (shown in Figure 6.19).

Figure 6.18 Cumulative production growth curve for the Rest of Europe



6. The plot is examined and a best guess at an ultimate discovery (UD) is made. In this case it is also 15 gigabarrels.
7. Cumulative discovery in 2006 is then projected to UD by bringing SD estimated for 2006 to zero in 2045. For the Rest of Europe, the projection of the cumulative discovery curve is shown in Figure 6.20.
8. No adjustment of the cumulative discovery curve is necessary.

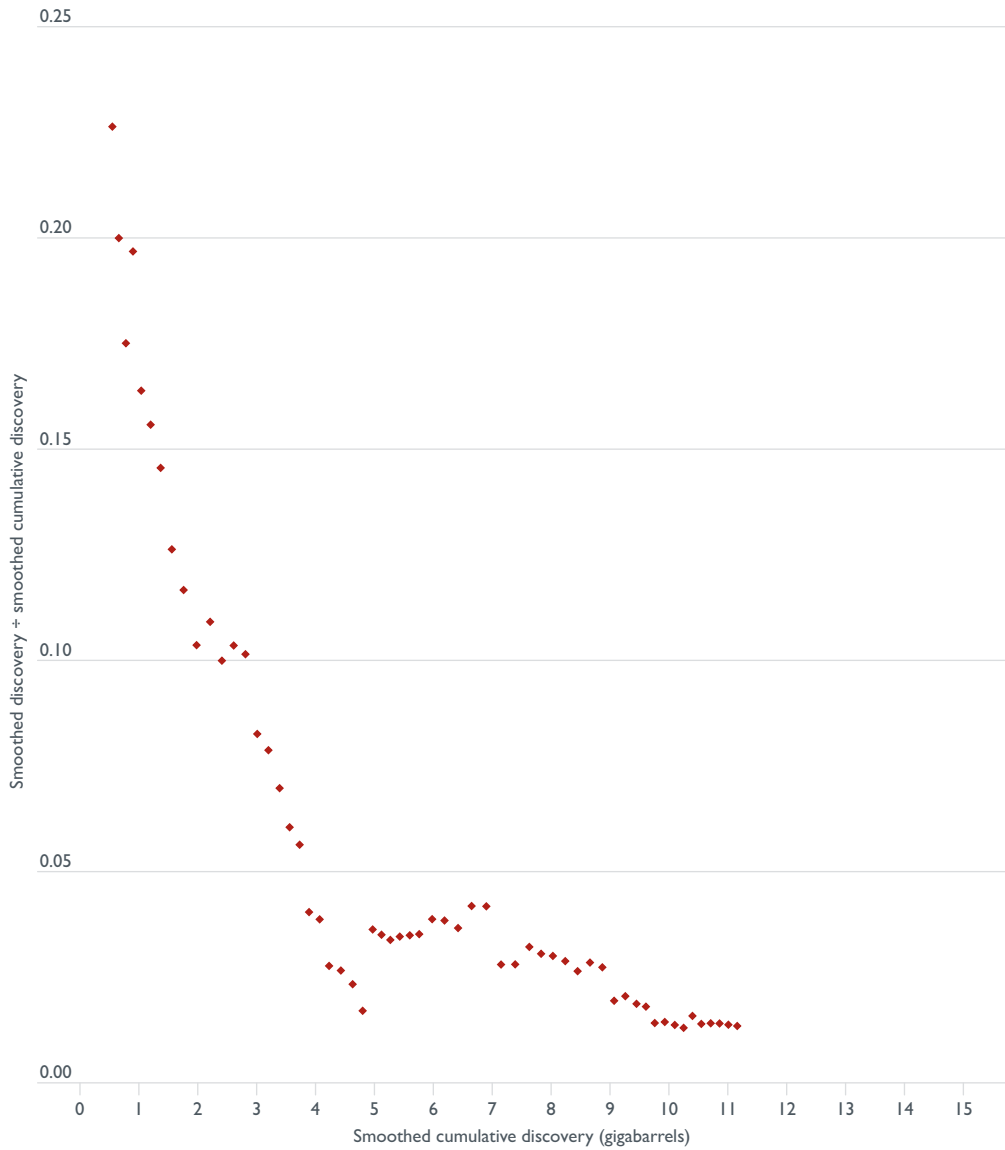
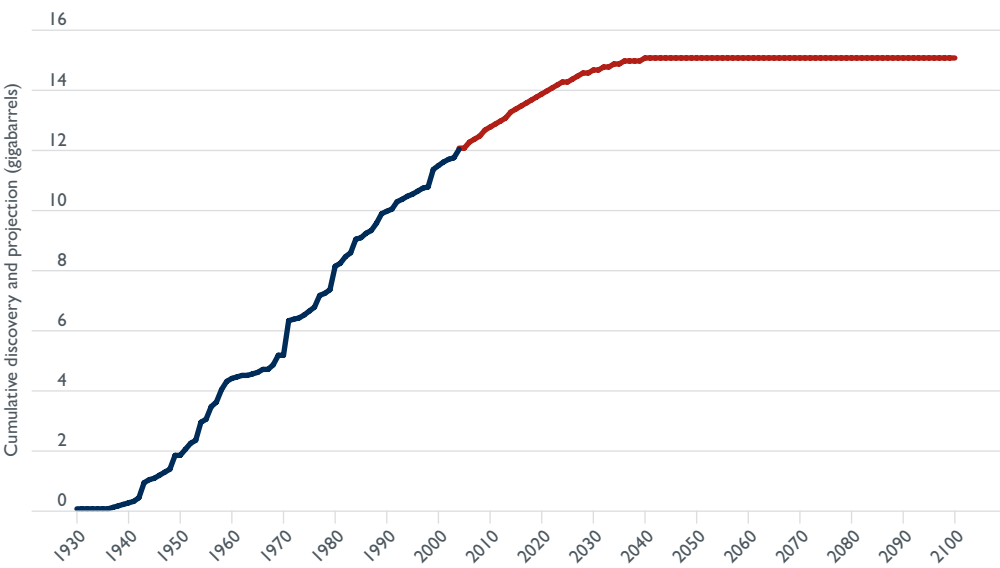
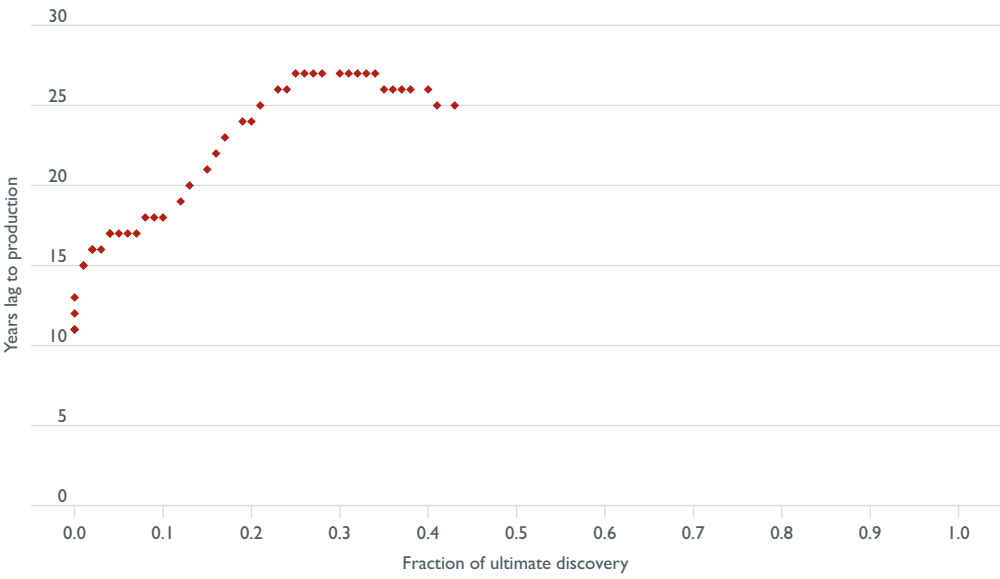
Figure 6.19 Cumulative discovery growth curve for the Rest of Europe

Figure 6.20 Cumulative discovery projection for the Rest of Europe



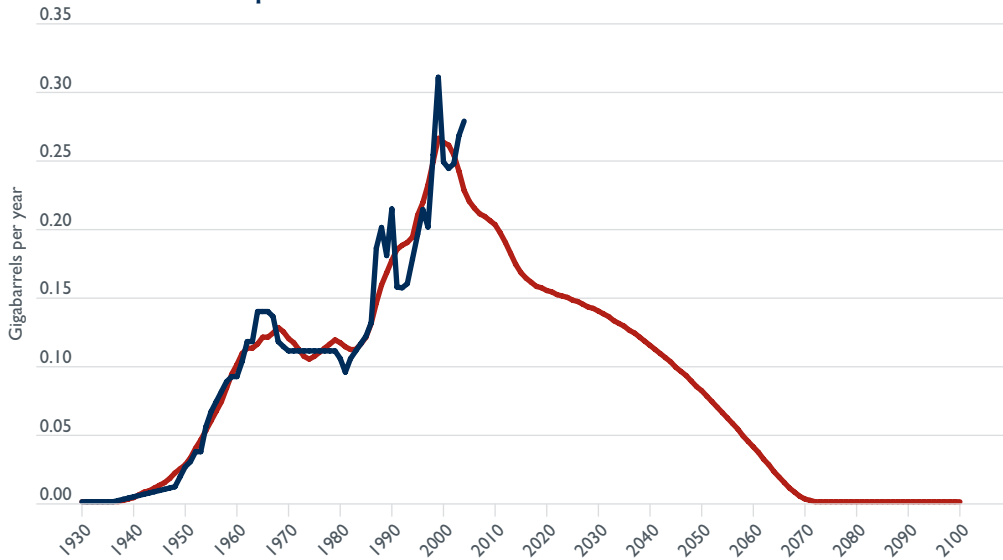
9. Next, the historical stretch lag between the cumulative discovery and production curves is calculated, and plotted against the fraction of cumulative discovery. This plot for The Rest of Europe is shown in Figure 6.21. After some noise in the range of zero to 0.1, the stretch lag exhibits a rapid rise corresponding to lower production rates in the 1980s. After the splitting up of the former Soviet Union, lags have stabilised and even declined somewhat. Extrapolating the trend at 25 years to 1.0 allows the rest of the cumulative production curve to be forecast from the extrapolated discovery curve and the predicted lags.

Figure 6.21 Stretch lag curve for the Rest of Europe



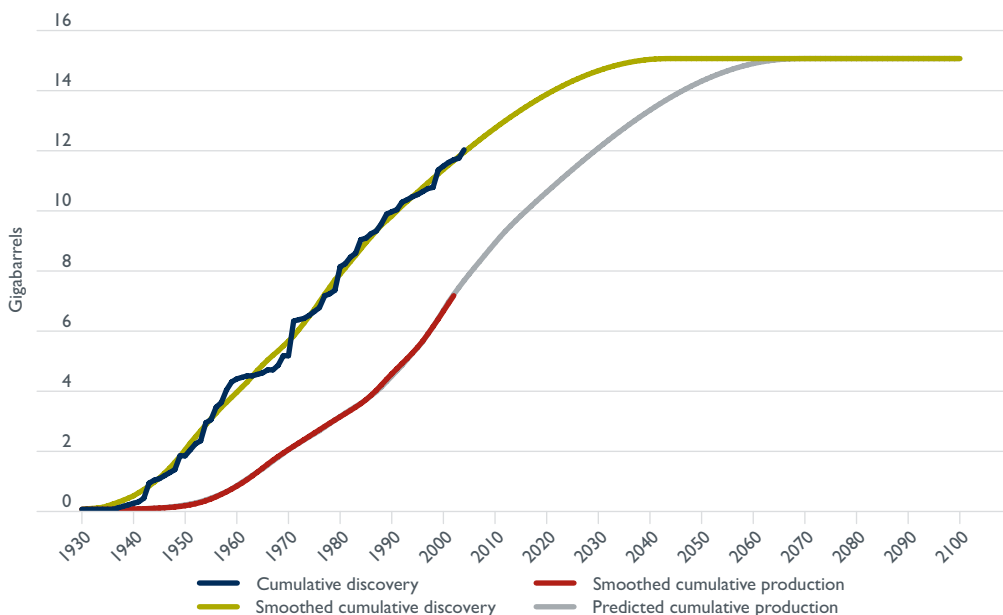
10. The predicted cumulative production curve is smoothed with a five year average and then differenced to give a raw predicted annual production. This is averaged over five years to give a final annual production forecast. This is shown in Figure 6.22.

Figure 6.22 Actual and predicted crude oil production for the Rest of Europe



11. Finally the cumulative discovery and production curves (actual and forecast) are plotted in Figure 6.23. This allows a spatial understanding of the relationship between production and discovery.

Figure 6.23 Cumulative discovery and cumulative production curves for the Rest of Europe



Europe summary

European oil production is now in steep decline, after peaking near 2.4 gigabarrels per year near the turn of the century. Figure 6.24 shows the fit of actual and predicted and illustrates the trend.

Figure 6.24 Actual and predicted European crude oil production

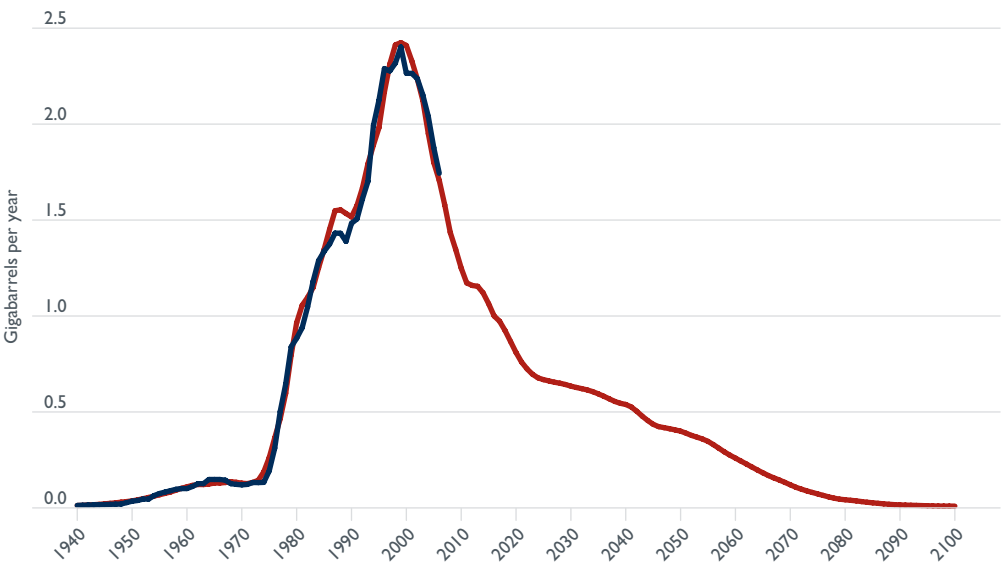


Figure 6.25 shows the importance of North Sea oil, shared as it is between the UK and Norway, to total European production.

Figure 6.25 Components of European crude oil production

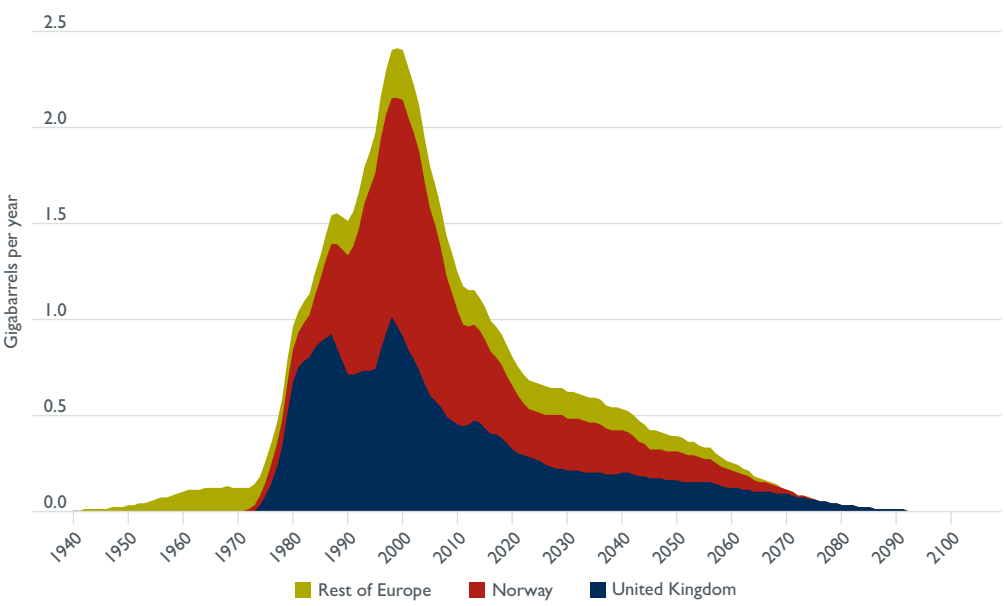


Table 6.1 UK, gigabarrels (continued)

Year	D	CD	I / yr SCD	Adj SCD	Predlag	Raw pred CP	3yr smth pred SCP	SCP	Raw pred P	3yr smth pred SP	Actual P
2041	0.11	37.39	37.39	37.39	30	33.32	33.32		0.20	0.20	
2042	0.09	37.48	37.48	37.48	30	33.52	33.52		0.20	0.19	
2043	0.06	37.54	37.54	37.54	30	33.71	33.71		0.20	0.18	
2044	0.05	37.59	37.59	37.59	30	33.90	33.90		0.19	0.18	
2045	0.01	37.60	37.60	37.60	30	34.09	34.09		0.19	0.17	
2046	0.06	37.66	37.66	37.66	30	34.28	34.25		0.15	0.17	
2047	0.05	37.71	37.71	37.71	30	34.37	34.37		0.12	0.17	
2048	0.05	37.76	37.76	37.76	30	34.46	34.49		0.12	0.16	
2049	0.04	37.80	37.80	37.80	30	34.64	34.64		0.15	0.16	
2050	0.04	37.84	37.84	37.84	30	34.81	34.81		0.17	0.16	
2051	0.03	37.87	37.87	37.87	30	34.98	34.98		0.17	0.15	
2052	0.03	37.89	37.89	37.89	30	35.14	35.14		0.17	0.15	
2053	0.02	37.91	37.92	37.92	30	35.31	35.30		0.16	0.15	
2054	0.02	37.93	37.93	37.93	30	35.46	35.46		0.16	0.15	
2055	0.01	37.94	37.94	37.94	30	35.62	35.61		0.15	0.15	
2056	0.01	37.95	37.95	37.95	30	35.76	35.76		0.15	0.15	
2057	0.01	37.96	37.96	37.96	30	35.91	35.91		0.14	0.14	
2058	0.01	37.97	37.97	37.97	30	36.05	36.05		0.14	0.13	
2059	0.01	37.98	37.98	37.98	30	36.18	36.18		0.14	0.12	
2060	0.01	37.99	37.99	37.99	30	36.31	36.31		0.13	0.12	
2061	0.01	38.00	38.00	38.00	30	36.44	36.42		0.11	0.12	
2062	0.00	38.00	38.00	38.00	30	36.50	36.50		0.08	0.11	
2063	0.00	38.00	38.00	38.00	30	36.56	36.58		0.08	0.11	
2064	0.00	38.00	38.00	38.00	30	36.68	36.68		0.10	0.10	
2065	0.00	38.00	38.00	38.00	30	36.79	36.79		0.11	0.10	
2066	0.00	38.00	38.00	38.00	30	36.90	36.90		0.11	0.10	
2067	0.00	38.00	38.00	38.00	30	37.00	37.00		0.10	0.10	
2068	0.00	38.00	38.00	38.00	30	37.10	37.10		0.10	0.09	
2069	0.00	38.00	38.00	38.00	30	37.19	37.19		0.09	0.09	
2070	0.00	38.00	38.00	38.00	30	37.28	37.29		0.10	0.09	
2071	0.00	38.00	38.00	38.00	30	37.39	37.38		0.10	0.08	
2072	0.00	38.00	38.00	38.00	30	37.48	37.47		0.09	0.07	
2073	0.00	38.00	38.00	38.00	30	37.54	37.54		0.07	0.07	
2074	0.00	38.00	38.00	38.00	30	37.59	37.58		0.04	0.06	
2075	0.00	38.00	38.00	38.00	30	37.60	37.62		0.04	0.06	
2076	0.00	38.00	38.00	38.00	30	37.66	37.66		0.04	0.05	
2077	0.00	38.00	38.00	38.00	30	37.71	37.71		0.05	0.05	
2078	0.00	38.00	38.00	38.00	30	37.76	37.76		0.05	0.04	
2079	0.00	38.00	38.00	38.00	30	37.80	37.80		0.04	0.04	
2080	0.00	38.00	38.00	38.00	30	37.84	37.83		0.04	0.03	
2081	0.00	38.00	38.00	38.00	30	37.87	37.87		0.03	0.03	
2082	0.00	38.00	38.00	38.00	30	37.89	37.89		0.03	0.03	
2083	0.00	38.00	38.00	38.00	30	37.92	37.91		0.02	0.02	
2084	0.00	38.00	38.00	38.00	30	37.93	37.93		0.02	0.02	
2085	0.00	38.00	38.00	38.00	30	37.94	37.94		0.01	0.02	
2086	0.00	38.00	38.00	38.00	30	37.95	37.95		0.01	0.01	
2087	0.00	38.00	38.00	38.00	30	37.96	37.96		0.01	0.01	
2088	0.00	38.00	38.00	38.00	30	37.97	37.97		0.01	0.01	
2089	0.00	38.00	38.00	38.00	30	37.98	37.98		0.01	0.01	
2090	0.00	38.00	38.00	38.00	30	37.99	37.99		0.01	0.01	
2091	0.00	38.00	38.00	38.00	30	38.00	37.99		0.01	0.01	
2092	0.00	38.00	38.00	38.00	30	38.00	38.00		0.00	0.00	
2093	0.00	38.00	38.00	38.00	30	38.00	38.00		0.00	0.00	
2094	0.00	38.00	38.00	38.00	30	38.00	38.00		0.00	0.00	
2095	0.00	38.00	38.00	38.00	30	38.00	38.00		0.00	0.00	
2096	0.00	38.00	38.00	38.00	30	38.00	38.00		0.00	0.00	
2097	0.00	38.00	38.00	38.00	30	38.00	38.00		0.00	0.00	
2098	0.00	38.00	38.00	38.00	30	38.00	38.00		0.00	0.00	
2099	0.00	38.00	38.00	38.00	30	38.00	38.00		0.00	0.00	
2100	0.00	38.00	38.00	38.00	30	38.00	38.00		0.00	0.00	

Notes: D—discovery; CD—cumulative discovery; SCD—smoothed cumulative discovery (years = number of years centred moving average); adj—adjusted (to match cumulative production maximum); predlag—predicted lag between cumulative discovery and cumulative production; raw Pred CP—prediction using direct lag of cumulative discovery by predicted lag years; Pred SCP—raw predicted CP smoothed (with years = number of years centred moving average); SCP—smoothed actual cumulative production (years = number of years centred moving average); raw Pred P—one year change in predicted smoothed cumulative production; Pred SP—smoothed raw Pred P (years = number of years centred moving average); Actual P—actual annual oil production. Shaded numbers are interpolations, extrapolations or forecasts.

Table 6.2 Norway, gigabarrels (continued)

Year	D	CD	1 lyr SCD	Adj SCD	Predlag	Raw pred CP	1 lyr smth pred SCP	SCP	Raw pred P	3yr smth pred SP	Actual P
2041	0.04	38.39	38.36	36.86	26	33.77	33.77	0.21	0.21		
2042	0.04	38.43	38.39	36.90	26	33.98	33.97	0.21	0.20		
2043	0.03	38.46	38.42	36.93	26	34.18	34.15	0.18	0.18		
2044	0.02	38.48	38.45	36.95	26	34.37	34.31	0.16	0.17		
2045	0.01	38.49	38.46	36.97	26	34.46	34.46	0.15	0.15		
2046	0.01	38.50	38.48	36.98	26	34.56	34.61	0.15	0.15		
2047	0.00	38.50	38.49	36.99	26	34.73	34.75	0.14	0.15		
2048	0.00	38.50	38.49	36.99	26	34.91	34.90	0.15	0.15		
2049	0.00	38.50	38.50	37.00	26	35.07	35.06	0.16	0.15		
2050	0.00	38.50	38.50	37.00	26	35.23	35.22	0.16	0.15		
2051	0.00	38.50	38.50	37.00	26	35.38	35.37	0.15	0.15		
2052	0.00	38.50	38.50	37.00	26	35.52	35.52	0.14	0.14		
2053	0.00	38.50	38.50	37.00	26	35.66	35.65	0.14	0.14		
2054	0.00	38.50	38.50	37.00	26	35.79	35.78	0.13	0.13		
2055	0.00	38.50	38.50	37.00	26	35.92	35.91	0.12	0.12		
2056	0.00	38.50	38.50	37.00	26	36.03	36.03	0.12	0.12		
2057	0.00	38.50	38.50	37.00	26	36.14	36.14	0.11	0.11		
2058	0.00	38.50	38.50	37.00	26	36.24	36.24	0.10	0.10		
2059	0.00	38.50	38.50	37.00	26	36.34	36.33	0.10	0.10		
2060	0.00	38.50	38.50	37.00	26	36.43	36.42	0.09	0.09		
2061	0.00	38.50	38.50	37.00	26	36.51	36.51	0.08	0.08		
2062	0.00	38.50	38.50	37.00	26	36.59	36.58	0.08	0.08		
2063	0.00	38.50	38.50	37.00	26	36.66	36.65	0.07	0.07		
2064	0.00	38.50	38.50	37.00	26	36.72	36.71	0.06	0.06		
2065	0.00	38.50	38.50	37.00	26	36.77	36.77	0.05	0.05		
2066	0.00	38.50	38.50	37.00	26	36.82	36.81	0.05	0.05		
2067	0.00	38.50	38.50	37.00	26	36.86	36.86	0.04	0.04		
2068	0.00	38.50	38.50	37.00	26	36.90	36.89	0.03	0.04		
2069	0.00	38.50	38.50	37.00	26	36.93	36.92	0.03	0.03		
2070	0.00	38.50	38.50	37.00	26	36.95	36.94	0.02	0.02		
2071	0.00	38.50	38.50	37.00	26	36.97	36.96	0.02	0.02		
2072	0.00	38.50	38.50	37.00	26	36.98	36.97	0.01	0.01		
2073	0.00	38.50	38.50	37.00	26	36.99	36.98	0.01	0.01		
2074	0.00	38.50	38.50	37.00	26	36.99	36.99	0.01	0.01		
2075	0.00	38.50	38.50	37.00	26	37.00	37.00	0.00	0.01		
2076	0.00	38.50	38.50	37.00	26	37.00	37.00	0.00	0.00		
2077	0.00	38.50	38.50	37.00	26	37.00	37.00	0.00	0.00		
2078	0.00	38.50	38.50	37.00	26	37.00	37.00	0.00	0.00		
2079	0.00	38.50	38.50	37.00	26	37.00	37.00	0.00	0.00		
2080	0.00	38.50	38.50	37.00	26	37.00	37.00	0.00	0.00		
2081	0.00	38.50	38.50	37.00	26	37.00	37.00	0.00	0.00		
2082	0.00	38.50	38.50	37.00	26	37.00	37.00	0.00	0.00		
2083	0.00	38.50	38.50	37.00	26	37.00	37.00	0.00	0.00		
2084	0.00	38.50	38.50	37.00	26	37.00	37.00	0.00	0.00		
2085	0.00	38.50	38.50	37.00	26	37.00	37.00	0.00	0.00		
2086	0.00	38.50	38.50	37.00	26	37.00	37.00	0.00	0.00		
2087	0.00	38.50	38.50	37.00	26	37.00	37.00	0.00	0.00		
2088	0.00	38.50	38.50	37.00	26	37.00	37.00	0.00	0.00		
2089	0.00	38.50	38.50	37.00	26	37.00	37.00	0.00	0.00		
2090	0.00	38.50	38.50	37.00	26	37.00	37.00	0.00	0.00		
2091	0.00	38.50	38.50	37.00	26	37.00	37.00	0.00	0.00		
2092	0.00	38.50	38.50	37.00	26	37.00	37.00	0.00	0.00		
2093	0.00	38.50	38.50	37.00	26	37.00	37.00	0.00	0.00		
2094	0.00	38.50	38.50	37.00	26	37.00	37.00	0.00	0.00		
2095	0.00	38.50	38.50	37.00	26	37.00	37.00	0.00	0.00		
2096	0.00	38.50	38.50	37.00	26	37.00	37.00	0.00	0.00		
2097	0.00	38.50	38.50	37.00	26	37.00	37.00	0.00	0.00		
2098	0.00	38.50	38.50	37.00	26	37.00	37.00	0.00	0.00		
2099	0.00	38.50	38.50	37.00	26	37.00	37.00	0.00	0.00		
2100	0.00	38.50	38.50	37.00	26	37.00	37.00	0.00	0.00		

Notes: D—discovery; CD—cumulative discovery; SCD—smoothed cumulative discovery (years = number of years centred moving average); adj—adjusted (to match cumulative production maximum); predlag—predicted lag between cumulative discovery and cumulative production; raw Pred CP—prediction using direct lag of cumulative discovery by predicted lag years; Pred SCP—raw predicted CP smoothed (with years = number of years centred moving average); SCP—smoothed actual cumulative production (years = number of years centred moving average); raw Pred P—one year change in predicted smoothed cumulative production; Pred SP—smoothed raw Pred P (years = number of years centred moving average); Actual P—actual annual oil production. Shaded numbers are interpolations, extrapolations or forecasts.

Table 6.3 France, millions of barrels (continued)

Year	D	CD	Adj CD1	Adj CD2	9,19yr SCD	Predlag	Raw pred CP	11yr smth pred SCP	SCP	Raw pred P	5yr smth pred SP	Actual P
2070	0.0	990.2	350.0	550.2	900.2	14	900.2	900.2		0.0	0.0	
2071	0.0	990.2	350.0	550.2	900.2	14	900.2	900.2		0.0	0.0	
2072	0.0	990.2	350.0	550.2	900.2	14	900.2	900.2		0.0	0.0	
2073	0.0	990.2	350.0	550.2	900.2	14	900.2	900.2		0.0	0.0	
2074	0.0	990.2	350.0	550.2	900.2	14	900.2	900.2		0.0	0.0	
2075	0.0	990.2	350.0	550.2	900.2	14	900.2	900.2		0.0	0.0	
2076	0.0	990.2	350.0	550.2	900.2	14	900.2	900.2		0.0	0.0	
2077	0.0	990.2	350.0	550.2	900.2	14	900.2	900.2		0.0	0.0	
2078	0.0	990.2	350.0	550.2	900.2	14	900.2	900.2		0.0	0.0	
2079	0.0	990.2	350.0	550.2	900.2	14	900.2	900.2		0.0	0.0	
2080	0.0	990.2	350.0	550.2	900.2	14	900.2	900.2		0.0	0.0	
2081	0.0	990.2	350.0	550.2	900.2	14	900.2	900.2		0.0	0.0	
2082	0.0	990.2	350.0	550.2	900.2	14	900.2	900.2		0.0	0.0	
2083	0.0	990.2	350.0	550.2	900.2	14	900.2	900.2		0.0	0.0	
2084	0.0	990.2	350.0	550.2	900.2	14	900.2	900.2		0.0	0.0	
2085	0.0	990.2	350.0	550.2	900.2	14	900.2	900.2		0.0	0.0	
2086	0.0	990.2	350.0	550.2	900.2	14	900.2	900.2		0.0	0.0	
2087	0.0	990.2	350.0	550.2	900.2	14	900.2	900.2		0.0	0.0	
2088	0.0	990.2	350.0	550.2	900.2	14	900.2	900.2		0.0	0.0	
2089	0.0	990.2	350.0	550.2	900.2	14	900.2	900.2		0.0	0.0	
2090	0.0	990.2	350.0	550.2	900.2	14	900.2	900.2		0.0	0.0	
2091	0.0	990.2	350.0	550.2	900.2	14	900.2	900.2		0.0	0.0	
2092	0.0	990.2	350.0	550.2	900.2	14	900.2	900.2		0.0	0.0	
2093	0.0	990.2	350.0	550.2	900.2	14	900.2	900.2		0.0	0.0	
2094	0.0	990.2	350.0	550.2	900.2	14	900.2	900.2		0.0	0.0	
2095	0.0	990.2	350.0	550.2	900.2	14	900.2	900.2		0.0	0.0	
2096	0.0	990.2	350.0	550.2	900.2	14	900.2	900.2		0.0	0.0	
2097	0.0	990.2	350.0	550.2	900.2	14	900.2	900.2		0.0	0.0	
2098	0.0	990.2	350.0	550.2	900.2	14	900.2	900.2		0.0	0.0	
2099	0.0	990.2	350.0	550.2	900.2	14	900.2	900.2		0.0	0.0	
2100	0.0	990.2	350.0	550.2	900.2	14	900.2	900.2		0.0	0.0	

Notes: D—discovery; CD—cumulative discovery; SCD—smoothed cumulative discovery (years = number of years centred moving average); adj—adjusted (to match cumulative production maximum); predlag—predicted lag between cumulative discovery and cumulative production; raw Pred CP—prediction using direct lag of cumulative discovery by predicted lag years; Pred SCP—raw predicted CP smoothed (with years = number of years centred moving average); SCP—smoothed actual cumulative production (years = number of years centred moving average); raw Pred P—one year change in predicted smoothed cumulative production; Pred SP—smoothed raw Pred P (years = number of years centred moving average); Actual P—actual annual oil production. Shaded numbers are interpolations, extrapolations or forecasts.

Table 6.4 Rest of Europe, gigabarrels (continued)

Year	D	CD	17yr SCD	Adj SCD	Predlag	Raw pred CP	5yr smth pred SCP	SCP	Raw pred P	5yr smth pred SP	Actual P
2092	0.00	15.00	15.00	15.00	25	15.00	15.00		0.00	0.00	
2093	0.00	15.00	15.00	15.00	25	15.00	15.00		0.00	0.00	
2094	0.00	15.00	15.00	15.00	25	15.00	15.00		0.00	0.00	
2095	0.00	15.00	15.00	15.00	25	15.00	15.00		0.00	0.00	
2096	0.00	15.00	15.00	15.00	25	15.00	15.00		0.00	0.00	
2097	0.00	15.00	15.00	15.00	25	15.00	15.00		0.00	0.00	
2098	0.00	15.00	15.00	15.00	25	15.00	15.00		0.00	0.00	
2099	0.00	15.00	15.00	15.00	25	15.00	15.00		0.00	0.00	
2100	0.00	15.00	15.00	15.00	25	15.00	15.00		0.00	0.00	

Notes: D—discovery; CD—cumulative discovery; SCD—smoothed cumulative discovery (years = number of years centred moving average); adj—adjusted (to match cumulative production maximum); predlag—predicted lag between cumulative discovery and cumulative production; raw Pred CP—prediction using direct lag of cumulative discovery by predicted lag years; Pred SCP—raw predicted CP smoothed (with years = number of years centred moving average); SCP—smoothed actual cumulative production (years = number of years centred moving average); raw Pred P—one year change in predicted smoothed cumulative production; Pred SP—smoothed raw Pred P (years = number of years centred moving average); Actual P—actual annual oil production. Shaded numbers are interpolations, extrapolations or forecasts.

Table 6.5 Europe, gigabarrels (continued)

Year	UK	Norway	Rest Europe	Total Europe	UK	Norway	Rest Europe	Total Europe
	(predicted production)				(actual production)			
2021	0.30	0.30	0.15	0.75				
2022	0.29	0.27	0.15	0.71				
2023	0.28	0.25	0.15	0.69				
2024	0.27	0.25	0.15	0.67				
2025	0.26	0.25	0.15	0.66				
2026	0.24	0.26	0.15	0.65				
2027	0.23	0.27	0.14	0.65				
2028	0.22	0.28	0.14	0.64				
2029	0.22	0.28	0.14	0.63				
2030	0.21	0.27	0.14	0.62				
2031	0.21	0.27	0.14	0.62				
2032	0.21	0.27	0.13	0.61				
2033	0.20	0.27	0.13	0.60				
2034	0.20	0.26	0.13	0.60				
2035	0.20	0.26	0.13	0.58				
2036	0.20	0.25	0.13	0.57				
2037	0.19	0.24	0.12	0.56				
2038	0.19	0.23	0.12	0.55				
2039	0.19	0.23	0.12	0.54				
2040	0.20	0.22	0.11	0.53				
2041	0.20	0.21	0.11	0.52				
2042	0.19	0.20	0.11	0.49				
2043	0.18	0.18	0.11	0.47				
2044	0.18	0.17	0.10	0.45				
2045	0.17	0.15	0.10	0.43				
2046	0.17	0.15	0.10	0.41				
2047	0.17	0.15	0.09	0.41				
2048	0.16	0.15	0.09	0.40				
2049	0.16	0.15	0.08	0.40				
2050	0.16	0.15	0.08	0.39				
2051	0.15	0.15	0.08	0.38				
2052	0.15	0.14	0.07	0.37				
2053	0.15	0.14	0.07	0.36				
2054	0.15	0.13	0.06	0.35				
2055	0.15	0.12	0.06	0.34				
2056	0.15	0.12	0.06	0.32				
2057	0.14	0.11	0.05	0.30				
2058	0.13	0.10	0.05	0.28				
2059	0.12	0.10	0.04	0.27				
2060	0.12	0.09	0.04	0.25				
2061	0.12	0.08	0.04	0.23				
2062	0.11	0.08	0.03	0.22				
2063	0.11	0.07	0.03	0.20				
2064	0.10	0.06	0.02	0.19				
2065	0.10	0.05	0.02	0.17				
2066	0.10	0.05	0.01	0.16				
2067	0.10	0.04	0.01	0.15				
2068	0.09	0.04	0.01	0.14				
2069	0.09	0.03	0.00	0.12				
2070	0.09	0.02	0.00	0.11				
2071	0.08	0.02	0.00	0.10				
2072	0.07	0.01	0.00	0.09				
2073	0.07	0.01	0.00	0.08				
2074	0.06	0.01	0.00	0.07				
2075	0.06	0.01	0.00	0.06				
2076	0.05	0.00	0.00	0.06				
2077	0.05	0.00	0.00	0.05				
2078	0.04	0.00	0.00	0.04				
2079	0.04	0.00	0.00	0.04				
2080	0.03	0.00	0.00	0.03				
2081	0.03	0.00	0.00	0.03				
2082	0.03	0.00	0.00	0.03				
2083	0.02	0.00	0.00	0.02				
2084	0.02	0.00	0.00	0.02				
2085	0.02	0.00	0.00	0.02				
2086	0.01	0.00	0.00	0.01				
2087	0.01	0.00	0.00	0.01				
2088	0.01	0.00	0.00	0.01				
2089	0.01	0.00	0.00	0.01				
2090	0.01	0.00	0.00	0.01				
2091	0.01	0.00	0.00	0.01				
2092	0.00	0.00	0.00	0.00				
2093	0.00	0.00	0.00	0.00				
2094	0.00	0.00	0.00	0.00				
2095	0.00	0.00	0.00	0.00				
2096	0.00	0.00	0.00	0.00				
2097	0.00	0.00	0.00	0.00				
2098	0.00	0.00	0.00	0.00				
2099	0.00	0.00	0.00	0.00				
2100	0.00	0.00	0.00	0.00				

Note: UK—United Kingdom.

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Chapter 7

Eurasia



Chapter 7 Eurasia

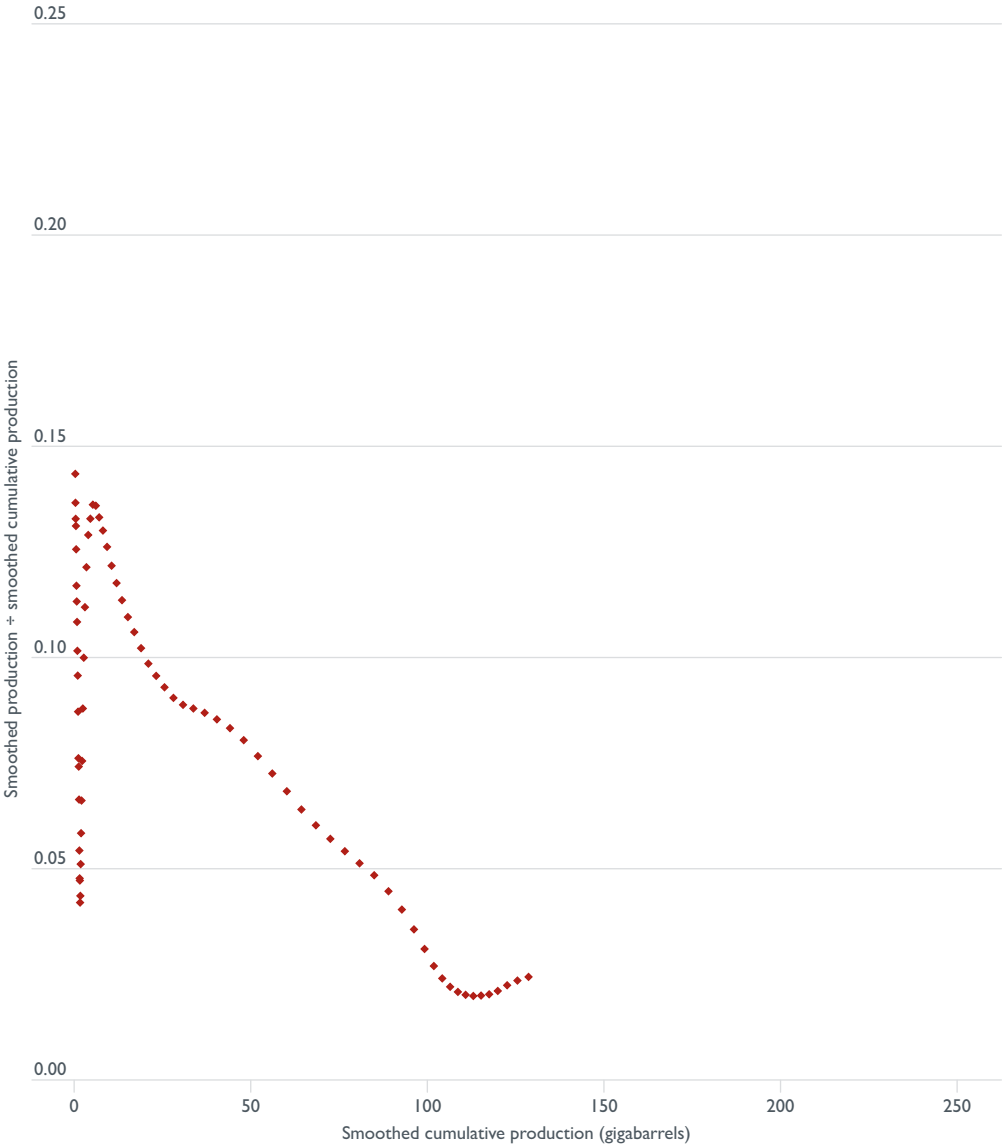
Eurasia will be analysed as six major oil-producing subregions: conventional oil production in Russia, China, Kazakhstan, Azerbaijan, and the Rest of Eurasia, and deep water production in China. The five conventional areas will be analysed first. Chinese deep prospects will be examined in more detail in Chapter 11, but the results of that analysis as concern Eurasia will be summarised at the end of this chapter.

Russia

Table 7.1 sets out the 11 steps to a forecast of Russian oil production.

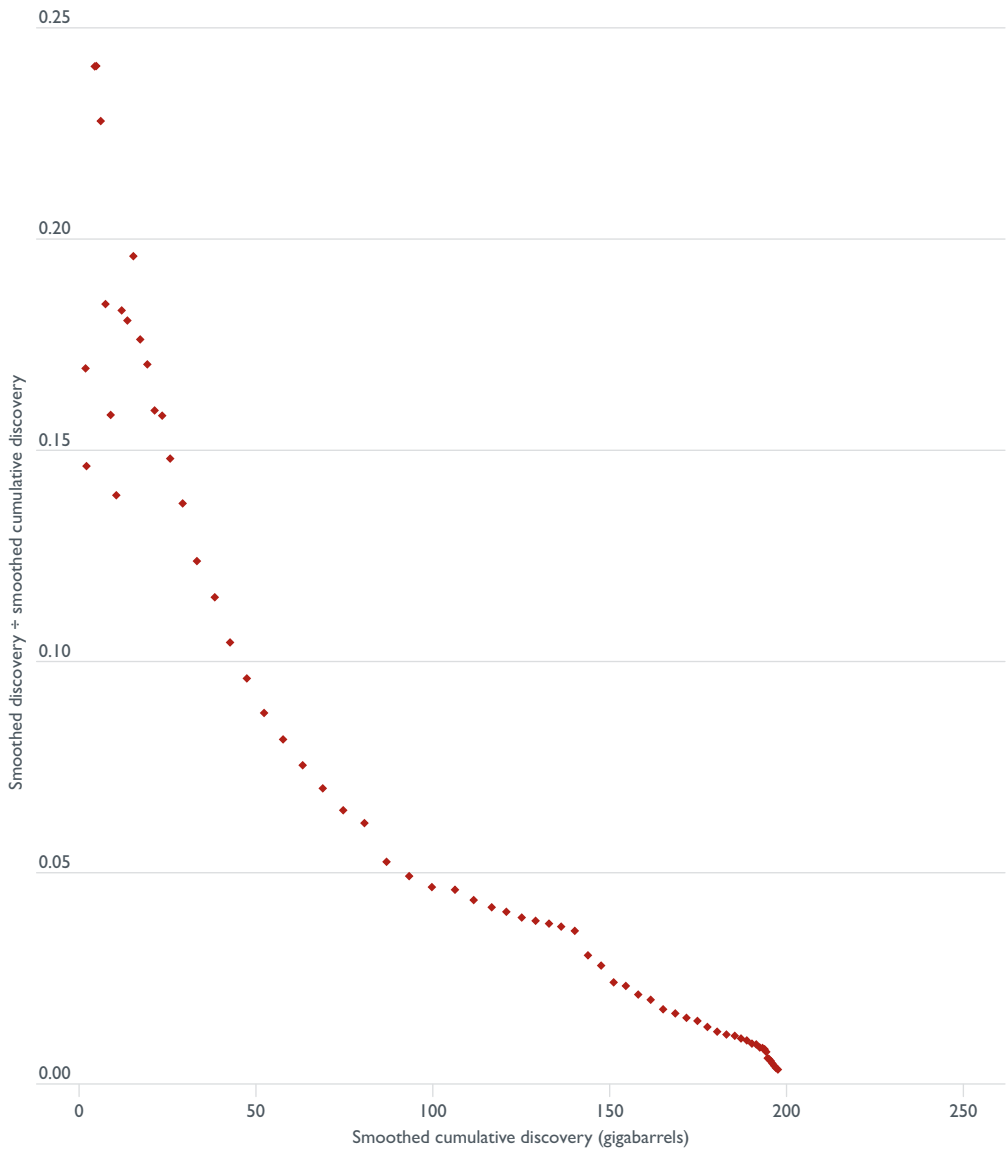
1. First, annual production (P) and cumulative production (CP) are smoothed with five and three year averages, generating SP and SCP (Table 7.1).
2. The fractional growth in production (SP/SCP) is calculated and plotted against last year's cumulative production, as shown in Figure 7.1.
3. The plot is then examined and a best guess at an ultimate cumulative production (U) is made. In this case, it is 225 gigabarrels.
4. Discovery (D) is smoothed with a 31 year moving average and cumulative discovery (CD) is smoothed with a 15 year moving average.
5. The fractional growth in discovery (SD/SCD) is calculated and plotted against last year's smoothed cumulative discovery, as shown in Figure 7.2.

Figure 7.1 Russian cumulative production growth curve



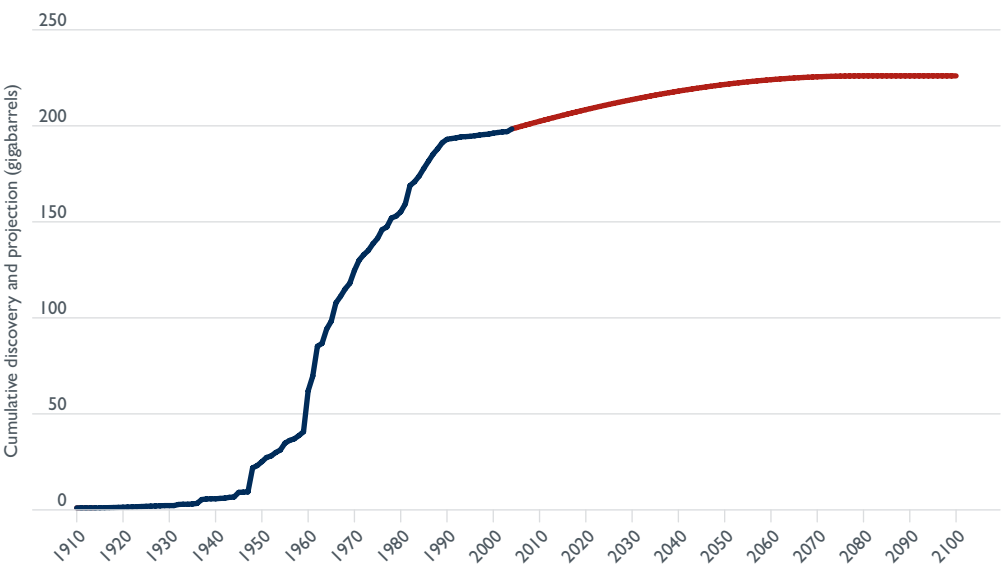
6. The plot is examined and a best guess at an ultimate discovery (UD) is made. In this case it is also 225 gigabarrels.

Figure 7.2 Russian cumulative discovery growth curve



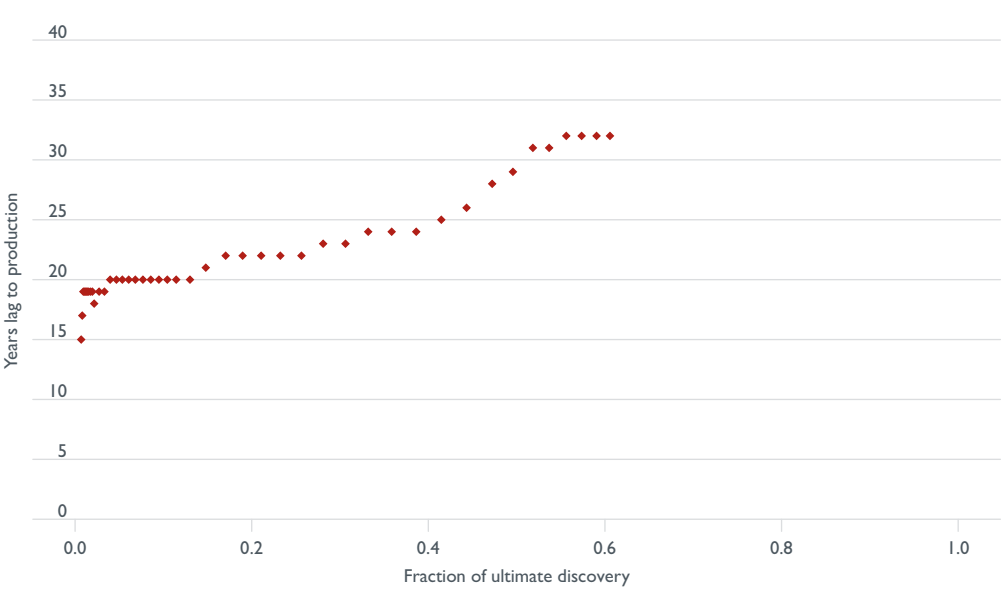
7. Cumulative discovery in 2006 is then projected to UD by bringing SD estimated for 2006 to zero in 2085. For Russian oil, the projection of the cumulative discovery curve is shown in Figure 7.3.

Figure 7.3 Russian cumulative discovery projection



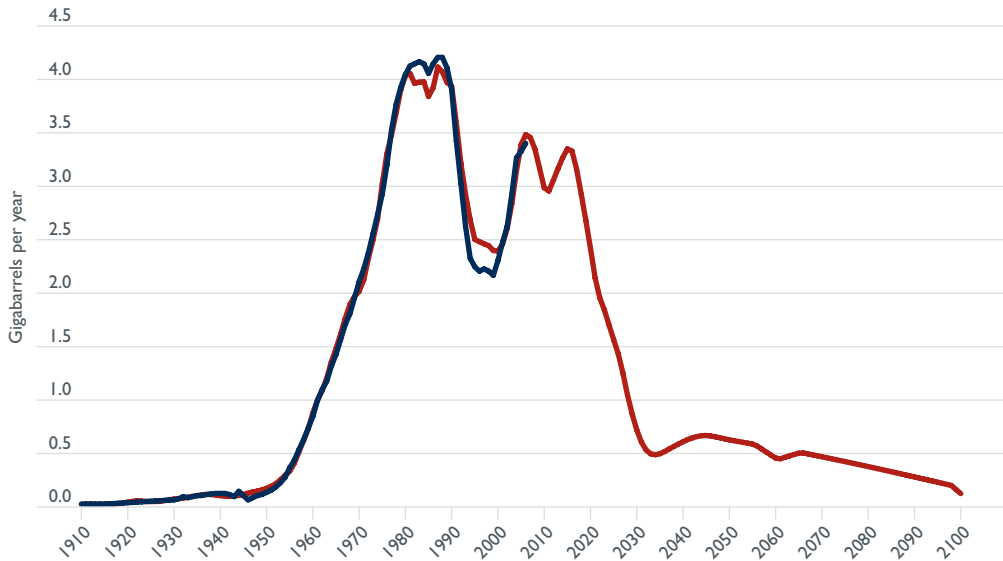
- 8. No adjustment to the cumulative discovery estimates is needed.
- 9. Next, the historical stretch lag between the cumulative discovery and production curves is calculated, and plotted against the fraction of cumulative discovery. This plot for Russia is shown in Figure 7.4. After some noise in the range of zero to 0.1, the stretch lag rose slowly until the break-up of the former Soviet Union, when it rose quickly. It has since stabilised. Extrapolating the trend to 37 years at 1.0 allows the rest of the cumulative production lag curve to be forecast from the extrapolated discovery curve and the predicted lags.

Figure 7.4 Russian stretch lag curve



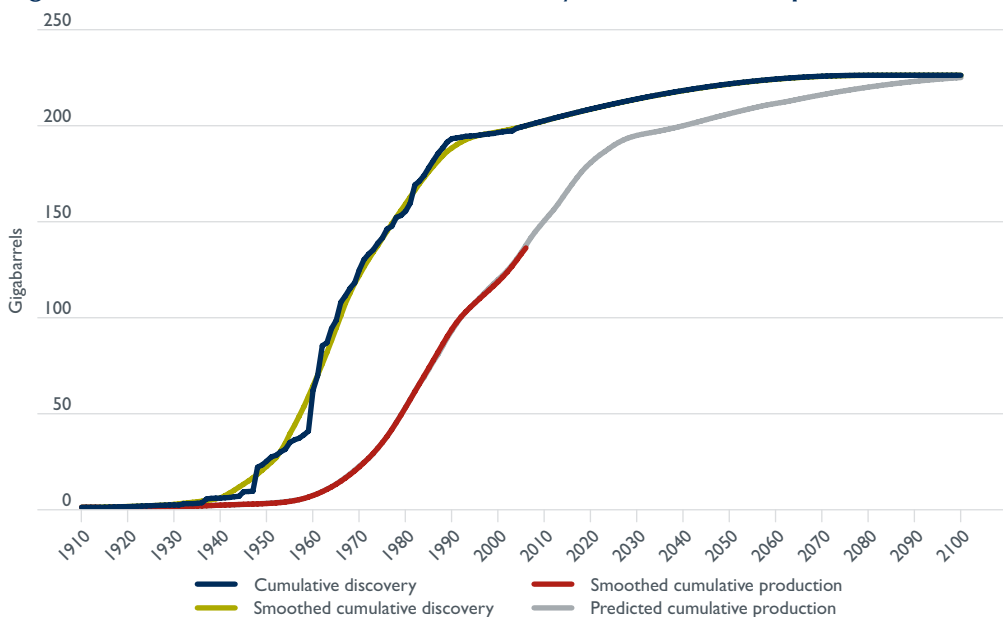
10. The predicted cumulative production curve is smoothed with a five year average and then differenced to give a raw predicted annual production. This is then averaged over five years to give a final annual production forecast. This is shown in Figure 7.5.

Figure 7.5 Actual and predicted Russia crude oil production



11. Finally the cumulative discovery and production curves (actual and forecast) are plotted in Figure 7.6. This allows a spatial understanding of the relationship between production and discovery.

Figure 7.6 Russian cumulative discovery and cumulative production curves

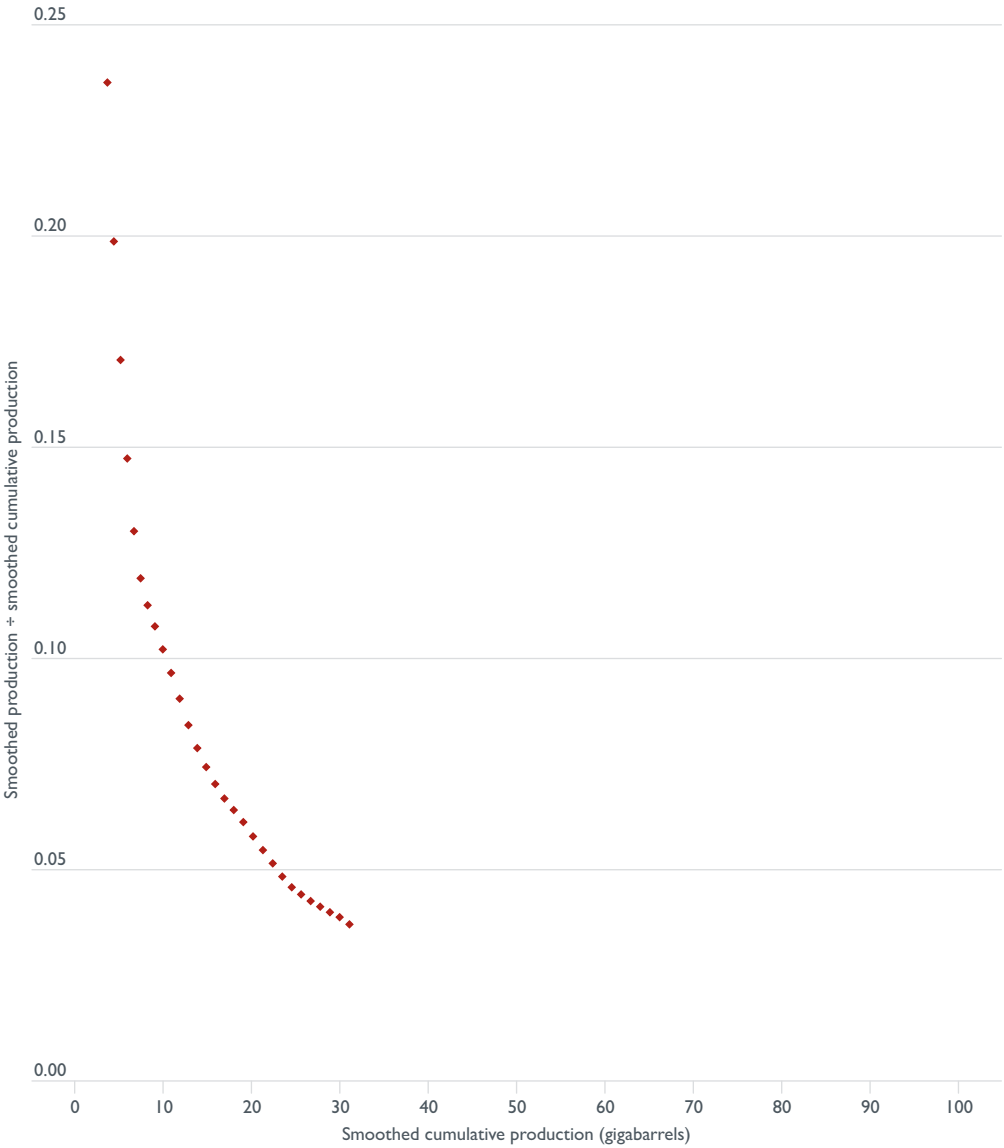


China

Table 7.2 sets out the calculations from the 11 steps to a forecast of production of Chinese oil.

- 1. First, annual production (P) and cumulative production (CP) are smoothed with five and three year averages, generating SP and SCP (Table 7.2).
- 2. The fractional growth in production (SP/SCP) is calculated and plotted against last year's cumulative production, as shown in Figure 7.7.

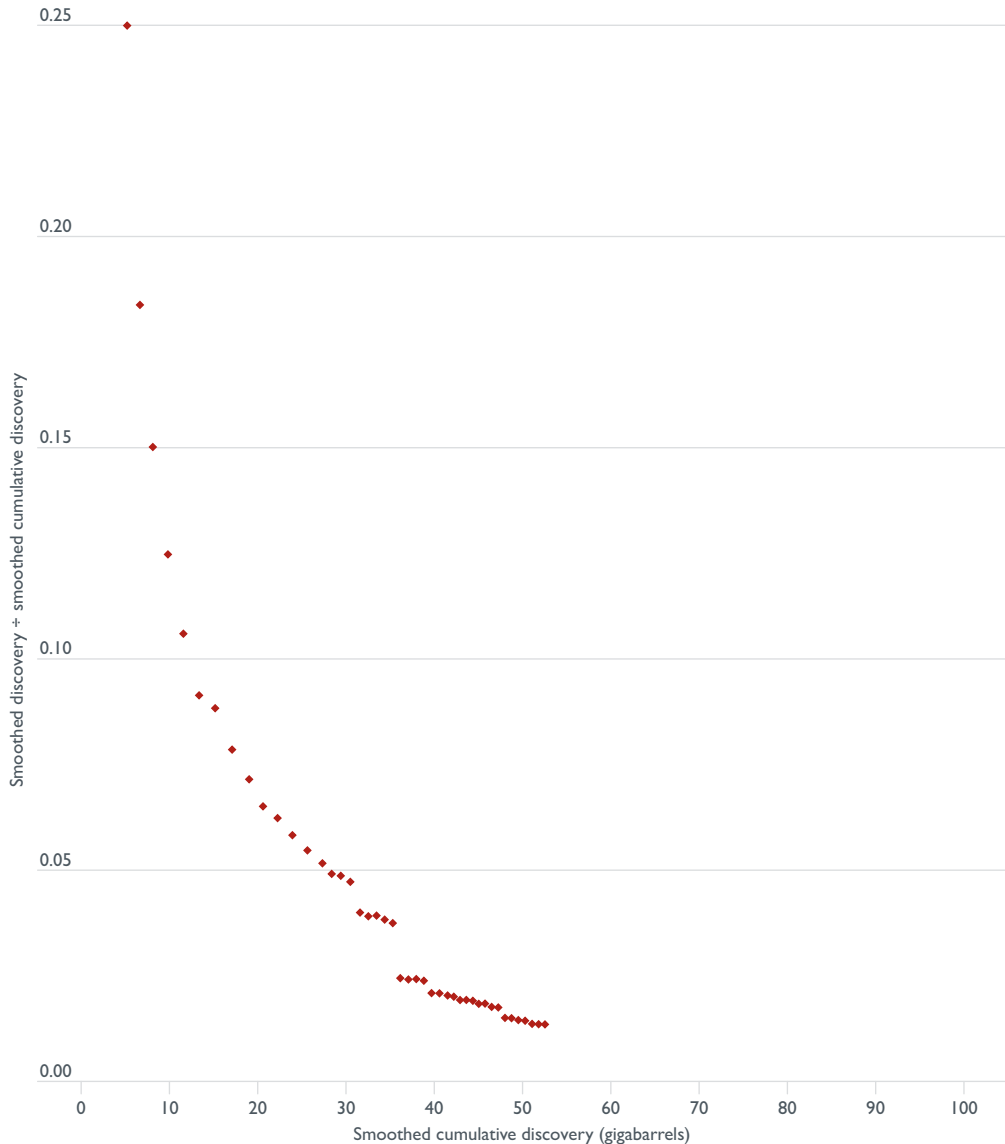
Figure 7.7 Chinese cumulative production growth curve



- 3. The plot is then examined and a best guess at an ultimate cumulative production (U) is made. In this case, it is 95 gigabarrels.

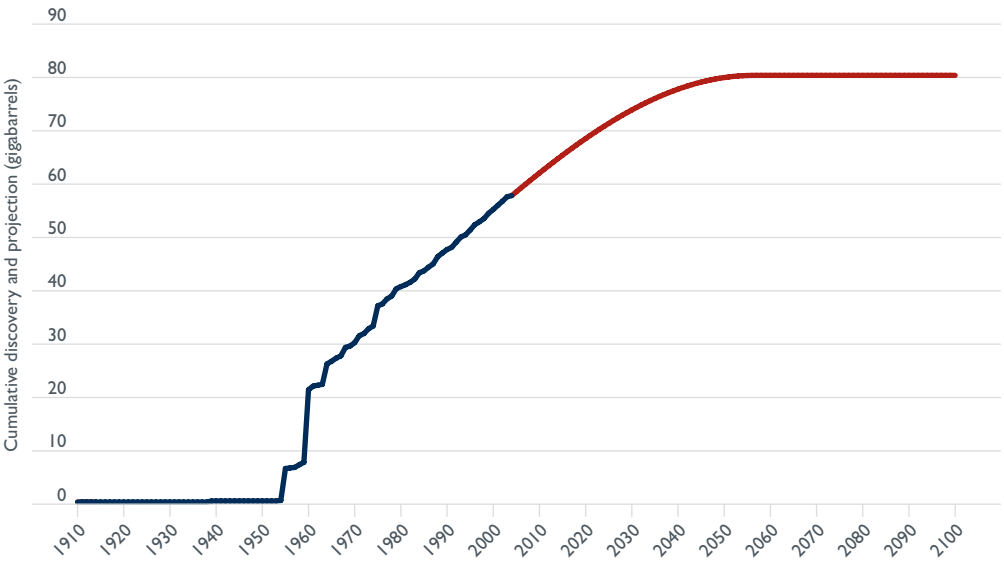
4. Discovery (D) is smoothed with a 31 year moving average and cumulative discovery (CD) is smoothed with a 15 year moving average.
5. The fractional growth in discovery (SD/SCD) is calculated and plotted against last year's smoothed cumulative discovery, as shown in Figure 7.8.

Figure 7.8 Chinese cumulative discovery growth curve



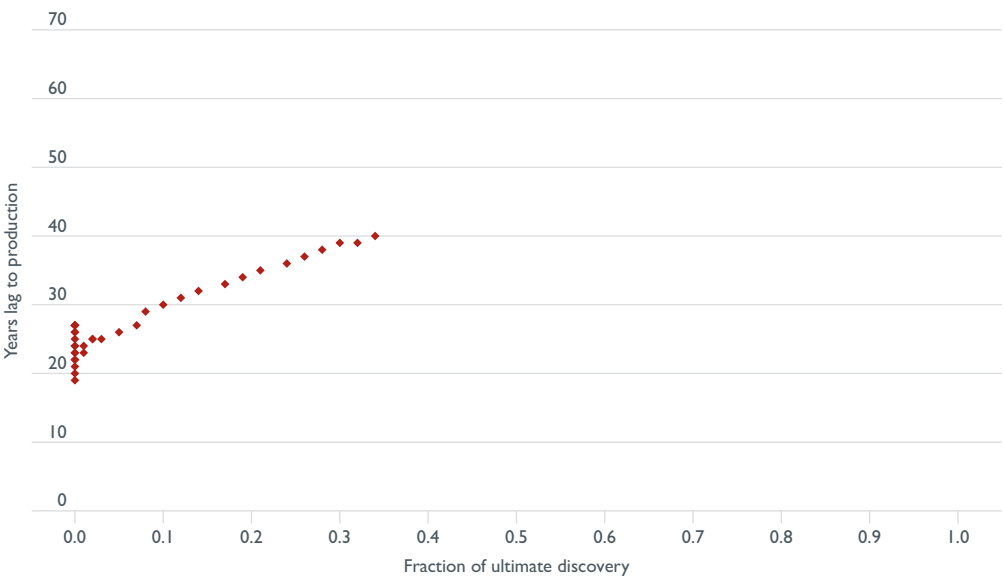
6. The plot is examined and a best guess at an ultimate discovery (UD) is made. In this case it is 80 gigabarrels.
7. Cumulative discovery in 2006 is then projected to UD by bringing SD estimated for 2006 to zero in 2057. For Chinese oil, the projection of the cumulative discovery curve is shown in Figure 7.9.

Figure 7.9 Chinese cumulative discovery projection



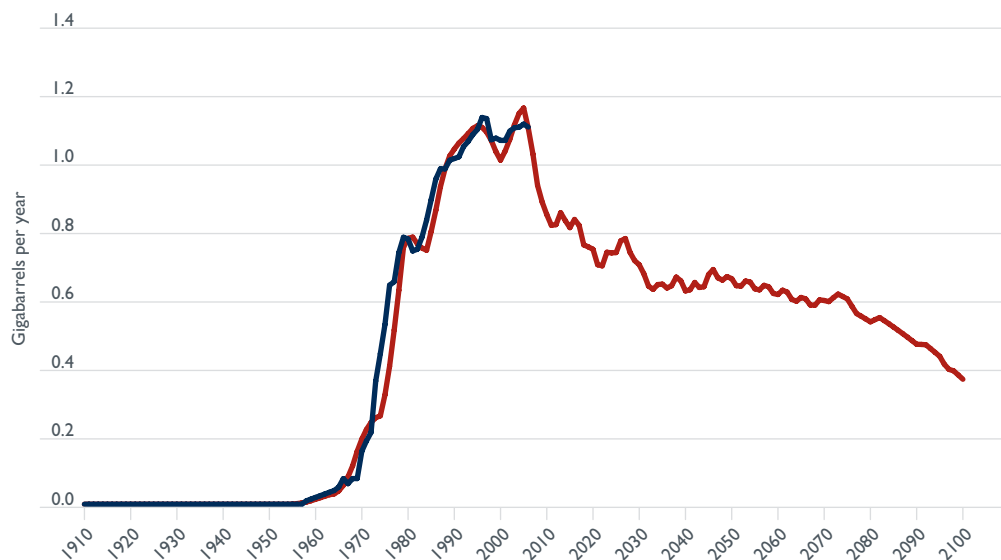
- 8. Next, the height of the cumulative discovery curve has to be adjusted to equal the more reliable cumulative production estimate. In this case, the adjustment is upward, amounting to multiplying by 95/80.
- 9. Next, the historical stretch lag between the cumulative discovery and production curves is calculated, and plotted against the fraction of cumulative discovery, as shown in Figure 7.10. It is apparent that there is a regular relationship. After some noise in the range of zero to 0.05, the stretch lag exhibits a fairly steady rise. Extrapolating the trend to 65 years at 1.0 allows the rest of the cumulative production curve to be forecast from the extrapolated discovery curve and the predicted lags.

Figure 7.10 Chinese stretch lag curve



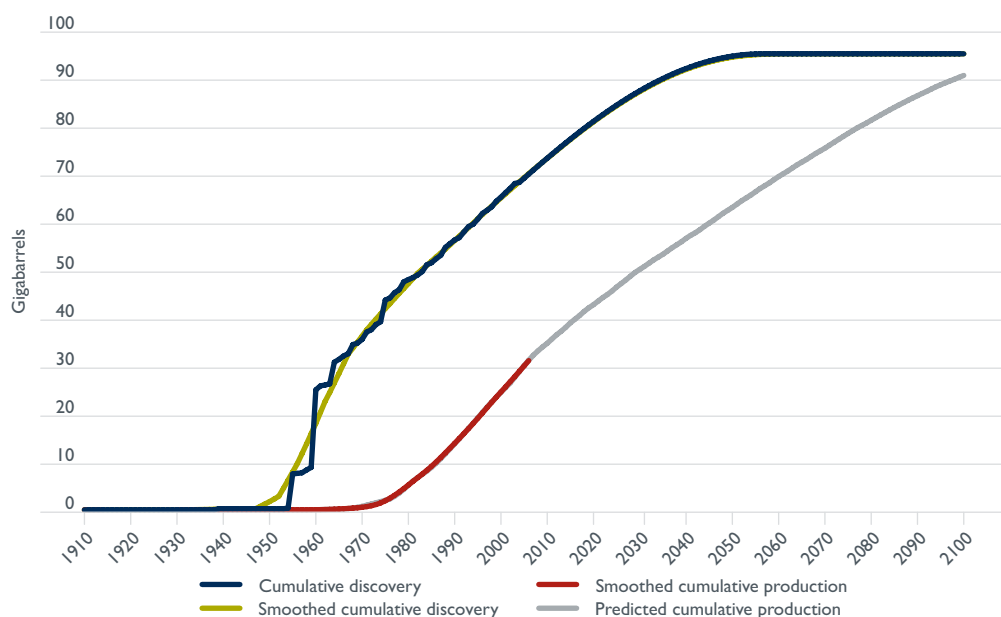
10. The predicted cumulative production curve is smoothed with a five year average and then differenced to give a raw predicted annual production. This is then averaged over five years to give a final annual production forecast. This is shown in Figure 7.11.

Figure 7.11 Actual and predicted Chinese crude oil production



11. Finally the cumulative discovery and production curves (actual and forecast) are plotted in Figure 7.12. This allows a spatial understanding of the relationship between production and discovery.

Figure 7.12 Chinese cumulative discovery and cumulative production curves

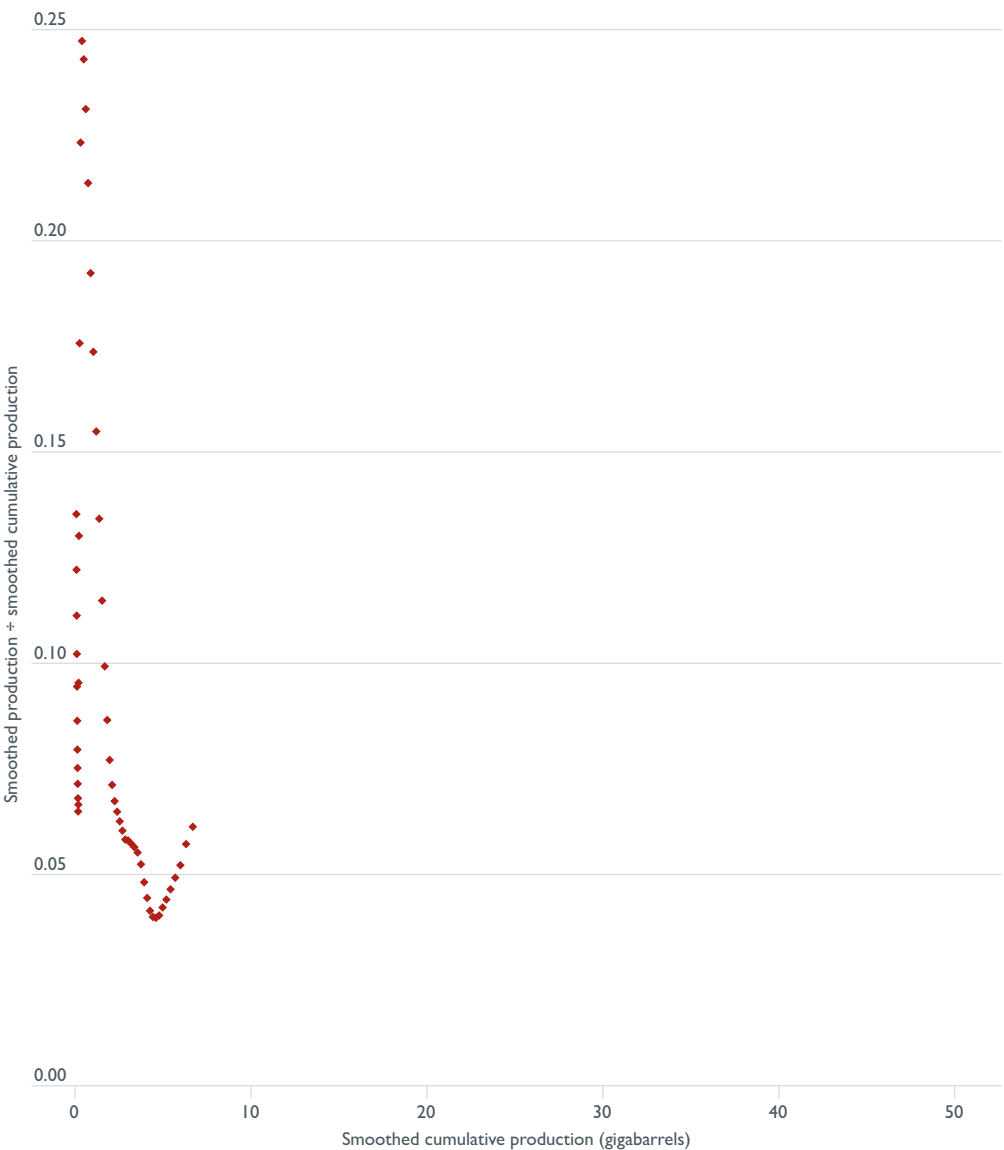


Kazakhstan

Table 7.3 sets out the calculations from the 11 steps to a forecast of production of oil in Kazakhstan.

- 1. First, annual production (P) and cumulative production (CP) are smoothed with five and three year averages, generating SP and SCP (Table 7.3).
- 2. The fractional growth in production (SP/SCP) is calculated and plotted against last year's cumulative production, as shown in Figure 7.13.

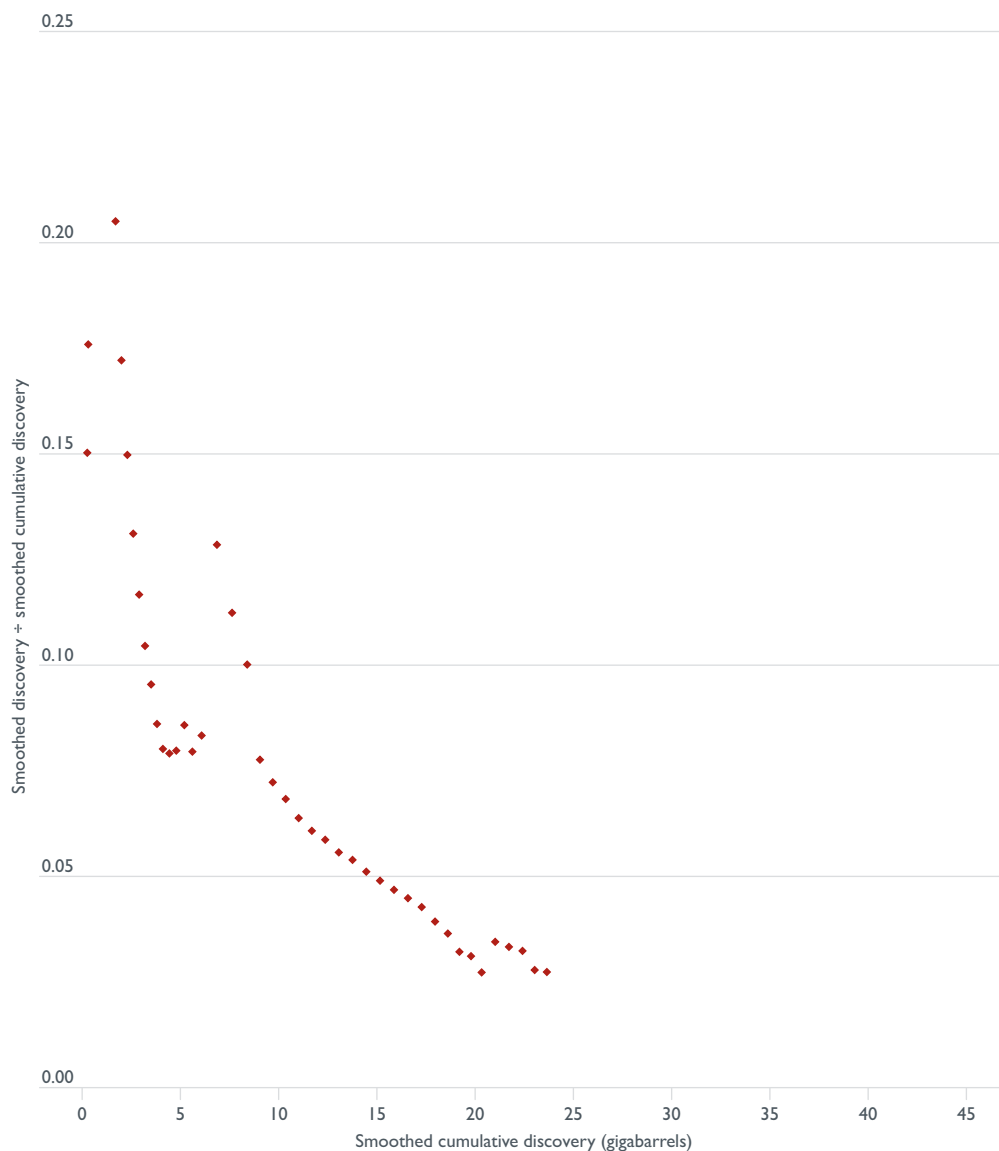
Figure 7.13 Kazakhstan cumulative production growth curve



- 3. The plot is then examined and a best guess at an ultimate cumulative production (U) is made. In this case, it is 40 gigabarrels.

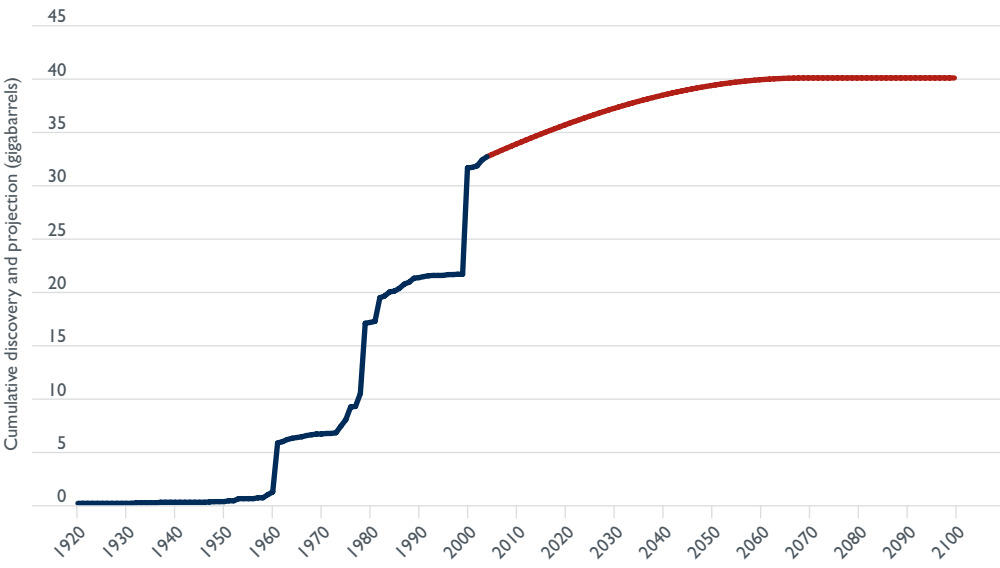
4. Discovery (D) and cumulative discovery (CD) are smoothed with 21 year moving averages.
5. The fractional growth in discovery (SD/SCD) is calculated and plotted against last year's smoothed cumulative discovery, as shown in Figure 7.14.

Figure 7.14 Kazakhstan cumulative discovery growth curve



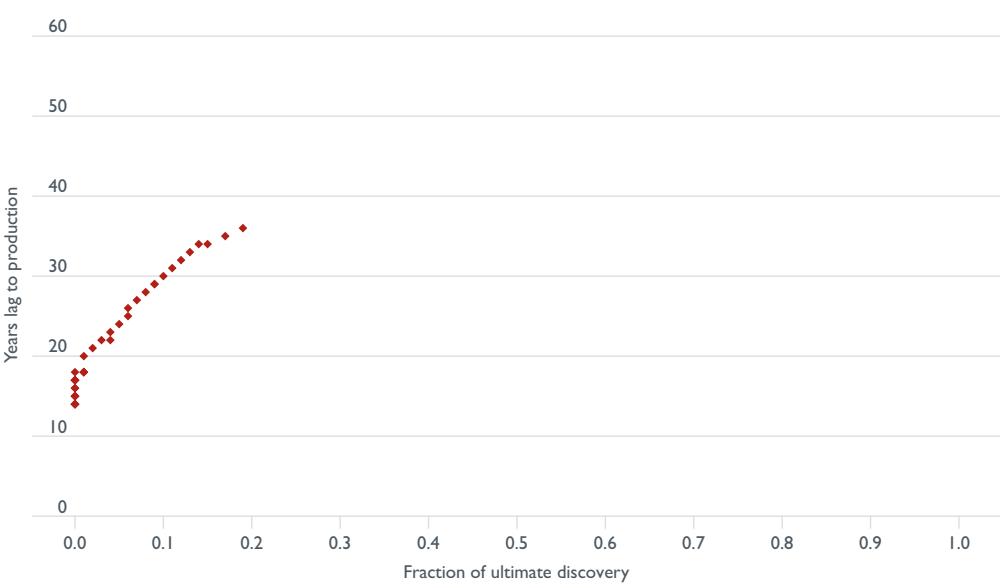
6. The plot is examined and a best guess at an ultimate discovery (UD) is made. In this case it is also 40 gigabarrels.
7. Cumulative discovery in 2006 is then projected to UD by bringing SD estimated for 2006 to zero in 2070. For Kazakhstan, the projection of the cumulative discovery curve is shown in Figure 7.15.

Figure 7.15 **Kazakhstan cumulative discovery projection**



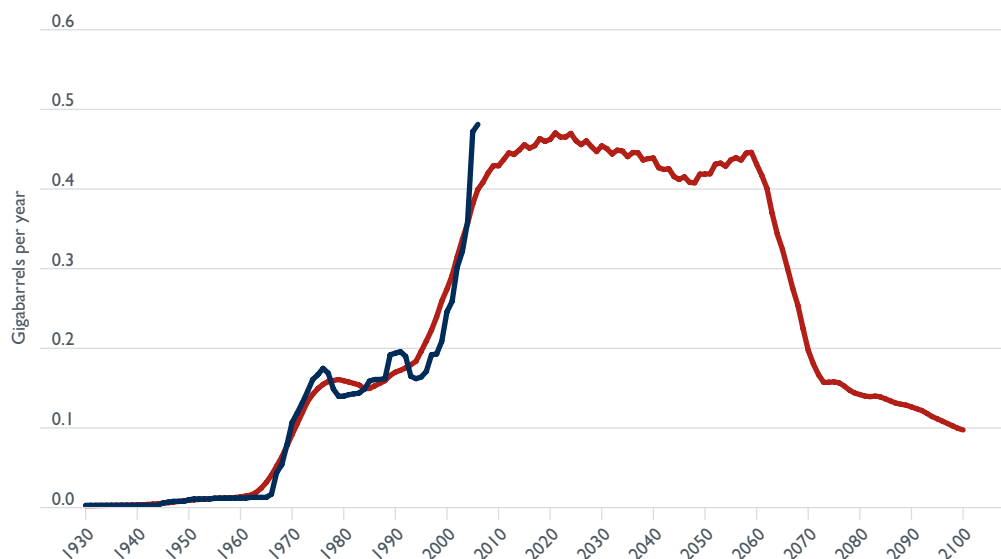
- 8. No adjustment to the cumulative discovery estimates is necessary.
- 9. The historical stretch lag between the cumulative discovery and production curves is calculated, and plotted against the fraction of cumulative discovery. This plot for Kazakhstan is shown in Figure 7.16. The stretch lag rises quickly at first, then slows. Extrapolating the trend to 60 years at 1.0 allows the rest of the cumulative production curve to be forecast from the extrapolated discovery curve and the predicted lags.

Figure 7.16 **Kazakhstan stretch lag curve**



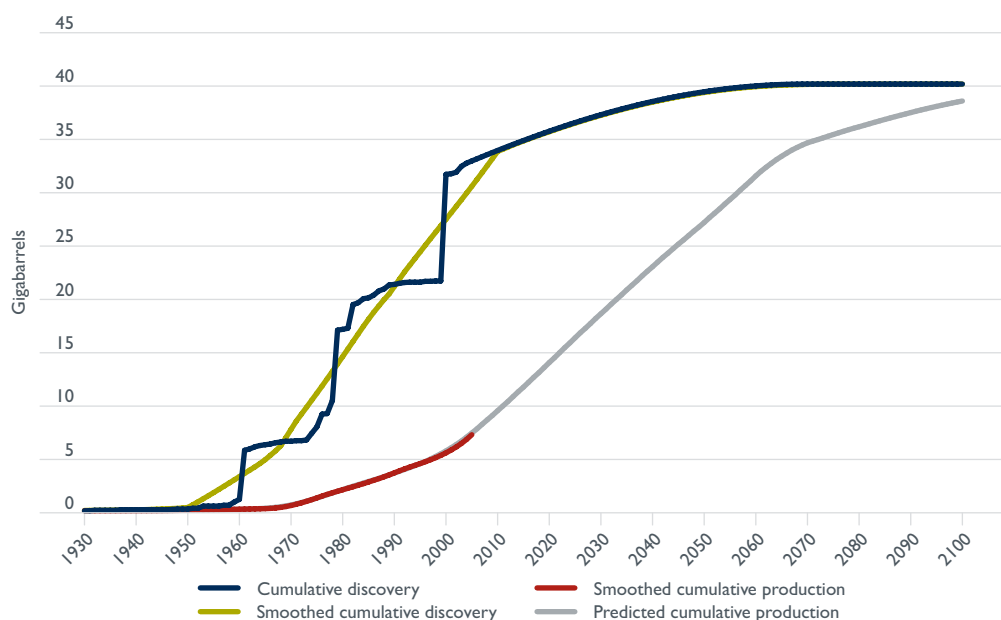
10. The predicted cumulative production curve is smoothed with an 11 year average and then differenced to give a raw predicted annual production. This is then averaged over five years to give a final annual production forecast. This is shown in Figure 7.17.

Figure 7.17 Actual and predicted Kazakhstan crude oil production



11. Finally the cumulative discovery and production curves (actual and forecast) are plotted in Figure 7.18. This allows a spatial understanding of the relationship between production and discovery.

Figure 7.18 Kazakhstan cumulative discovery and cumulative production curves

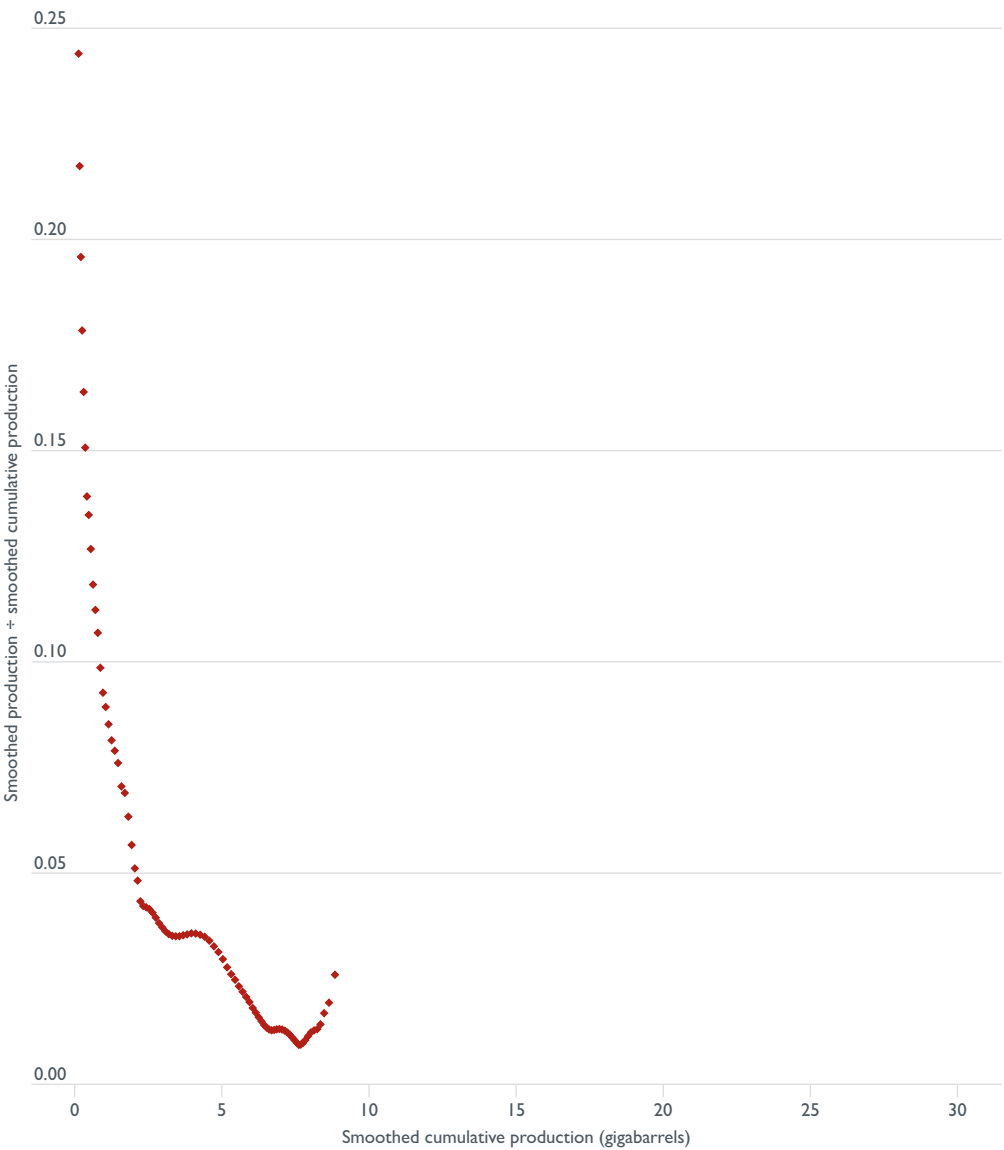


Azerbaijan

Table 7.4 sets out the calculations from the 11 steps to a forecast of production of oil in Azerbaijan.

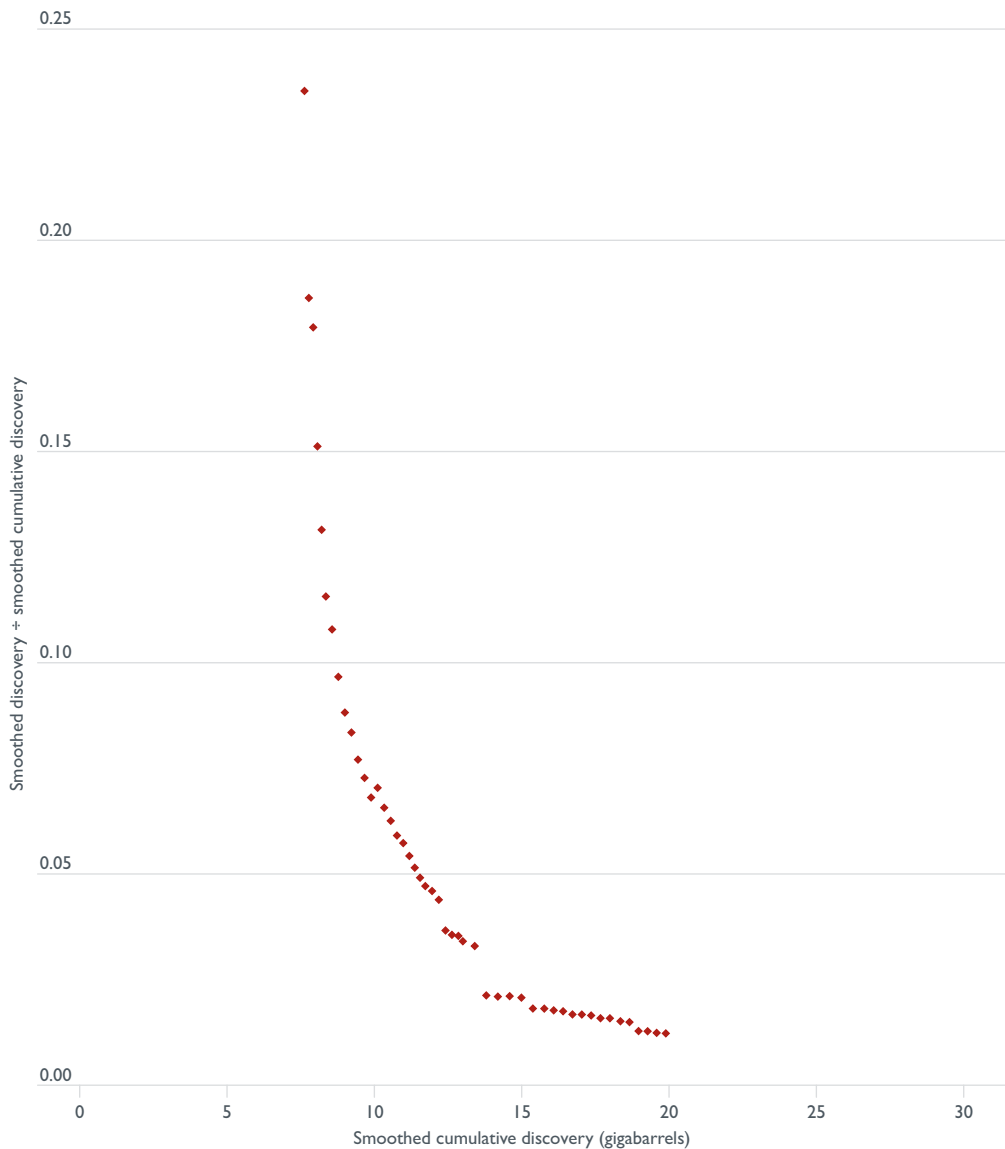
- 1. First, annual production (P) and cumulative production (CP) are smoothed with five and three year averages, generating SP and SCP (Table 7.4).
- 2. The fractional growth in production (SP/SCP) is calculated and plotted against last year's cumulative production, as shown in Figure 7.19.

Figure 7.19 Azerbaijan cumulative production growth curve



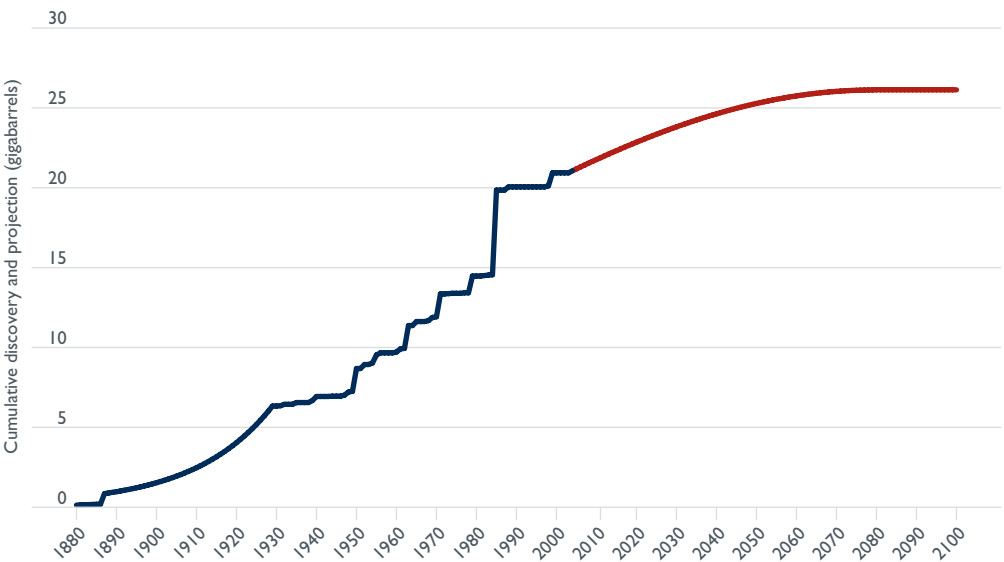
3. The plot is then examined and a best guess at an ultimate cumulative production (U) is made. In this case, it is 30.5 gigabarrels. Azerbaijan production appears to have been severely constrained. When it comes to forecasting, this will necessitate a somewhat different approach of first getting Azerbaijan production back on track (up and to the right on the cumulative production growth curve). Thereafter forecasting will proceed as usual by extrapolating the lag on discovery.
4. Discovery (D) and cumulative discovery (CD) are smoothed with 21 year moving averages.
5. The fractional growth in discovery (SD/SCD) is calculated and plotted against last year's smoothed cumulative discovery (Figure 7.20).

Figure 7.20 Azerbaijan cumulative discovery growth curve

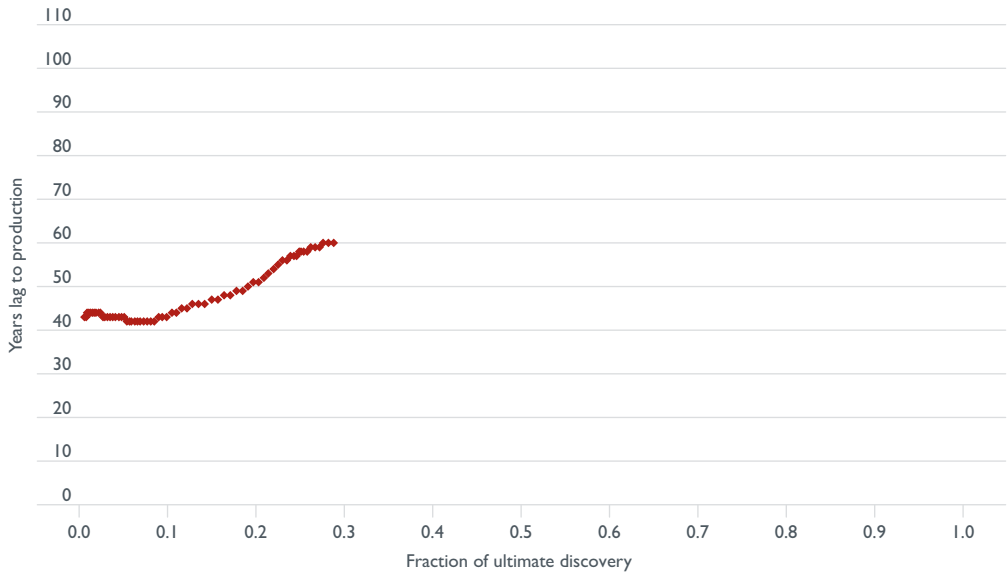
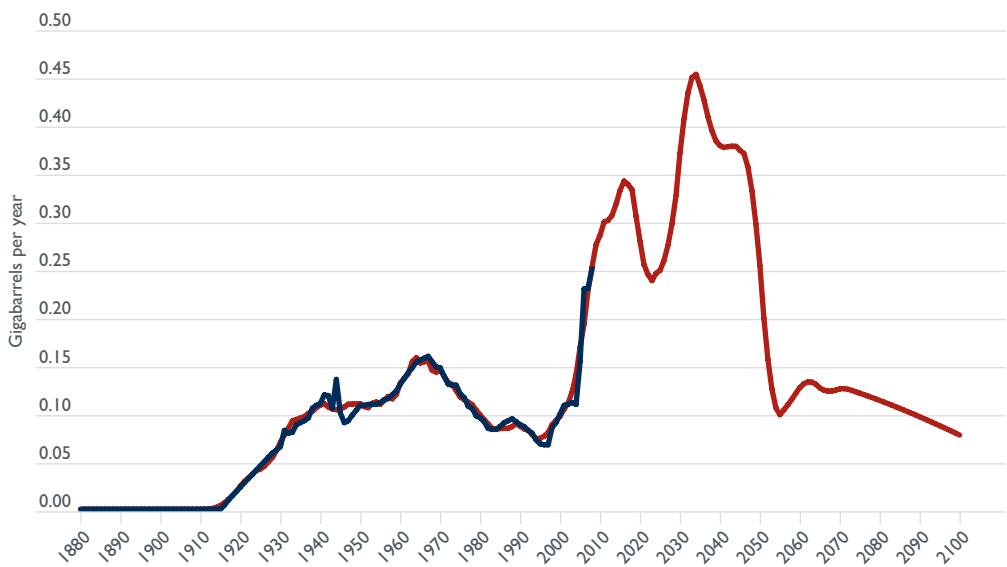


- 6. The plot is examined and a best guess at an ultimate discovery (UD) is made. In this case it is 26 gigabarrels.
- 7. Cumulative discovery in 2006 is then projected to UD by bringing SD estimated for 2006 to zero in 2080. For Azerbaijan, the projection of the cumulative discovery curve is shown in Figure 7.21.

Figure 7.21 Azerbaijan cumulative discovery projection

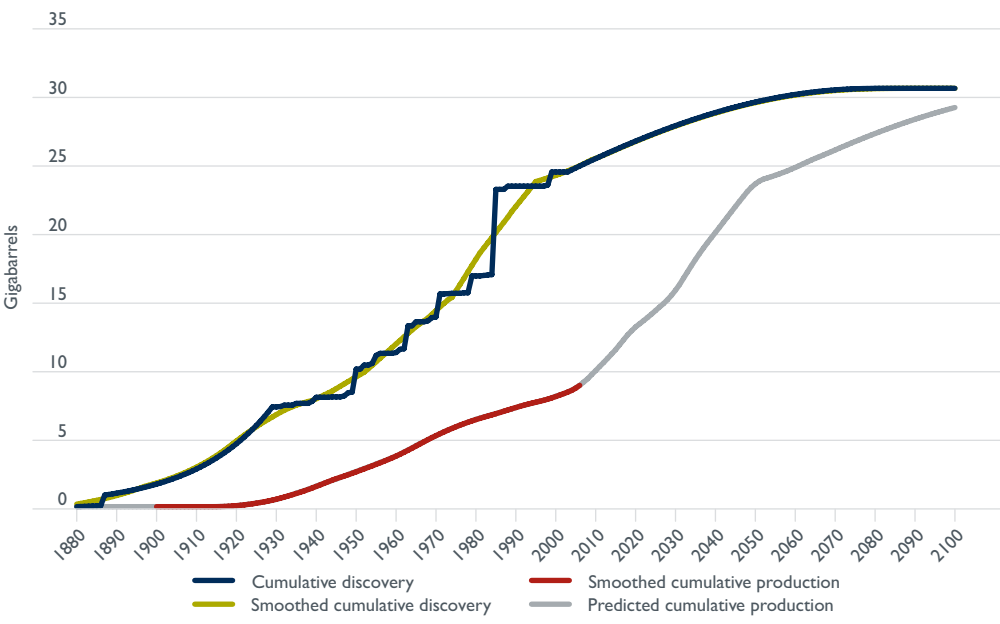


- 8. An adjustment to the cumulative discovery data is necessary, in this case upward by a factor of 30.5/26.
- 9. The stretch lag between the cumulative discovery and production curves is calculated, and plotted against the fraction of cumulative discovery (Figure 7.22). After some noise in the range of zero to 0.1, the lag rises to 60 years. Azerbaijan production has been constrained in the past by administrative and delivery restrictions. These appear to be lifting, and with them production levels. The forecasts for Azerbaijan are made in two stages. The first stage has Azerbaijan production rising over a dozen years so that its plot on the cumulative production growth curve lies along a more normal path. This reduces the lag from 60 to 55 years. Holding a constant 55 years to 1.0 allows the rest of the cumulative production curve to be forecast from the discovery curve and the predicted lags.
- 10. The predicted cumulative production curve is smoothed with a five year average and then differenced to give a raw predicted annual production. This is then averaged over five years to give a final annual production forecast. This is shown in Figure 7.23.

Figure 7.22 Azerbaijan stretch lag curve**Figure 7.23** Actual and predicted Azerbaijan crude oil production

11. Finally the cumulative discovery and production curves (actual and forecast) are plotted in Figure 7.24. This allows a spatial understanding of the relationship between production and discovery.

Figure 7.24 Azerbaijan cumulative discovery and cumulative production curves

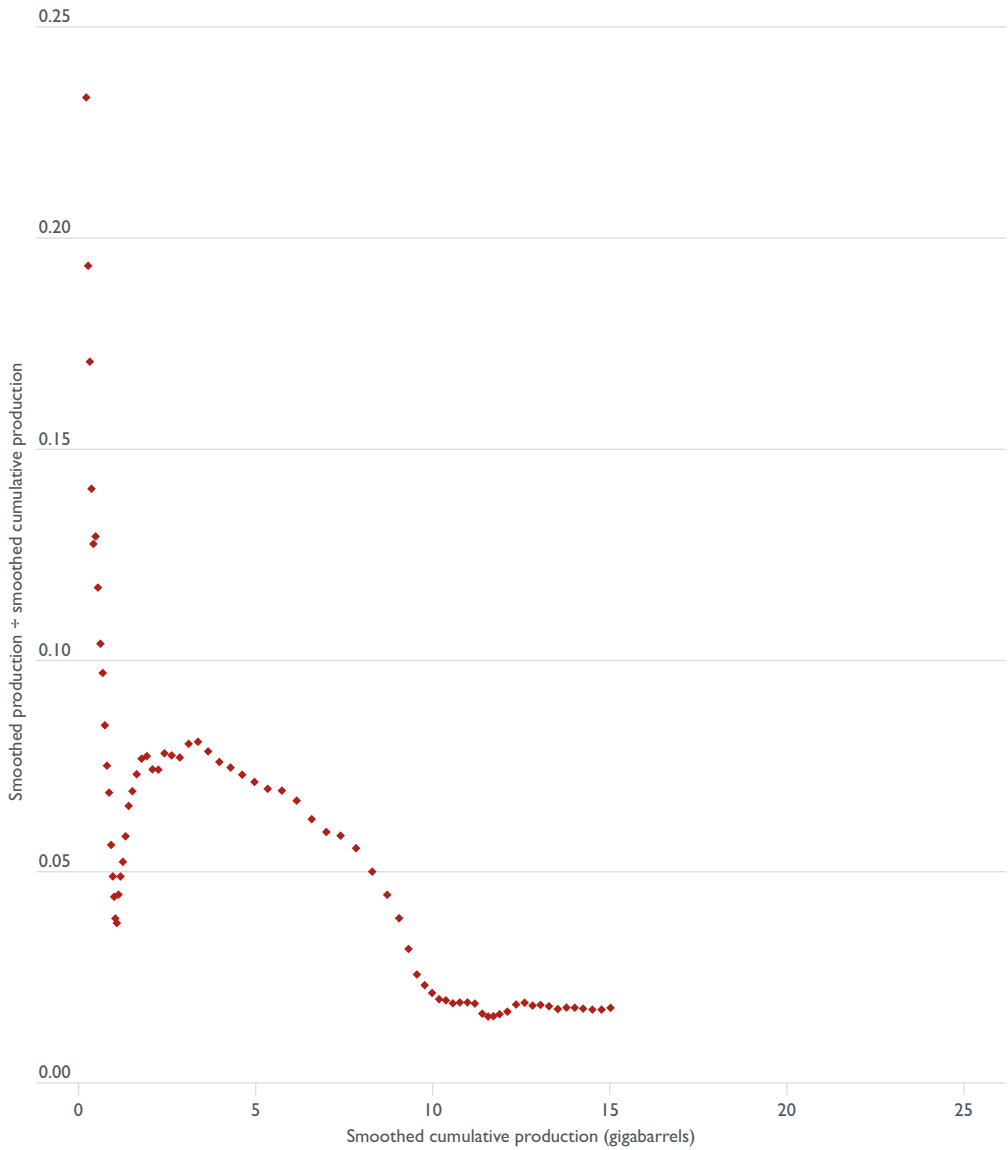


The Rest of Eurasia

The Rest of Eurasia includes countries such as Romania, Turkmenistan, the Ukraine, Uzbekistan, Croatia, Hungary and Albania. Table 7.5 sets out the calculations from the 11 steps to a forecast of production of oil from the Rest of Eurasia.

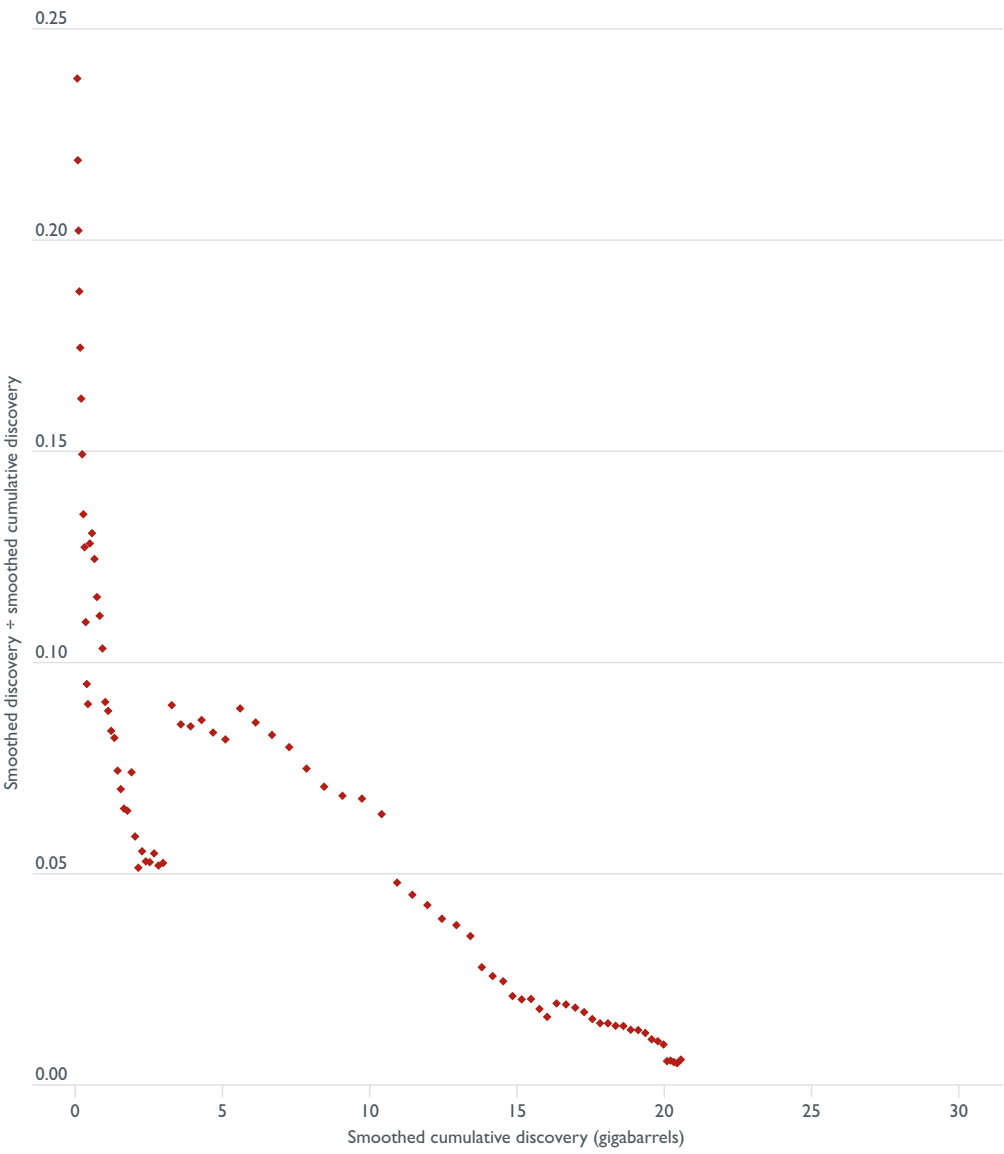
1. First, annual production (P) and cumulative production (CP) are smoothed with five and three year averages (see Table 7.5).
2. The fractional growth in production (SP/SCP) is calculated and plotted against last year's cumulative production, as shown in Figure 7.25.
3. The plot is then examined and a best guess at an ultimate cumulative production (U) is made. In this case, it is 25 gigabarrels.
4. Discovery (D) and cumulative discovery (CD) are smoothed with 15 year moving averages.
5. Then the fractional growth in discovery (SD/SCD) is calculated and plotted against last year's smoothed cumulative discovery. This plot is shown in Figure 7.26.
6. The plot is examined and a best guess at an ultimate discovery (UD) is made. In this case it is again 25 gigabarrels.

Figure 7.25 Cumulative production growth curve for the Rest of Eurasia



7. Cumulative discovery in 2006 is then projected to UD by bringing SD estimated for 2006 to zero in 2100. For the Rest of Eurasia, the projection of the cumulative discovery curve is shown in Figure 7.27.

Figure 7.26 Cumulative discovery growth curve for the Rest of Eurasia



- 8. No adjustment to the cumulative discovery data is necessary.
- 9. Next, the historical stretch lag between the cumulative discovery and production curves is calculated, and plotted against the fraction of cumulative discovery. This plot for The Rest of Eurasia is shown in Figure 7.28. After some noise in the range of zero to 0.1, the stretch lag levels off. Then during the late 1980s and after the break-up of the former Soviet Union, the lags lengthen and then stabilise. Extrapolating the trend to 35 years at 1.0 allows the rest of the cumulative production curve to be forecast from the extrapolated discovery curve and the predicted lags.

Figure 7.27 Cumulative discovery projection for the Rest of Eurasia

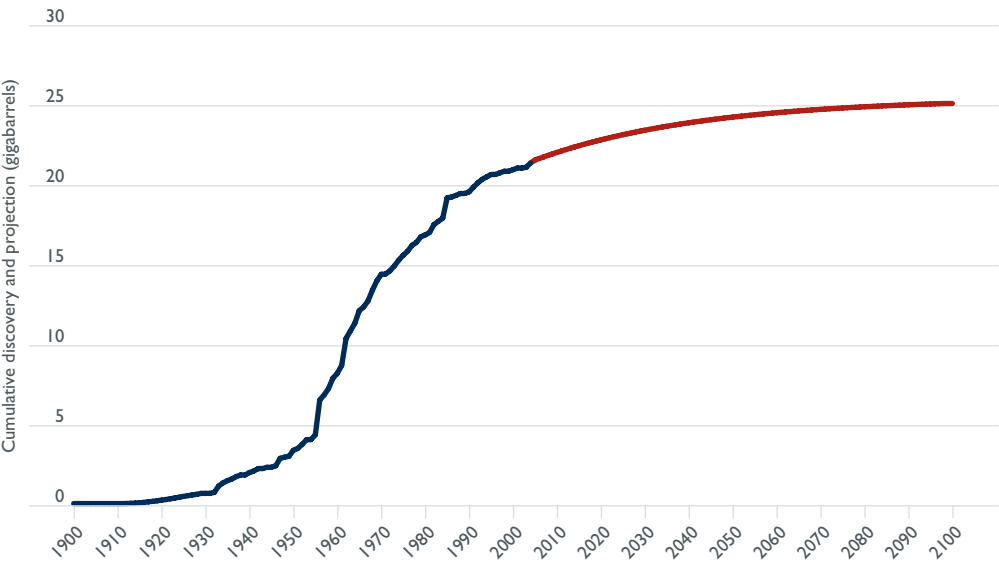
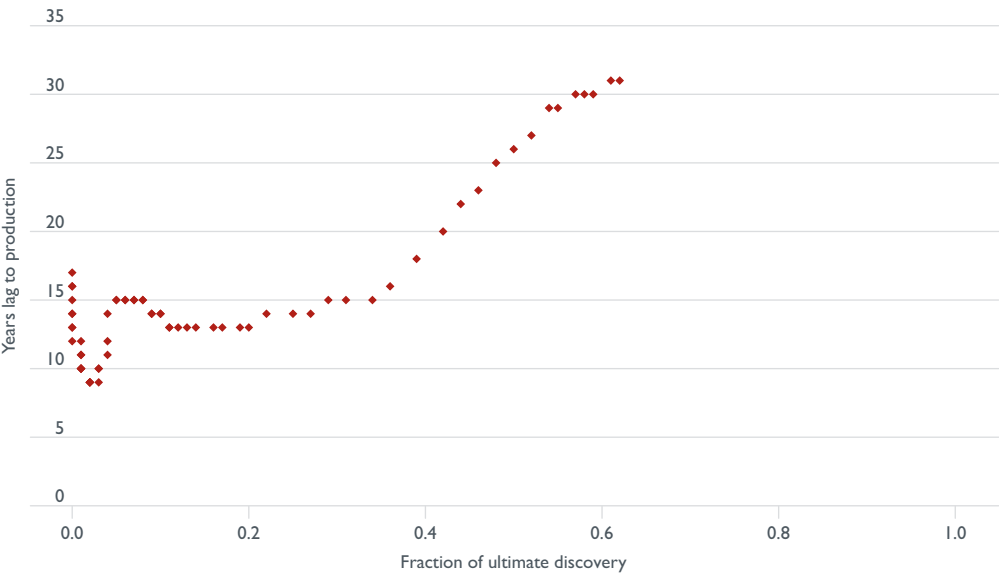
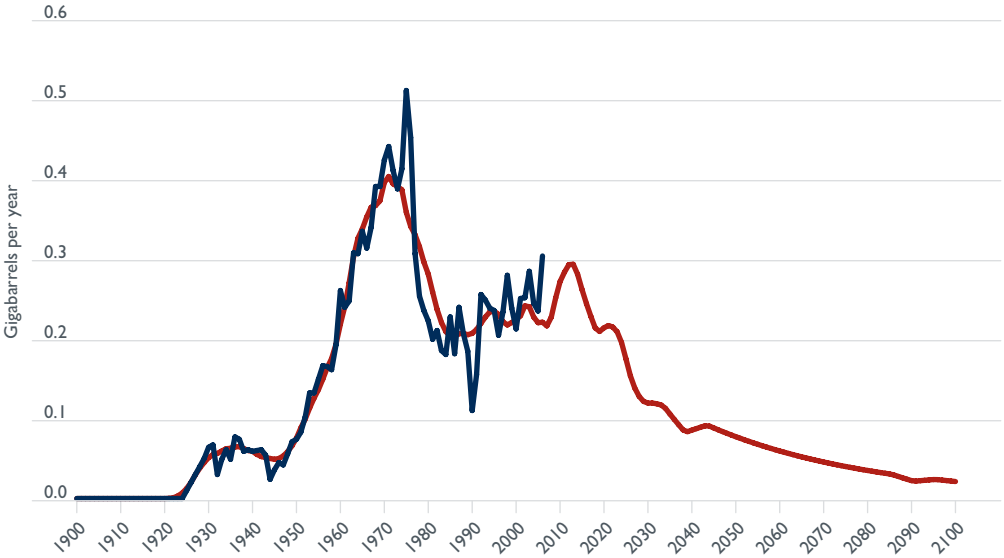


Figure 7.28 Stretch lag curve for the Rest of Eurasia



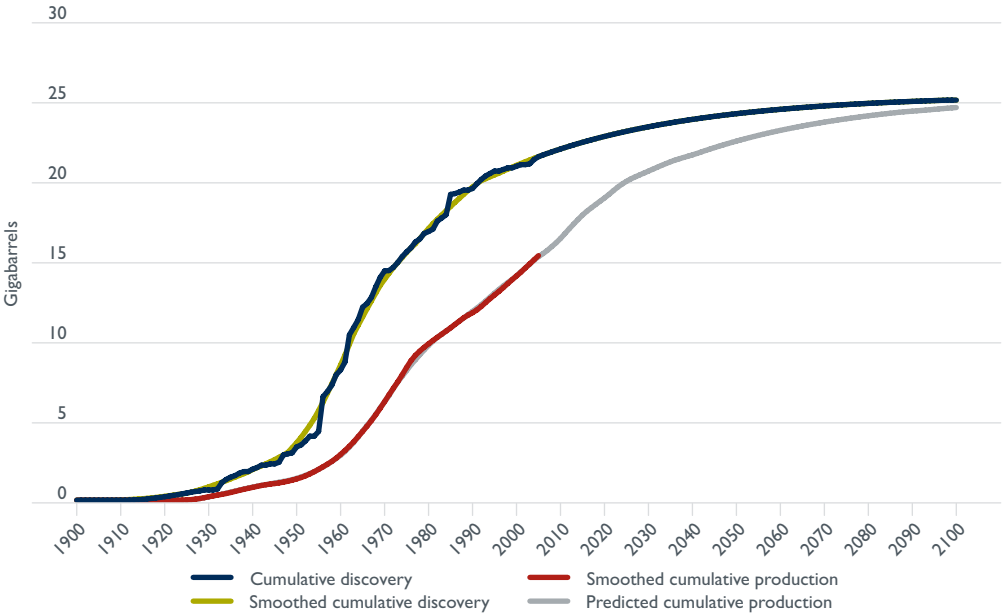
10. The predicted cumulative production curve is smoothed with a five year average and then differenced to give a raw predicted annual production. This is then averaged over five years to give a final annual production forecast. This is shown in Figure 7.29.

Figure 7.29 Actual and predicted crude oil production for the Rest of Eurasia



11. Finally the cumulative discovery and production curves (actual and forecast) are plotted in Figure 7.30. This allows a spatial understanding of the relationship between production and discovery.

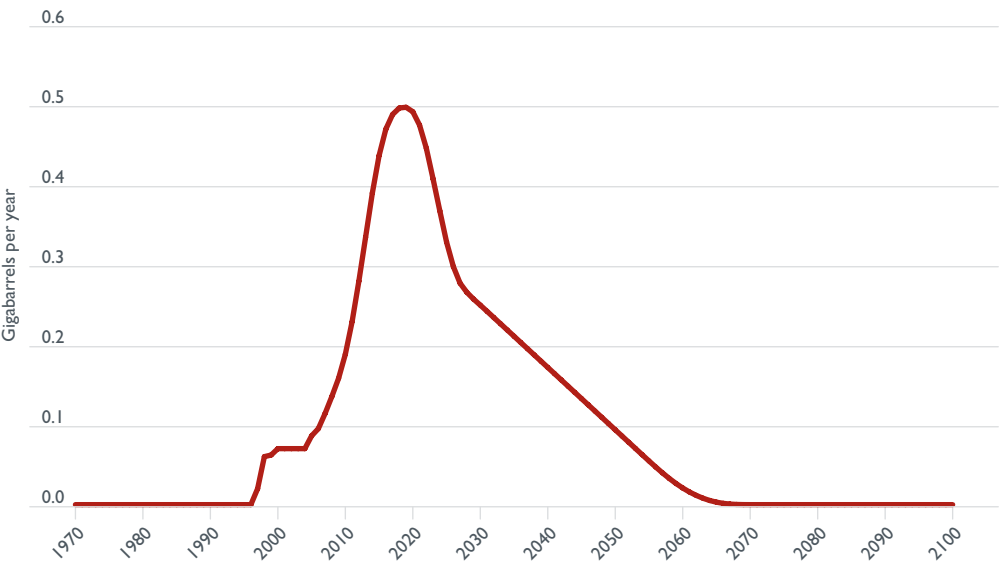
Figure 7.30 Cumulative discovery and cumulative production curves for the Rest of Eurasia



Chinese deep water oil production

Projected production of Chinese deep water oil is shown in Figure 7.31. The projection relies on one for ‘other’ deep water production, apportioned between regions. More details are given in Chapter 11.

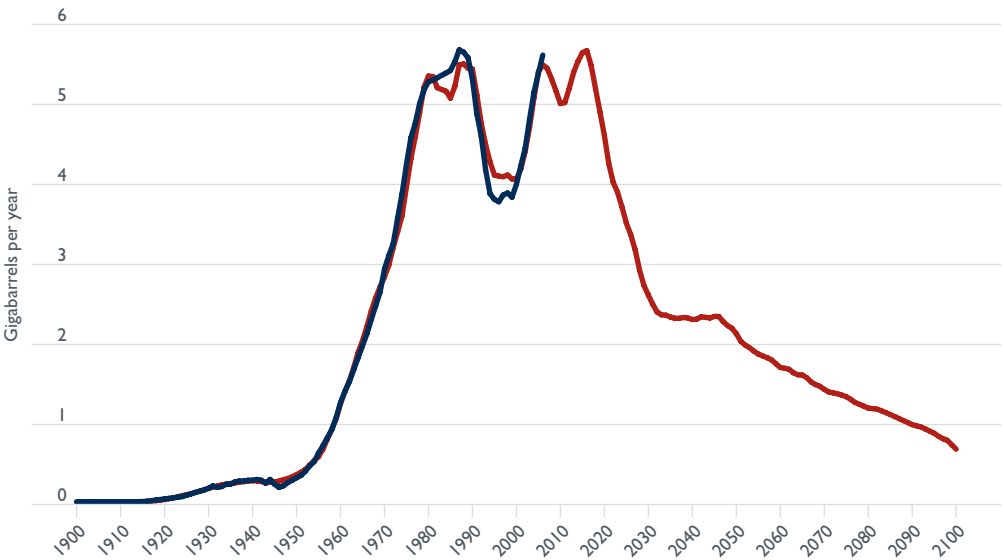
Figure 7.31 Chinese deep water oil production



Eurasia summary

Table 7.6 summarises the production trends for Eurasia. As shown in Figure 7.32, production from Eurasia is projected to fluctuate until 2016. After that time, the decline will be rapid, as the turn-off in cumulative discovery after the 1980s feeds through with a lag.

Figure 7.32 Actual and predicted Eurasian crude oil production



As can be seen from Figure 7.33, the dominant influence on this trend is oil production in Russia.

Figure 7.33 Components of predicted Eurasian crude oil production

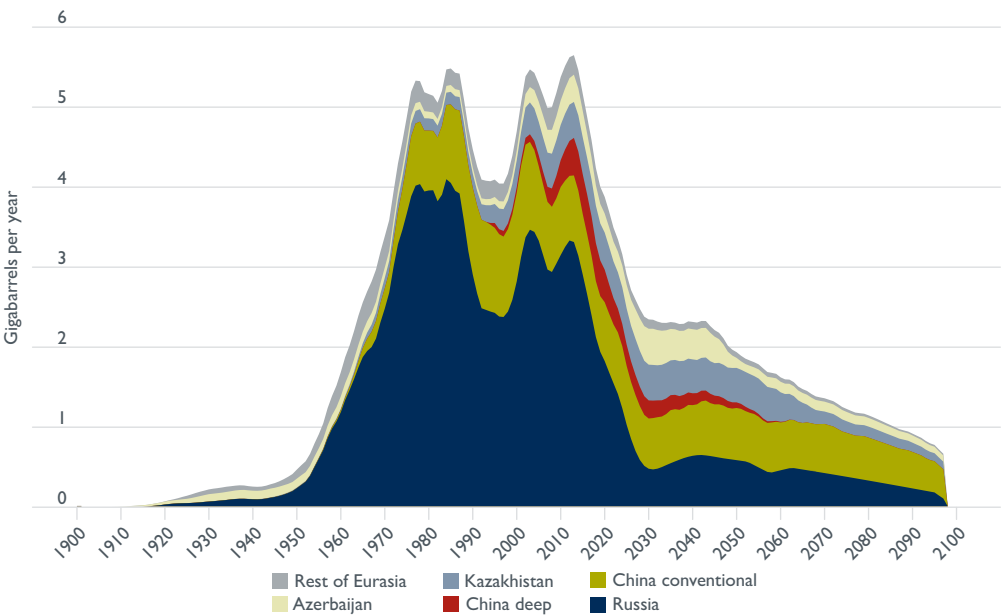


Table 7.1 Russia, gigabarrels (continued)

Year	D	CD	15yr SCD	Adj SCD	Predlag	Raw pred CP	5yr smth pred SCP	SCP	Raw pred P	5yr smth pred SP	Actual P
2077	0.03	224.95	224.87	224.87	35	217.74	217.73		0.38	0.38	
2078	0.02	224.97	224.90	224.90	35	218.11	218.10		0.37	0.37	
2079	0.01	224.98	224.93	224.93	35	218.47	218.46		0.36	0.36	
2080	0.02	225.00	224.95	224.95	35	218.82	218.81		0.35	0.35	
2081	0.00	225.00	224.97	224.97	35	219.16	219.15		0.34	0.34	
2082	0.00	225.00	224.98	224.98	35	219.49	219.48		0.33	0.33	
2083	0.00	225.00	224.99	224.99	35	219.82	219.81		0.32	0.32	
2084	0.00	225.00	224.99	224.99	35	220.13	220.12		0.31	0.31	
2085	0.00	225.00	225.00	225.00	35	220.43	220.42		0.30	0.30	
2086	0.00	225.00	225.00	225.00	35	220.73	220.72		0.29	0.29	
2087	0.00	225.00	225.00	225.00	35	221.01	221.00		0.28	0.28	
2088	0.00	225.00	225.00	225.00	35	221.28	221.27		0.27	0.27	
2089	0.00	225.00	225.00	225.00	35	221.55	221.54		0.26	0.26	
2090	0.00	225.00	225.00	225.00	35	221.80	221.79		0.25	0.25	
2091	0.00	225.00	225.00	225.00	35	222.05	222.04		0.24	0.24	
2092	0.00	225.00	225.00	225.00	35	222.28	222.27		0.23	0.23	
2093	0.00	225.00	225.00	225.00	35	222.51	222.50		0.22	0.22	
2094	0.00	225.00	225.00	225.00	35	222.72	222.71		0.21	0.21	
2095	0.00	225.00	225.00	225.00	35	222.93	222.92		0.20	0.20	
2096	0.00	225.00	225.00	225.00	35	223.12	223.11		0.19	0.19	
2097	0.00	225.00	225.00	225.00	35	223.31	223.30		0.18	0.18	
2098	0.00	225.00	225.00	225.00	35	223.48	223.47		0.17	0.17	
2099	0.00	225.00	225.00	225.00	35	223.65	223.63		0.16	0.14	
2100	0.00	225.00	225.00	225.00	35	223.80	223.79		0.15	0.10	

Notes: D—discovery; CD—cumulative discovery; SCD—smoothed cumulative discovery (years = number of years centred moving average); adj—adjusted (to match cumulative production maximum); predlag—predicted lag between cumulative discovery and cumulative production; raw Pred CP—prediction using direct lag of cumulative discovery by predicted lag years; Pred SCP—raw predicted CP smoothed (with years = number of years centred moving average); SCP—smoothed actual cumulative production (years = number of years centred moving average); raw Pred P—one year change in predicted smoothed cumulative production; Pred SP—smoothed raw Pred P (years = number of years centred moving average); Actual P—actual annual oil production. Shaded numbers are interpolations, extrapolations or forecasts.

Table 7.2 China, gigabarrels

Year	D	CD	15yr SCD	Adj SCD	Predlag	Raw pred CP	5yr smth pred SCP	SCP	Raw pred P	5yr smth pred SP	Actual P
1915	0.00	0.00	0.00	0.00			0.00	0.00	0	0	0.00
1916	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1917	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1918	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1919	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1920	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1921	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1922	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1923	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1924	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1925	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1926	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1927	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1928	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1929	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1930	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1931	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1932	0.00	0.00	0.01	0.02	27		0.00	0.00	0.00	0.00	0.00
1933	0.00	0.00	0.03	0.03	27		0.00	0.00	0.00	0.00	0.00
1934	0.00	0.00	0.04	0.05	27		0.00	0.00	0.00	0.00	0.00
1935	0.00	0.00	0.05	0.06	27		0.00	0.00	0.00	0.00	0.00
1936	0.00	0.00	0.07	0.08	26		0.00	0.00	0.00	0.00	0.00
1937	0.00	0.00	0.08	0.10	26		0.00	0.00	0.00	0.00	0.00
1938	0.00	0.00	0.09	0.11	25		0.00	0.00	0.00	0.00	0.00
1939	0.20	0.20	0.11	0.13	24		0.00	0.00	0.00	0.00	0.00
1940	0.00	0.20	0.12	0.14	24		0.00	0.00	0.00	0.00	0.00
1941	0.00	0.20	0.13	0.16	23		0.00	0.00	0.00	0.00	0.00
1942	0.00	0.20	0.15	0.17	23		0.00	0.00	0.00	0.00	0.00
1943	0.00	0.20	0.16	0.19	22		0.00	0.00	0.00	0.00	0.00
1944	0.00	0.20	0.17	0.21	22		0.00	0.00	0.00	0.00	0.00
1945	0.00	0.20	0.19	0.22	21		0.00	0.00	0.00	0.00	0.00
1946	0.00	0.20	0.20	0.24	21		0.00	0.00	0.00	0.00	0.00
1947	0.00	0.20	0.21	0.25	21		0.00	0.00	0.00	0.00	0.00
1948	0.00	0.20	0.61	0.73	22		0.00	0.00	0.00	0.00	0.00
1949	0.00	0.20	1.03	1.22	23		0.00	0.00	0.00	0.00	0.00
1950	0.00	0.20	1.45	1.72	24		0.00	0.00	0.00	0.00	0.00
1951	0.00	0.20	1.90	2.26	25		0.00	0.00	0.00	0.00	0.00
1952	0.00	0.20	2.38	2.83	26		0.00	0.00	0.00	0.00	0.00
1953	0.00	0.20	3.77	4.48	26		0.00	0.00	0.00	0.00	0.00
1954	0.10	0.30	5.21	6.19	27		0.00	0.00	0.00	0.00	0.00
1955	6.00	6.30	6.66	7.90	29		0.00	0.00	0.00	0.00	0.00
1956	0.10	6.40	8.12	9.64	30		0.00	0.00	0.00	0.00	0.00
1957	0.10	6.50	9.83	11.67	31		0.00	0.00	0.00	0.00	0.00
1958	0.50	7.00	11.58	13.75	32		0.01	0.00	0.01	0.01	0.01
1959	0.45	7.45	13.36	15.87	33	0.02	0.02	0.01	0.01	0.01	0.02
1960	13.60	21.05	15.18	18.02	34	0.03	0.03	0.03	0.01	0.01	0.02
1961	0.70	21.75	17.10	20.30	35	0.05	0.05	0.05	0.02	0.02	0.03
1962	0.15	21.90	19.03	22.59	36	0.06	0.08	0.07	0.03	0.02	0.03
1963	0.20	22.10	20.60	24.46	37	0.10	0.10	0.10	0.03	0.03	0.04
1964	3.80	25.90	22.25	26.43	38	0.14	0.14	0.14	0.03	0.03	0.04
1965	0.50	26.40	23.93	28.41	39	0.17	0.17	0.18	0.03	0.04	0.05
1966	0.60	27.00	25.63	30.43	39	0.21	0.20	0.23	0.03	0.06	0.08
1967	0.40	27.40	27.33	32.45	40	0.24	0.27	0.30	0.07	0.08	0.06
1968	1.60	29.00	28.38	33.70	41	0.25	0.38	0.37	0.11	0.11	0.08
1969	0.25	29.25	29.41	34.92	41	0.49	0.53	0.44	0.15	0.15	0.08
1970	0.65	29.90	30.49	36.20	42	0.73	0.73	0.54	0.20	0.19	0.16
1971	1.30	31.20	31.59	37.51	42	0.97	0.98	0.68	0.24	0.22	0.19
1972	0.40	31.60	32.53	38.63	43	1.22	1.22	0.86	0.25	0.24	0.21
1973	0.90	32.50	33.46	39.73	43	1.47	1.47	1.11	0.25	0.25	0.36
1974	0.50	33.00	34.38	40.82	43	1.72	1.73	1.45	0.26	0.26	0.44
1975	3.80	36.80	35.30	41.91	44	1.99	1.99	1.89	0.26	0.32	0.53
1976	0.35	37.15	36.15	42.93	44	2.26	2.27	2.42	0.27	0.40	0.64
1977	0.95	38.10	37.07	44.02	45	2.54	2.82	3.03	0.55	0.51	0.65
1978	0.50	38.60	37.96	45.08	45	2.83	3.49	3.70	0.67	0.62	0.74
1979	1.40	40.00	38.82	46.10	46	4.48	4.28	4.43	0.79	0.75	0.78
1980	0.40	40.40	39.69	47.13	46	5.33	5.12	5.19	0.84	0.78	0.78
1981	0.35	40.75	40.59	48.20	46	6.19	6.02	5.95	0.90	0.78	0.74
1982	0.45	41.20	41.51	49.29	47	6.76	6.70	6.71	0.68	0.76	0.75
1983	0.60	41.80	42.21	50.12	47	7.33	7.39	7.46	0.69	0.75	0.78
1984	1.20	43.00	42.92	50.96	47	7.90	8.08	8.25	0.69	0.74	0.83
1985	0.35	43.35	43.63	51.81	48	8.77	8.86	9.08	0.78	0.80	0.89
1986	0.70	44.05	44.37	52.69	48	9.64	9.73	9.97	0.87	0.86	0.95
1987	0.60	44.65	45.04	53.49	48	10.66	10.69	10.91	0.96	0.93	0.98
1988	1.40	46.05	45.75	54.32	49	11.67	11.69	11.88	1.00	0.98	0.98
1989	0.65	46.70	46.50	55.21	49	12.71	12.72	12.87	1.03	1.02	1.01
1990	0.65	47.35	47.25	56.11	49	13.75	13.76	13.87	1.04	1.04	1.01
1991	0.40	47.75	48.01	57.01	50	14.81	14.82	14.88	1.05	1.06	1.02
1992	1.00	48.75	48.75	57.89	50	15.87	15.88	15.90	1.06	1.07	1.05
1993	0.95	49.70	49.52	58.81	51	16.95	16.96	16.94	1.08	1.08	1.06
1994	0.40	50.10	50.29	59.72	51	18.02	18.06	18.00	1.10	1.10	1.08
1995	0.90	51.00	51.08	60.65	51	19.16	19.18	19.08	1.12	1.11	1.10

(continued)

Table 7.2 China, gigabarrels (continued)

Year	D	CD	1 Syr SCD	Adj SCD	Predlag	Raw pred CP	Syr smth pred SCP	SCP	Raw pred P	Syr smth pred SP	Actual P
1996	1.00	52.00	51.82	61.54	52	20.30	20.31	20.18	1.13	1.10	1.13
1997	0.55	52.55	52.54	62.39	52	21.45	21.41	21.30	1.10	1.09	1.13
1998	0.60	53.15	53.26	63.25	52	22.59	22.47	22.41	1.06	1.06	1.07
1999	1.00	54.15	54.00	64.13	53	23.53	23.50	23.49	1.03	1.03	1.07
2000	0.70	54.85	54.73	64.99	53	24.46	24.49	24.56	1.00	1.01	1.06
2001	0.80	55.65	55.43	65.83	53	25.44	25.46	25.62	0.97	1.03	1.06
2002	0.75	56.40	56.16	66.69	54	26.43	26.43	26.70	0.98	1.07	1.09
2003	0.85	57.25	56.87	67.54	54	27.42	27.63	27.78	1.19	1.11	1.10
2004	0.20	57.45	57.56	68.36	54	28.41	28.83	28.88	1.20	1.14	1.10
2005	0.71	58.17	58.26	69.19	55	30.43	30.03	29.98	1.21	1.16	1.11
2006	0.60	58.89	58.97	70.03	55	31.44	31.16	31.09	1.13	1.10	1.10
2007	0.60	59.60	59.65	70.84	55	32.45	32.22		1.06	1.02	
2008	0.60	60.30	60.33	71.64	56	33.08	33.12		0.90	0.93	
2009	0.60	61.00	61.00	72.44	56	33.70	33.94		0.82	0.88	
2010	0.60	61.69	61.66	73.22	56	34.92	34.69		0.75	0.85	
2011	0.60	62.38	62.31	73.99	57	35.56	35.58		0.89	0.81	
2012	0.60	63.05	62.98	74.79	57	36.20	36.45		0.87	0.82	
2013	0.60	63.72	63.64	75.58	57	37.51	37.19		0.74	0.85	
2014	0.60	64.38	64.30	76.36	58	38.07	38.03		0.83	0.83	
2015	0.50	65.04	64.95	77.13	58	38.63	38.95		0.92	0.81	
2016	0.50	65.68	65.59	77.89	58	39.73	39.72		0.77	0.83	
2017	0.50	66.31	66.22	78.64	58	40.82	40.49		0.77	0.81	
2018	0.50	66.94	66.84	79.37	59	41.37	41.35		0.86	0.76	
2019	0.50	67.55	67.45	80.10	59	41.91	42.10		0.75	0.75	
2020	0.50	68.15	68.05	80.81	59	42.93	42.74		0.64	0.74	
2021	0.50	68.74	68.64	81.51	60	43.47	43.48		0.74	0.70	
2022	0.50	69.33	69.22	82.19	60	44.02	44.22		0.74	0.70	
2023	0.50	69.89	69.78	82.86	60	45.08	44.85		0.63	0.74	
2024	0.50	70.45	70.33	83.52	60	45.59	45.58		0.73	0.73	
2025	0.40	70.99	70.87	84.16	61	46.10	46.42		0.84	0.74	
2026	0.40	71.53	71.40	84.79	61	47.13	47.15		0.73	0.77	
2027	0.40	72.04	71.92	85.40	61	48.20	47.89		0.74	0.78	
2028	0.40	72.55	72.42	85.99	61	48.75	48.70		0.81	0.74	
2029	0.40	73.04	72.90	86.57	62	49.29	49.47		0.77	0.71	
2030	0.40	73.51	73.38	87.13	62	50.12	50.10		0.64	0.70	
2031	0.40	73.97	73.83	87.68	62	50.96	50.71		0.61	0.67	
2032	0.40	74.42	74.28	88.20	62	51.39	51.39		0.68	0.64	
2033	0.40	74.85	74.71	88.71	62	51.81	52.07		0.67	0.63	
2034	0.40	75.27	75.12	89.20	63	52.69	52.65		0.59	0.64	
2035	0.30	75.67	75.52	89.67	63	53.49	53.24		0.59	0.64	
2036	0.30	76.05	75.90	90.13	63	53.90	53.92		0.68	0.63	
2037	0.30	76.42	76.26	90.56	63	54.32	54.61		0.69	0.64	
2038	0.30	76.77	76.61	90.97	63	55.21	55.22		0.62	0.66	
2039	0.30	77.10	76.94	91.37	64	56.11	55.85		0.62	0.65	
2040	0.30	77.42	77.25	91.74	64	56.56	56.56		0.71	0.62	
2041	0.30	77.71	77.55	92.09	64	57.01	57.19		0.63	0.63	
2042	0.30	78.00	77.83	92.42	64	57.89	57.72		0.54	0.65	
2043	0.30	78.26	78.09	92.73	64	58.35	58.36		0.63	0.63	
2044	0.30	78.50	78.34	93.02	64	58.81	59.09		0.73	0.64	
2045	0.20	78.73	78.56	93.29	64	59.72	59.73		0.64	0.67	
2046	0.20	78.94	78.77	93.54	64	60.65	60.36		0.64	0.69	
2047	0.20	79.13	78.96	93.76	65	61.10	61.08		0.72	0.66	
2048	0.20	79.30	79.13	93.96	65	61.54	61.79		0.70	0.65	
2049	0.20	79.46	79.28	94.15	65	62.39	62.39		0.61	0.67	
2050	0.20	79.59	79.41	94.30	65	63.25	63.00		0.61	0.66	
2051	0.10	79.71	79.53	94.44	65	63.69	63.69		0.69	0.64	
2052	0.10	79.80	79.63	94.56	65	64.13	64.38		0.69	0.64	
2053	0.10	79.88	79.71	94.66	65	64.99	64.98		0.60	0.65	
2054	0.10	79.94	79.78	94.74	65	65.83	65.58		0.60	0.65	
2055	0.10	79.97	79.84	94.81	65	66.26	66.26		0.68	0.63	
2056	0.00	79.99	79.89	94.87	65	66.69	66.93		0.67	0.63	
2057	0.00	80.00	79.93	94.91	65	67.54	67.52		0.59	0.64	
2058	0.00	80.00	79.95	94.94	65	68.36	68.11		0.59	0.64	
2059	0.00	80.00	79.97	94.97	65	68.77	68.78		0.67	0.62	
2060	0.00	80.00	79.99	94.98	65	69.19	69.44		0.66	0.61	
2061	0.00	80.00	79.99	94.99	65	70.03	70.01		0.58	0.63	
2062	0.00	80.00	80.00	95.00	65	70.84	70.59		0.57	0.62	
2063	0.00	80.00	80.00	95.00	65	71.24	71.24		0.65	0.60	
2064	0.00	80.00	80.00	95.00	65	71.64	71.88		0.64	0.59	
2065	0.00	80.00	80.00	95.00	65	72.44	72.43		0.55	0.60	
2066	0.00	80.00	80.00	95.00	65	73.22	72.98		0.55	0.60	
2067	0.00	80.00	80.00	95.00	65	73.61	73.61		0.63	0.58	
2068	0.00	80.00	80.00	95.00	65	73.99	74.24		0.63	0.58	
2069	0.00	80.00	80.00	95.00	65	74.79	74.79		0.55	0.60	
2070	0.00	80.00	80.00	95.00	65	75.58	75.34		0.55	0.60	
2071	0.00	80.00	80.00	95.00	65	75.97	75.96		0.63	0.59	
2072	0.00	80.00	80.00	95.00	65	76.36	76.58		0.62	0.60	
2073	0.00	80.00	80.00	95.00	65	77.13	77.20		0.61	0.61	
2074	0.00	80.00	80.00	95.00	65	77.89	77.80		0.61	0.61	
2075	0.00	80.00	80.00	95.00	65	78.64	78.41		0.60	0.60	
2076	0.00	80.00	80.00	95.00	65	79.01	79.00		0.59	0.58	

(continued)

Table 7.2 China, gigabarrels (continued)

Year	D	CD	15yr SCD	Adj SCD	Predlag	Raw pred CP	5yr smth pred SCP	SCP	Raw pred P	5yr smth pred SP	Actual P
2077	0.00	80.00	80.00	95.00	65	79.37	79.58		0.58	0.56	
2078	0.00	80.00	80.00	95.00	65	80.10	80.09		0.50	0.55	
2079	0.00	80.00	80.00	95.00	65	80.81	80.59		0.50	0.54	
2080	0.00	80.00	80.00	95.00	65	81.16	81.15		0.56	0.53	
2081	0.00	80.00	80.00	95.00	65	81.51	81.71		0.55	0.54	
2082	0.00	80.00	80.00	95.00	65	82.19	82.25		0.54	0.55	
2083	0.00	80.00	80.00	95.00	65	82.86	82.79		0.54	0.54	
2084	0.00	80.00	80.00	95.00	65	83.52	83.32		0.53	0.53	
2085	0.00	80.00	80.00	95.00	65	83.84	83.84		0.52	0.52	
2086	0.00	80.00	80.00	95.00	65	84.16	84.34		0.51	0.51	
2087	0.00	80.00	80.00	95.00	65	84.79	84.84		0.49	0.50	
2088	0.00	80.00	80.00	95.00	65	85.40	85.33		0.49	0.49	
2089	0.00	80.00	80.00	95.00	65	85.99	85.81		0.48	0.48	
2090	0.00	80.00	80.00	95.00	65	86.28	86.28		0.47	0.47	
2091	0.00	80.00	80.00	95.00	65	86.57	86.73		0.46	0.47	
2092	0.00	80.00	80.00	95.00	65	87.13	87.17		0.44	0.47	
2093	0.00	80.00	80.00	95.00	65	87.68	87.66		0.49	0.45	
2094	0.00	80.00	80.00	95.00	65	88.20	88.14		0.48	0.44	
2095	0.00	80.00	80.00	95.00	65	88.71	88.55		0.41	0.43	
2096	0.00	80.00	80.00	95.00	65	88.96	88.95		0.40	0.41	
2097	0.00	80.00	80.00	95.00	65	89.20	89.33		0.38	0.39	
2098	0.00	80.00	80.00	95.00	65	89.67	89.70		0.37	0.39	
2099	0.00	80.00	80.00	95.00	65	90.13	90.11		0.40	0.38	
2100	0.00	80.00	80.00	95.00	65	90.56	90.50		0.39	0.37	

Notes: D—discovery; CD—cumulative discovery; SCD—smoothed cumulative discovery (years = number of years centred moving average); adj—adjusted (to match cumulative production maximum); predlag—predicted lag between cumulative discovery and cumulative production; raw Pred CP—prediction using direct lag of cumulative discovery by predicted lag years; Pred SCP—raw predicted CP smoothed (with years = number of years centred moving average); SCP—smoothed actual cumulative production (years = number of years centred moving average); raw Pred P—one year change in predicted smoothed cumulative production; Pred SP—smoothed raw Pred P (years = number of years centred moving average); Actual P—actual annual oil production. Shaded numbers are interpolations, extrapolations or forecasts.

Table 7.3 Kazakhstan, gigabarrels

Year	D	CD	2 Iyr SCD	Adj SCD	Predlag	Raw pred CP	1 Iyr smth pred SCP	SCP	Raw pred P	5yr smth pred SP	Actual P
1905	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1906	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1907	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1908	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1909	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1910	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1911	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1912	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1913	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1914	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1915	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1916	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1917	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1918	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1919	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1920	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1921	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1922	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1923	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1924	0.00	0.00	0.01	0.01		0.00	0.00	0.00	0.00	0.00	0.00
1925	0.00	0.00	0.01	0.01		0.00	0.00	0.00	0.00	0.00	0.00
1926	0.00	0.00	0.01	0.01		0.00	0.00	0.00	0.00	0.00	0.00
1927	0.00	0.00	0.02	0.02		0.00	0.00	0.00	0.00	0.00	0.00
1928	0.00	0.00	0.02	0.02		0.00	0.00	0.00	0.00	0.00	0.00
1929	0.00	0.00	0.03	0.03		0.00	0.00	0.00	0.00	0.00	0.00
1930	0.00	0.00	0.03	0.03	17	0.00	0.00	0.00	0.00	0.00	0.00
1931	0.00	0.00	0.04	0.04	17	0.00	0.00	0.00	0.00	0.00	0.00
1932	0.05	0.05	0.04	0.04	17	0.00	0.00	0.00	0.00	0.00	0.00
1933	0.00	0.05	0.05	0.05	16	0.00	0.00	0.00	0.00	0.00	0.00
1934	0.00	0.05	0.05	0.05	16	0.01	0.00	0.01	0.00	0.00	0.00
1935	0.00	0.05	0.05	0.05	16	0.01	0.01	0.01	0.00	0.00	0.00
1936	0.00	0.05	0.06	0.06	15	0.01	0.01	0.01	0.00	0.00	0.00
1937	0.05	0.10	0.07	0.07	15	0.01	0.01	0.01	0.00	0.00	0.00
1938	0.00	0.10	0.07	0.07	14	0.01	0.01	0.01	0.00	0.00	0.00
1939	0.00	0.10	0.08	0.08	14	0.01	0.01	0.01	0.00	0.00	0.00
1940	0.00	0.10	0.09	0.09	14	0.01	0.01	0.01	0.00	0.00	0.00
1941	0.00	0.10	0.10	0.10	14	0.01	0.01	0.01	0.00	0.00	0.00
1942	0.00	0.10	0.11	0.11	15	0.01	0.02	0.01	0.00	0.00	0.00
1943	0.00	0.10	0.13	0.13	15	0.01	0.02	0.01	0.00	0.00	0.00
1944	0.00	0.10	0.15	0.15	16	0.02	0.02	0.02	0.00	0.00	0.00
1945	0.00	0.10	0.17	0.17	17	0.02	0.02	0.02	0.00	0.00	0.00
1946	0.00	0.10	0.19	0.19	17	0.02	0.03	0.02	0.00	0.00	0.01
1947	0.03	0.13	0.21	0.21	18	0.03	0.03	0.03	0.00	0.01	0.01
1948	0.03	0.16	0.23	0.23	18	0.04	0.04	0.04	0.01	0.01	0.01
1949	0.00	0.16	0.26	0.26	18	0.04	0.05	0.04	0.01	0.01	0.01
1950	0.00	0.16	0.31	0.31	19	0.05	0.05	0.05	0.01	0.01	0.01
1951	0.08	0.24	0.57	0.57	20	0.05	0.06	0.06	0.01	0.01	0.01
1952	0.00	0.24	0.85	0.85	21	0.07	0.07	0.07	0.01	0.01	0.01
1953	0.20	0.44	1.13	1.13	22	0.08	0.08	0.08	0.01	0.01	0.01
1954	0.00	0.44	1.41	1.41	22	0.09	0.09	0.09	0.01	0.01	0.01
1955	0.00	0.44	1.70	1.70	23	0.10	0.10	0.10	0.01	0.01	0.01
1956	0.00	0.44	2.00	2.00	24	0.11	0.11	0.11	0.01	0.01	0.01
1957	0.08	0.52	2.30	2.30	25	0.11	0.12	0.12	0.01	0.01	0.01
1958	0.00	0.52	2.60	2.60	26	0.13	0.13	0.13	0.01	0.01	0.01
1959	0.30	0.82	2.90	2.90	27	0.14	0.14	0.14	0.01	0.01	0.01
1960	0.25	1.07	3.20	3.20	28	0.15	0.15	0.15	0.01	0.01	0.01
1961	4.60	5.67	3.51	3.51	29	0.16	0.16	0.16	0.01	0.01	0.01
1962	0.13	5.80	3.81	3.51	29	0.17	0.18	0.17	0.01	0.01	0.01
1963	0.20	6.00	4.11	4.11	30	0.19	0.19	0.18	0.02	0.02	0.01
1964	0.12	6.12	4.44	4.44	31	0.20	0.21	0.19	0.02	0.02	0.01
1965	0.07	6.19	4.79	4.79	32	0.21	0.24	0.20	0.03	0.03	0.01
1966	0.07	6.26	5.20	5.20	33	0.23	0.27	0.22	0.04	0.04	0.02
1967	0.12	6.38	5.61	5.61	34	0.26	0.32	0.26	0.05	0.05	0.04
1968	0.07	6.45	6.08	6.08	34	0.29	0.39	0.32	0.06	0.06	0.05
1969	0.07	6.52	6.86	6.86	35	0.31	0.46	0.40	0.07	0.08	0.08
1970	0.00	6.52	7.63	7.63	36	0.44	0.54	0.50	0.08	0.09	0.11
1971	0.05	6.57	8.40	8.40	37	0.57	0.65	0.61	0.11	0.10	0.12
1972	0.00	6.57	9.05	9.05	37	0.71	0.77	0.74	0.12	0.12	0.13
1973	0.07	6.64	9.70	9.70	38	0.85	0.90	0.89	0.13	0.13	0.14
1974	0.62	7.26	10.36	10.36	38	0.99	1.05	1.04	0.14	0.14	0.16
1975	0.60	7.86	11.02	11.02	39	1.13	1.20	1.21	0.15	0.15	0.17
1976	1.20	9.06	11.69	11.69	39	1.41	1.36	1.38	0.15	0.15	0.17
1977	0.05	9.11	12.37	12.37	40	1.56	1.51	1.54	0.16	0.16	0.17
1978	1.22	10.33	13.06	13.06	40	1.70	1.67	1.69	0.16	0.16	0.15
1979	6.60	16.93	13.76	13.76	41	1.85	1.83	1.83	0.16	0.16	0.14
1980	0.08	17.01	14.46	14.46	41	2.00	1.99	1.97	0.16	0.16	0.14
1981	0.10	17.11	15.16	15.16	42	2.15	2.15	2.11	0.16	0.16	0.14
1982	2.22	19.33	15.87	15.87	42	2.30	2.30	2.25	0.15	0.15	0.14
1983	0.17	19.50	16.58	16.58	43	2.45	2.45	2.39	0.15	0.15	0.14
1984	0.38	19.88	17.28	17.28	43	2.60	2.60	2.54	0.15	0.15	0.15
1985	0.08	19.96	17.96	17.96	44	2.75	2.75	2.70	0.15	0.15	0.16

(continued)

Table 7.3 Kazakhstan, gigabarrels (continued)

Year	D	CD	2/yr SCD	Adj SCD	Predlag	Raw pred CP	1/yr smth pred SCP	SCP	Raw pred P	5yr smth pred SP	Actual P
1986	0.25	20.21	18.61	18.61	44	2.90	2.89	2.86	0.14	0.15	0.16
1987	0.40	20.61	19.20	19.20	45	3.05	3.04	3.01	0.15	0.15	0.16
1988	0.18	20.79	19.79	19.79	45	3.20	3.20	3.18	0.17	0.16	0.16
1989	0.38	21.17	20.33	20.33	45	3.35	3.37	3.36	0.17	0.16	0.19
1990	0.05	21.22	21.02	21.02	46	3.51	3.54	3.56	0.17	0.17	0.19
1991	0.10	21.32	21.72	21.72	46	3.51	3.71	3.75	0.17	0.17	0.19
1992	0.08	21.40	22.41	22.41	47	3.81	3.88	3.93	0.17	0.17	0.19
1993	0.03	21.43	23.03	23.03	47	4.11	4.06	4.10	0.18	0.18	0.16
1994	0.00	21.43	23.65	23.65	48	4.28	4.24	4.26	0.18	0.18	0.16
1995	0.00	21.43	24.27	24.27	48	4.44	4.42	4.43	0.19	0.19	0.16
1996	0.08	21.51	24.89	24.89	49	4.61	4.62	4.60	0.19	0.21	0.17
1997	0.00	21.51	25.51	25.51	49	4.79	4.85	4.78	0.23	0.22	0.19
1998	0.03	21.54	26.11	26.11	50	5.00	5.09	4.98	0.24	0.24	0.19
1999	0.00	21.54	26.72	26.72	50	5.20	5.34	5.19	0.25	0.26	0.21
2000	10.00	31.54	27.32	27.32	51	5.41	5.61	5.43	0.27	0.27	0.24
2001	0.05	31.59	27.93	27.93	51	5.61	5.90	5.70	0.29	0.29	0.26
2002	0.15	31.74	28.54	28.54	52	6.08	6.21	5.99	0.31	0.31	0.30
2003	0.55	32.29	29.16	29.16	52	6.47	6.54	6.31	0.33	0.34	0.32
2004	0.30	32.59	29.78	29.78	52	6.86	6.91	6.70	0.37	0.36	0.36
2005	0.20	32.79	30.41	30.41	53	7.25	7.29	7.13	0.38	0.38	0.47
2006	0.20	32.99	31.06	31.06	53	7.63	7.68	7.61	0.39	0.40	0.48
2007	0.20	33.19	31.70	31.70	54	8.02	8.11		0.43	0.41	
2008	0.20	33.39	32.35	32.35	54	8.40	8.53		0.42	0.42	
2009	0.19	33.58	33.02	33.02	55	9.05	8.94		0.41	0.43	
2010	0.19	33.78	33.68	33.68	55	9.37	9.38		0.44	0.43	
2011	0.19	33.97	33.88	33.88	55	9.70	9.82		0.43	0.44	
2012	0.19	34.16	34.09	34.09	56	10.36	10.25		0.43	0.44	
2013	0.19	34.34	34.30	34.30	56	10.69	10.70		0.46	0.44	
2014	0.18	34.53	34.48	34.48	56	11.02	11.16		0.46	0.45	
2015	0.18	34.71	34.67	34.67	56	11.69	11.59		0.43	0.45	
2016	0.18	34.89	34.84	34.84	56	12.03	12.05		0.46	0.45	
2017	0.18	35.06	35.02	35.02	56	12.37	12.51		0.46	0.45	
2018	0.17	35.24	35.19	35.19	56	13.06	12.95		0.44	0.46	
2019	0.17	35.41	35.36	35.36	57	13.41	13.42		0.47	0.46	
2020	0.17	35.58	35.53	35.53	57	13.76	13.89		0.47	0.46	
2021	0.17	35.75	35.70	35.70	57	14.46	14.34		0.44	0.47	
2022	0.16	35.91	35.86	35.86	57	14.81	14.82		0.48	0.46	
2023	0.16	36.07	36.02	36.02	57	15.16	15.29		0.48	0.46	
2024	0.16	36.23	36.18	36.18	57	15.87	15.74		0.45	0.47	
2025	0.16	36.39	36.34	36.34	57	16.22	16.21		0.47	0.46	
2026	0.15	36.54	36.49	36.49	57	16.58	16.68		0.47	0.45	
2027	0.15	36.69	36.64	36.64	58	17.28	17.11		0.43	0.46	
2028	0.15	36.84	36.79	36.79	58	17.62	17.56		0.45	0.45	
2029	0.14	36.98	36.93	36.93	58	17.96	18.03		0.47	0.45	
2030	0.14	37.13	37.07	37.07	58	18.61	18.47		0.44	0.45	
2031	0.14	37.26	37.21	37.21	58	18.90	18.91		0.44	0.45	
2032	0.14	37.40	37.34	37.34	58	19.20	19.37		0.47	0.44	
2033	0.13	37.53	37.47	37.47	58	19.79	19.81		0.43	0.45	
2034	0.13	37.66	37.60	37.60	58	20.33	20.24		0.44	0.45	
2035	0.13	37.79	37.73	37.73	58	20.67	20.70		0.46	0.44	
2036	0.12	37.91	37.85	37.85	58	21.02	21.13		0.43	0.44	
2037	0.12	38.03	37.97	37.97	58	21.72	21.57		0.43	0.44	
2038	0.12	38.15	38.09	38.09	59	22.06	22.03		0.46	0.43	
2039	0.11	38.26	38.20	38.20	59	22.41	22.46		0.44	0.44	
2040	0.11	38.37	38.31	38.31	59	23.03	22.88		0.41	0.44	
2041	0.11	38.48	38.41	38.41	59	23.34	23.32		0.44	0.42	
2042	0.10	38.58	38.52	38.52	59	23.65	23.75		0.44	0.42	
2043	0.10	38.68	38.62	38.62	59	24.27	24.15		0.40	0.42	
2044	0.10	38.77	38.71	38.71	59	24.58	24.57		0.42	0.41	
2045	0.09	38.87	38.80	38.80	59	24.89	24.99		0.42	0.41	
2046	0.09	38.96	38.89	38.89	59	25.51	25.38		0.39	0.41	
2047	0.09	39.04	38.98	38.98	59	25.81	25.80		0.42	0.41	
2048	0.08	39.12	39.06	39.06	59	26.11	26.22		0.42	0.41	
2049	0.08	39.20	39.14	39.14	59	26.72	26.61		0.39	0.42	
2050	0.08	39.28	39.21	39.21	59	27.02	27.02		0.42	0.42	
2051	0.07	39.35	39.28	39.28	59	27.32	27.47		0.44	0.42	
2052	0.07	39.42	39.35	39.35	60	27.93	27.89		0.42	0.43	
2053	0.06	39.48	39.41	39.41	60	28.24	28.30		0.42	0.43	
2054	0.06	39.54	39.47	39.47	60	28.54	28.75		0.45	0.43	
2055	0.06	39.60	39.53	39.53	60	29.16	29.18		0.42	0.43	
2056	0.05	39.65	39.58	39.58	60	29.78	29.60		0.43	0.44	
2057	0.05	39.70	39.63	39.63	60	30.10	30.06		0.46	0.43	
2058	0.05	39.75	39.68	39.68	60	30.41	30.49		0.43	0.44	
2059	0.04	39.79	39.72	39.72	60	31.06	30.93		0.43	0.44	
2060	0.04	39.83	39.76	39.76	60	31.38	31.39		0.47	0.43	
2061	0.03	39.86	39.79	39.79	60	31.70	31.82		0.43	0.42	
2062	0.03	39.89	39.82	39.82	60	32.35	32.21		0.38	0.40	
2063	0.03	39.92	39.85	39.85	60	32.69	32.57		0.36	0.37	
2064	0.02	39.94	39.88	39.88	60	33.02	32.92		0.35	0.34	
2065	0.02	39.96	39.90	39.90	60	33.68	33.23		0.31	0.32	
2066	0.02	39.98	39.92	39.92	60	33.88	33.53		0.30	0.30	

(continued)

Table 7.3 Kazakhstan, gigabarrels (continued)

Year	D	CD	2 l yr SCD	Adj SCD	Predlag	Raw pred CP	1 l yr smth pred SCP	SCP	Raw pred P	5 yr smth pred SP	Actual P
2067	0.01	39.99	39.93	39.93	60	33.99	33.82		0.29	0.27	
2068	0.01	39.99	39.95	39.95	60	34.09	34.06		0.24	0.25	
2069	0.01	40.00	39.96	39.96	60	34.30	34.29		0.23	0.22	
2070	0.00	40.00	39.97	39.97	60	34.48	34.49		0.21	0.20	
2071	0.00	40.00	39.98	39.98	60	34.67	34.65		0.15	0.18	
2072	0.00	40.00	39.98	39.98	60	34.84	34.80		0.15	0.17	
2073	0.00	40.00	39.99	39.99	60	35.02	34.95		0.16	0.16	
2074	0.00	40.00	39.99	39.99	60	35.19	35.11		0.16	0.16	
2075	0.00	40.00	40.00	40.00	60	35.28	35.27		0.16	0.16	
2076	0.00	40.00	40.00	40.00	60	35.36	35.42		0.15	0.15	
2077	0.00	40.00	40.00	40.00	60	35.53	35.58		0.15	0.15	
2078	0.00	40.00	40.00	40.00	60	35.70	35.73		0.15	0.15	
2079	0.00	40.00	40.00	40.00	60	35.86	35.87		0.14	0.14	
2080	0.00	40.00	40.00	40.00	60	36.02	36.00		0.13	0.14	
2081	0.00	40.00	40.00	40.00	60	36.18	36.13		0.14	0.14	
2082	0.00	40.00	40.00	40.00	60	36.34	36.28		0.14	0.14	
2083	0.00	40.00	40.00	40.00	60	36.49	36.42		0.14	0.14	
2084	0.00	40.00	40.00	40.00	60	36.56	36.55		0.14	0.14	
2085	0.00	40.00	40.00	40.00	60	36.64	36.69		0.13	0.13	
2086	0.00	40.00	40.00	40.00	60	36.79	36.82		0.13	0.13	
2087	0.00	40.00	40.00	40.00	60	36.93	36.95		0.13	0.13	
2088	0.00	40.00	40.00	40.00	60	37.07	37.08		0.13	0.13	
2089	0.00	40.00	40.00	40.00	60	37.21	37.20		0.12	0.13	
2090	0.00	40.00	40.00	40.00	60	37.34	37.33		0.13	0.12	
2091	0.00	40.00	40.00	40.00	60	37.47	37.45		0.13	0.12	
2092	0.00	40.00	40.00	40.00	60	37.60	37.57		0.12	0.12	
2093	0.00	40.00	40.00	40.00	60	37.73	37.69		0.12	0.12	
2094	0.00	40.00	40.00	40.00	60	37.85	37.80		0.11	0.11	
2095	0.00	40.00	40.00	40.00	60	37.97	37.91		0.11	0.11	
2096	0.00	40.00	40.00	40.00	60	38.03	38.02		0.11	0.11	
2097	0.00	40.00	40.00	40.00	60	38.09	38.12		0.10	0.10	
2098	0.00	40.00	40.00	40.00	60	38.20	38.22		0.10	0.10	
2099	0.00	40.00	40.00	40.00	60	38.31	38.32		0.10	0.10	
2100	0.00	40.00	40.00	40.00	60	38.41	38.41		0.09	0.10	

Notes: D—discovery; CD—cumulative discovery; SCD—smoothed cumulative discovery (years = number of years centred moving average); adj—adjusted (to match cumulative production maximum); predlag—predicted lag between cumulative discovery and cumulative production; raw Pred CP—prediction using direct lag of cumulative discovery by predicted lag years; Pred SCP—raw predicted CP smoothed (with years = number of years centred moving average); SCP—smoothed actual cumulative production (years = number of years centred moving average); raw Pred P—one year change in predicted smoothed cumulative production; Pred SP—smoothed raw Pred P (years = number of years centred moving average); Actual P—actual annual oil production. Shaded numbers are interpolations, extrapolations or forecasts.

Table 7.4 Azerbaijan, gigabarrels

Year	D	CD	21yr SCD	Adj SCD	Predlag	Raw pred CP	Syr smth pred SCP	SCP	Raw pred P	Syr smth pred SP	Actual P
1880	0.00	0.00	0.16	0.19	43		0.00	0.00	0.00	0.00	0.00
1881	0.01	0.01	0.20	0.23	43		0.00	0.00	0.00	0.00	0.00
1882	0.01	0.02	0.24	0.29	44		0.00	0.00	0.00	0.00	0.00
1883	0.01	0.03	0.29	0.34	44		0.00	0.00	0.00	0.00	0.00
1884	0.01	0.04	0.34	0.40	44		0.00	0.00	0.00	0.00	0.00
1885	0.01	0.05	0.39	0.46	44		0.00	0.00	0.00	0.00	0.00
1886	0.01	0.06	0.45	0.52	44		0.00	0.00	0.00	0.00	0.00
1887	0.66	0.72	0.50	0.59	44		0.00	0.00	0.00	0.00	0.00
1888	0.04	0.76	0.56	0.66	44		0.00	0.00	0.00	0.00	0.00
1889	0.04	0.80	0.63	0.74	44		0.00	0.00	0.00	0.00	0.00
1890	0.04	0.84	0.69	0.81	43		0.00	0.00	0.00	0.00	0.00
1891	0.04	0.88	0.76	0.90	43		0.00	0.00	0.00	0.00	0.00
1892	0.05	0.93	0.84	0.98	43		0.00	0.00	0.00	0.00	0.00
1893	0.05	0.98	0.91	1.07	43		0.00	0.00	0.00	0.00	0.00
1894	0.05	1.03	0.99	1.17	43		0.00	0.00	0.00	0.00	0.00
1895	0.05	1.08	1.08	1.27	43		0.00	0.00	0.00	0.00	0.00
1896	0.06	1.14	1.17	1.37	43		0.00	0.00	0.00	0.00	0.00
1897	0.06	1.20	1.26	1.48	43		0.00	0.00	0.00	0.00	0.00
1898	0.06	1.26	1.33	1.56	43		0.00	0.00	0.00	0.00	0.00
1899	0.07	1.33	1.40	1.64	42		0.00	0.00	0.00	0.00	0.00
1900	0.07	1.40	1.47	1.72	42		0.00	0.00	0.00	0.00	0.00
1901	0.07	1.47	1.55	1.81	42		0.00	0.00	0.00	0.00	0.00
1902	0.08	1.55	1.63	1.91	42		0.00	0.00	0.00	0.00	0.00
1903	0.08	1.63	1.71	2.01	42		0.00	0.00	0.00	0.00	0.00
1904	0.09	1.72	1.80	2.12	42		0.00	0.00	0.00	0.00	0.00
1905	0.09	1.81	1.90	2.23	42		0.00	0.00	0.00	0.00	0.00
1906	0.10	1.91	2.00	2.34	42		0.00	0.00	0.00	0.00	0.00
1907	0.10	2.01	2.10	2.47	42		0.00	0.00	0.00	0.00	0.00
1908	0.11	2.11	2.21	2.60	42		0.00	0.00	0.00	0.00	0.00
1909	0.11	2.22	2.33	2.73	43		0.00	0.00	0.00	0.00	0.00
1910	0.12	2.34	2.45	2.88	43		0.00	0.00	0.00	0.00	0.00
1911	0.12	2.46	2.58	3.03	43		0.00	0.00	0.00	0.00	0.00
1912	0.13	2.59	2.72	3.19	44		0.00	0.00	0.00	0.00	0.00
1913	0.14	2.73	2.86	3.36	44		0.00	0.00	0.00	0.00	0.00
1914	0.14	2.87	3.01	3.53	45		0.00	0.00	0.00	0.00	0.00
1915	0.15	3.02	3.17	3.72	45		0.00	0.00	0.00	0.00	0.00
1916	0.16	3.18	3.34	3.92	46	0.01	0.01	0.01	0.01	0.01	0.00
1917	0.17	3.35	3.51	4.12	46	0.02	0.02	0.02	0.01	0.01	0.01
1918	0.18	3.53	3.70	4.34	46	0.03	0.03	0.03	0.01	0.01	0.01
1919	0.19	3.71	3.89	4.57	47	0.05	0.05	0.05	0.02	0.02	0.02
1920	0.20	3.91	4.08	4.79	47	0.07	0.08	0.07	0.02	0.02	0.02
1921	0.21	4.11	4.27	5.01	48	0.10	0.10	0.10	0.03	0.03	0.03
1922	0.22	4.33	4.45	5.22	48	0.13	0.14	0.13	0.04	0.03	0.03
1923	0.23	4.56	4.63	5.43	49	0.17	0.18	0.17	0.04	0.04	0.04
1924	0.24	4.80	4.80	5.63	49	0.23	0.22	0.21	0.04	0.04	0.04
1925	0.25	5.05	4.97	5.83	50	0.26	0.26	0.25	0.04	0.04	0.05
1926	0.27	5.32	5.13	6.02	51	0.29	0.30	0.30	0.05	0.04	0.05
1927	0.28	5.60	5.28	6.20	51	0.34	0.35	0.36	0.04	0.05	0.05
1928	0.29	5.89	5.43	6.37	52	0.40	0.40	0.41	0.05	0.05	0.06
1929	0.31	6.20	5.57	6.54	53	0.46	0.46	0.48	0.06	0.06	0.06
1930	0.00	6.20	5.72	6.71	54	0.52	0.53	0.55	0.06	0.07	0.07
1931	0.02	6.22	5.86	6.87	55	0.59	0.61	0.62	0.08	0.08	0.08
1932	0.09	6.31	5.99	7.02	56	0.66	0.70	0.70	0.09	0.08	0.08
1933	0.00	6.31	6.10	7.16	56	0.81	0.79	0.78	0.09	0.09	0.08
1934	0.00	6.31	6.21	7.29	57	0.90	0.88	0.87	0.10	0.09	0.09
1935	0.11	6.42	6.31	7.40	57	0.98	0.99	0.96	0.10	0.09	0.09
1936	0.00	6.42	6.39	7.50	57	1.07	1.08	1.05	0.09	0.10	0.09
1937	0.00	6.42	6.47	7.59	58	1.17	1.17	1.15	0.09	0.10	0.10
1938	0.00	6.42	6.54	7.67	58	1.27	1.27	1.25	0.10	0.10	0.11
1939	0.13	6.55	6.60	7.74	58	1.37	1.38	1.36	0.11	0.11	0.11
1940	0.25	6.80	6.71	7.87	58	1.48	1.49	1.47	0.11	0.11	0.11
1941	0.00	6.80	6.82	8.00	59	1.64	1.60	1.59	0.11	0.11	0.12
1942	0.00	6.80	6.94	8.14	59	1.72	1.71	1.70	0.11	0.11	0.12
1943	0.00	6.80	7.06	8.28	59	1.81	1.82	1.82	0.11	0.10	0.11
1944	0.02	6.82	7.18	8.43	60	1.91	1.91	1.93	0.10	0.10	0.14
1945	0.00	6.82	7.33	8.60	60	2.01	2.02	2.04	0.10	0.10	0.10
1946	0.00	6.82	7.48	8.77	60	2.12	2.12	2.14	0.11	0.11	0.09
1947	0.06	6.88	7.63	8.95	59	2.23	2.23	2.23	0.11	0.11	0.09
1948	0.20	7.08	7.78	9.12	59	2.34	2.35	2.33	0.12	0.11	0.10
1949	0.04	7.12	7.92	9.30	59	2.47	2.46	2.43	0.11	0.11	0.10
1950	1.43	8.55	8.07	9.47	59	2.60	2.56	2.54	0.10	0.11	0.11
1951	0.00	8.55	8.21	9.63	58	2.67	2.67	2.65	0.11	0.11	0.11
1952	0.25	8.80	8.35	9.80	58	2.73	2.78	2.75	0.11	0.11	0.11
1953	0.00	8.80	8.57	10.05	58	2.88	2.88	2.86	0.10	0.11	0.11
1954	0.10	8.90	8.78	10.30	57	3.03	2.99	2.97	0.10	0.11	0.11
1955	0.50	9.40	9.00	10.56	57	3.11	3.11	3.08	0.12	0.11	0.11
1956	0.13	9.53	9.22	10.82	57	3.19	3.23	3.20	0.11	0.11	0.11
1957	0.00	9.53	9.44	11.08	57	3.36	3.33	3.31	0.10	0.12	0.12
1958	0.00	9.53	9.67	11.34	57	3.45	3.45	3.43	0.12	0.11	0.12
1959	0.00	9.53	9.89	11.60	57	3.53	3.58	3.56	0.13	0.12	0.12
1960	0.05	9.58	10.11	11.86	56	3.72	3.69	3.69	0.11	0.13	0.13

(continued)

Table 7.4 Azerbaijan, gigabarrels (continued)

Year	D	CD	2 Iyr SCD	Adj SCD	Predlag	Raw pred CP	5yr smth pred SCP	SCP	Raw pred P	5yr smth pred SP	Actual P
1961	0.20	9.78	10.33	12.12	56	3.82	3.82	3.82	0.14	0.14	0.14
1962	0.03	9.81	10.56	12.38	56	3.92	3.98	3.96	0.16	0.14	0.14
1963	1.43	11.24	10.77	12.63	55	4.12	4.13	4.11	0.15	0.15	0.15
1964	0.00	11.24	10.98	12.88	55	4.34	4.28	4.26	0.15	0.16	0.15
1965	0.25	11.49	11.19	13.12	55	4.45	4.45	4.42	0.17	0.15	0.16
1966	0.00	11.49	11.37	13.34	55	4.57	4.61	4.57	0.16	0.15	0.16
1967	0.00	11.49	11.55	13.55	55	4.79	4.74	4.73	0.13	0.15	0.16
1968	0.06	11.55	11.73	13.76	55	4.90	4.90	4.88	0.15	0.14	0.15
1969	0.20	11.75	11.96	14.03	55	5.01	5.05	5.03	0.15	0.14	0.15
1970	0.04	11.79	12.19	14.30	55	5.22	5.18	5.18	0.13	0.14	0.15
1971	1.43	13.22	12.41	14.56	55	5.33	5.32	5.32	0.15	0.14	0.14
1972	0.00	13.22	12.63	14.82	55	5.43	5.47	5.45	0.14	0.13	0.13
1973	0.02	13.24	12.85	15.08	55	5.63	5.59	5.58	0.12	0.13	0.13
1974	0.02	13.26	13.00	15.25	55	5.73	5.71	5.70	0.12	0.12	0.13
1975	0.00	13.26	13.41	15.73	55	5.83	5.82	5.83	0.12	0.12	0.12
1976	0.00	13.26	13.80	16.19	55	5.92	5.94	5.94	0.11	0.11	0.12
1977	0.03	13.29	14.19	16.65	55	6.02	6.05	6.05	0.11	0.11	0.11
1978	0.00	13.29	14.59	17.12	55	6.20	6.16	6.15	0.11	0.11	0.11
1979	1.05	14.34	14.99	17.58	55	6.28	6.26	6.25	0.11	0.10	0.10
1980	0.00	14.34	15.38	18.04	55	6.37	6.37	6.35	0.10	0.10	0.10
1981	0.00	14.34	15.77	18.49	55	6.45	6.45	6.44	0.09	0.09	0.09
1982	0.03	14.37	16.09	18.87	55	6.54	6.54	6.52	0.09	0.09	0.08
1983	0.03	14.40	16.40	19.24	55	6.62	6.62	6.60	0.08	0.08	0.08
1984	0.02	14.42	16.72	19.62	55	6.71	6.71	6.69	0.08	0.08	0.08
1985	5.30	19.72	17.04	19.99	55	6.79	6.79	6.78	0.08	0.08	0.09
1986	0.00	19.72	17.36	20.36	55	6.87	6.87	6.86	0.08	0.08	0.09
1987	0.00	19.72	17.67	20.73	55	6.95	6.96	6.96	0.09	0.08	0.09
1988	0.20	19.92	17.99	21.11	55	7.02	7.05	7.05	0.09	0.09	0.09
1989	0.00	19.92	18.35	21.53	55	7.16	7.13	7.14	0.08	0.09	0.09
1990	0.00	19.92	18.66	21.89	55	7.22	7.22	7.23	0.09	0.09	0.09
1991	0.00	19.92	18.97	22.25	55	7.29	7.31	7.31	0.10	0.08	0.09
1992	0.00	19.92	19.27	22.61	55	7.40	7.39	7.40	0.08	0.08	0.08
1993	0.00	19.92	19.58	22.97	55	7.50	7.46	7.47	0.07	0.08	0.08
1994	0.00	19.92	19.89	23.33	55	7.54	7.54	7.55	0.08	0.07	0.07
1995	0.00	19.92	20.21	23.70	55	7.59	7.61	7.62	0.07	0.07	0.07
1996	0.00	19.92	20.28	23.78	55	7.67	7.68	7.68	0.07	0.08	0.07
1997	0.00	19.92	20.35	23.87	55	7.74	7.76	7.76	0.08	0.08	0.07
1998	0.07	19.99	20.43	23.97	55	7.87	7.84	7.84	0.08	0.09	0.09
1999	0.81	20.80	20.51	24.05	55	7.93	7.94	7.93	0.10	0.09	0.09
2000	0.00	20.80	20.59	24.15	55	8.00	8.05	8.03	0.11	0.10	0.10
2001	0.00	20.80	20.67	24.25	55	8.14	8.14	8.13	0.10	0.10	0.11
2002	0.00	20.80	20.77	24.36	55	8.28	8.24	8.24	0.10	0.11	0.11
2003	0.00	20.80	20.86	24.48	55	8.36	8.36	8.35	0.12	0.12	0.11
2004	0.13	20.93	20.97	24.60	55	8.43	8.49	8.48	0.13	0.14	0.11
2005	0.12	21.05	21.08	24.72	55	8.60	8.66	8.64	0.17	0.17	0.15
2006	0.12	21.17	21.19	24.86	55	8.77	8.84	8.84	0.19	0.19	0.23
2007	0.12	21.29	21.31	24.99	55	9.12	9.08		0.24	0.23	
2008	0.12	21.40	21.43	25.14	55	9.30	9.32		0.24	0.25	
2009	0.12	21.52	21.56	25.29	55	9.63	9.63		0.30	0.28	
2010	0.11	21.63	21.65	25.39	55	9.80	9.92		0.29	0.28	
2011	0.11	21.75	21.74	25.51	55	10.30	10.22		0.30	0.30	
2012	0.11	21.86	21.84	25.62	55	10.56	10.51		0.29	0.30	
2013	0.11	21.97	21.95	25.75	55	10.82	10.82		0.31	0.31	
2014	0.11	22.08	22.06	25.88	55	11.08	11.13		0.31	0.32	
2015	0.11	22.19	22.17	26.01	55	11.34	11.44		0.31	0.33	
2016	0.11	22.30	22.28	26.13	55	11.86	11.81		0.36	0.34	
2017	0.11	22.41	22.38	26.26	55	12.12	12.17		0.36	0.34	
2018	0.11	22.51	22.49	26.38	55	12.63	12.52		0.36	0.33	
2019	0.10	22.62	22.59	26.50	55	12.88	12.82		0.30	0.30	
2020	0.10	22.72	22.70	26.62	55	13.12	13.10		0.29	0.28	
2021	0.10	22.82	22.80	26.74	55	13.34	13.33		0.23	0.25	
2022	0.10	22.92	22.90	26.86	55	13.55	13.56		0.23	0.24	
2023	0.10	23.02	23.00	26.98	55	13.76	13.79		0.23	0.24	
2024	0.10	23.12	23.09	27.09	55	14.03	14.04		0.24	0.25	
2025	0.10	23.22	23.19	27.21	55	14.30	14.29		0.25	0.25	
2026	0.10	23.31	23.29	27.32	55	14.56	14.56		0.26	0.26	
2027	0.09	23.41	23.38	27.43	55	14.82	14.80		0.25	0.27	
2028	0.09	23.50	23.47	27.53	55	15.08	15.09		0.29	0.30	
2029	0.09	23.59	23.56	27.64	55	15.25	15.41		0.32	0.33	
2030	0.09	23.68	23.65	27.75	55	15.73	15.78		0.37	0.37	
2031	0.09	23.77	23.74	27.85	55	16.19	16.19		0.41	0.41	
2032	0.09	23.85	23.83	27.95	55	16.65	16.65		0.47	0.43	
2033	0.09	23.94	23.91	28.05	55	17.12	17.11		0.46	0.45	
2034	0.08	24.02	24.00	28.15	55	17.58	17.58		0.46	0.45	
2035	0.08	24.11	24.08	28.24	55	18.04	18.02		0.44	0.44	
2036	0.08	24.19	24.16	28.34	55	18.49	18.45		0.43	0.43	
2037	0.08	24.27	24.24	28.43	55	18.87	18.85		0.41	0.41	
2038	0.08	24.34	24.31	28.52	55	19.24	19.24		0.39	0.39	
2039	0.08	24.42	24.39	28.61	55	19.62	19.62		0.37	0.38	
2040	0.07	24.49	24.46	28.70	55	19.99	19.99		0.37	0.38	
2041	0.07	24.57	24.54	28.78	55	20.36	20.36		0.37	0.38	

(continued)

Table 7.4 Azerbaijan, gigabarrels (continued)

Year	D	CD	21yr SCD	Adj SCD	Predlag	Raw pred CP	Syr smth pred SCP	SCP	Raw pred P	Syr smth pred SP	Actual P
2042	0.07	24.64	24.61	28.87	55	20.73	20.74		0.38	0.38	
2043	0.07	24.71	24.68	28.95	55	21.11	21.12		0.38	0.38	
2044	0.07	24.77	24.74	29.03	55	21.53	21.50		0.38	0.38	
2045	0.07	24.84	24.81	29.10	55	21.89	21.88		0.38	0.37	
2046	0.06	24.91	24.87	29.18	55	22.25	22.25		0.37	0.37	
2047	0.06	24.97	24.94	29.25	55	22.61	22.61		0.36	0.36	
2048	0.06	25.03	25.00	29.32	55	22.97	22.97		0.36	0.33	
2049	0.06	25.09	25.06	29.39	55	23.33	23.28		0.31	0.30	
2050	0.06	25.14	25.11	29.46	55	23.70	23.53		0.25	0.25	
2051	0.06	25.20	25.17	29.52	55	23.78	23.73		0.20	0.20	
2052	0.05	25.25	25.22	29.59	55	23.87	23.88		0.14	0.16	
2053	0.05	25.31	25.27	29.65	55	23.97	23.97		0.09	0.12	
2054	0.05	25.36	25.32	29.71	55	24.05	24.06		0.09	0.11	
2055	0.05	25.40	25.37	29.76	55	24.15	24.16		0.10	0.10	
2056	0.05	25.45	25.42	29.82	55	24.25	24.26		0.10	0.10	
2057	0.04	25.50	25.46	29.87	55	24.36	24.37		0.11	0.11	
2058	0.04	25.54	25.50	29.92	55	24.48	24.48		0.11	0.11	
2059	0.04	25.58	25.54	29.97	55	24.60	24.60		0.12	0.12	
2060	0.04	25.62	25.58	30.01	55	24.72	24.73		0.13	0.13	
2061	0.04	25.65	25.62	30.05	55	24.86	24.86		0.13	0.13	
2062	0.04	25.69	25.66	30.10	55	24.99	25.00		0.14	0.13	
2063	0.03	25.72	25.69	30.13	55	25.14	25.13		0.13	0.13	
2064	0.03	25.75	25.72	30.17	55	25.29	25.26		0.13	0.13	
2065	0.03	25.78	25.75	30.21	55	25.39	25.39		0.13	0.13	
2066	0.03	25.81	25.78	30.24	55	25.51	25.51		0.12	0.12	
2067	0.03	25.84	25.80	30.27	55	25.62	25.63		0.12	0.12	
2068	0.02	25.86	25.83	30.29	55	25.75	25.75		0.12	0.12	
2069	0.02	25.88	25.85	30.32	55	25.88	25.88		0.13	0.12	
2070	0.02	25.90	25.87	30.34	55	26.01	26.00		0.13	0.13	
2071	0.02	25.92	25.88	30.36	55	26.13	26.13		0.13	0.13	
2072	0.02	25.94	25.90	30.38	55	26.26	26.26		0.12	0.12	
2073	0.01	25.95	25.92	30.40	55	26.38	26.38		0.12	0.12	
2074	0.01	25.96	25.93	30.42	55	26.50	26.50		0.12	0.12	
2075	0.01	25.97	25.94	30.43	55	26.62	26.62		0.12	0.12	
2076	0.01	25.98	25.95	30.44	55	26.74	26.74		0.12	0.12	
2077	0.01	25.99	25.96	30.45	55	26.86	26.86		0.12	0.12	
2078	0.00	25.99	25.97	30.46	55	26.98	26.98		0.12	0.12	
2079	0.00	25.99	25.97	30.47	55	27.09	27.09		0.11	0.11	
2080	0.00	26.00	25.98	30.48	55	27.21	27.20		0.11	0.11	
2081	0.00	26.00	25.98	30.48	55	27.32	27.31		0.11	0.11	
2082	0.00	26.00	25.99	30.49	55	27.43	27.42		0.11	0.11	
2083	0.00	26.00	25.99	30.49	55	27.53	27.53		0.11	0.11	
2084	0.00	26.00	25.99	30.49	55	27.64	27.64		0.11	0.11	
2085	0.00	26.00	26.00	30.50	55	27.75	27.74		0.10	0.10	
2086	0.00	26.00	26.00	30.50	55	27.85	27.85		0.10	0.10	
2087	0.00	26.00	26.00	30.50	55	27.95	27.95		0.10	0.10	
2088	0.00	26.00	26.00	30.50	55	28.05	28.05		0.10	0.10	
2089	0.00	26.00	26.00	30.50	55	28.15	28.15		0.10	0.10	
2090	0.00	26.00	26.00	30.50	55	28.24	28.24		0.10	0.10	
2091	0.00	26.00	26.00	30.50	55	28.34	28.34		0.09	0.09	
2092	0.00	26.00	26.00	30.50	55	28.43	28.43		0.09	0.09	
2093	0.00	26.00	26.00	30.50	55	28.52	28.52		0.09	0.09	
2094	0.00	26.00	26.00	30.50	55	28.61	28.61		0.09	0.09	
2095	0.00	26.00	26.00	30.50	55	28.70	28.70		0.09	0.09	
2096	0.00	26.00	26.00	30.50	55	28.78	28.78		0.08	0.08	
2097	0.00	26.00	26.00	30.50	55	28.87	28.86		0.08	0.08	
2098	0.00	26.00	26.00	30.50	55	28.95	28.95		0.08	0.08	
2099	0.00	26.00	26.00	30.50	55	29.03	29.02		0.08	0.08	
2100	0.00	26.00	26.00	30.50	55	29.10	29.10		0.08	0.08	

Notes: D—discovery; CD—cumulative discovery; SCD—smoothed cumulative discovery (years = number of years centred moving average); adj—adjusted (to match cumulative production maximum); predlag—predicted lag between cumulative discovery and cumulative production; raw Pred CP—prediction using direct lag of cumulative discovery by predicted lag years; Pred SCP—raw predicted CP smoothed (with years = number of years centred moving average); SCP—smoothed actual cumulative production (years = number of years centred moving average); raw Pred P—one year change in predicted smoothed cumulative production; Pred SP—smoothed raw Pred P (years = number of years centred moving average); Actual P—actual annual oil production. Shaded numbers are interpolations, extrapolations or forecasts.

Table 7.5 Rest of Eurasia, gigabarrels

Year	D	CD	1 lyr SCD	Adj SCD	Predlag	Raw pred CP	1 lyr smth pred SCP	SCP	Raw pred P	3yr smth pred SP	Actual P
1900	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1901	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1902	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1903	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1904	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1905	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1906	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1907	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1908	0.00	0.00	0.01	0.01	17	0.00	0.00	0.00	0.00	0.00	0.00
1909	0.00	0.00	0.01	0.01	16	0.00	0.00	0.00	0.00	0.00	0.00
1910	0.00	0.00	0.02	0.02	16	0.00	0.00	0.00	0.00	0.00	0.00
1911	0.00	0.00	0.03	0.03	15	0.00	0.00	0.00	0.00	0.00	0.00
1912	0.01	0.01	0.04	0.04	14	0.00	0.00	0.00	0.00	0.00	0.00
1913	0.01	0.02	0.05	0.05	14	0.00	0.00	0.00	0.00	0.00	0.00
1914	0.02	0.03	0.07	0.07	13	0.00	0.00	0.00	0.00	0.00	0.00
1915	0.02	0.05	0.09	0.09	13	0.00	0.00	0.00	0.00	0.00	0.00
1916	0.03	0.08	0.11	0.11	12	0.00	0.00	0.00	0.00	0.00	0.00
1917	0.04	0.11	0.14	0.14	12	0.00	0.00	0.00	0.00	0.00	0.00
1918	0.03	0.14	0.17	0.17	11	0.00	0.00	0.00	0.00	0.00	0.00
1919	0.04	0.18	0.20	0.20	11	0.00	0.00	0.00	0.00	0.00	0.00
1920	0.04	0.22	0.24	0.24	10	0.00	0.00	0.00	0.00	0.00	0.00
1921	0.04	0.26	0.28	0.28	10	0.00	0.00	0.00	0.00	0.00	0.00
1922	0.05	0.30	0.32	0.32	10	0.00	0.00	0.00	0.00	0.00	0.00
1923	0.05	0.35	0.36	0.36	10	0.00	0.00	0.00	0.00	0.00	0.00
1924	0.05	0.40	0.39	0.39	9	0.00	0.01	0.00	0.00	0.01	0.00
1925	0.05	0.45	0.43	0.43	9	0.01	0.02	0.01	0.01	0.01	0.01
1926	0.05	0.50	0.50	0.50	9	0.02	0.03	0.03	0.02	0.02	0.02
1927	0.05	0.54	0.57	0.57	9	0.05	0.06	0.06	0.03	0.03	0.03
1928	0.04	0.58	0.65	0.65	9	0.09	0.10	0.10	0.04	0.04	0.04
1929	0.06	0.64	0.74	0.74	10	0.14	0.15	0.15	0.05	0.05	0.05
1930	0.00	0.64	0.83	0.83	10	0.20	0.21	0.22	0.05	0.05	0.06
1931	0.00	0.64	0.93	0.93	11	0.28	0.26	0.27	0.05	0.05	0.07
1932	0.06	0.70	1.02	1.02	12	0.32	0.32	0.32	0.06	0.06	0.03
1933	0.40	1.10	1.12	1.12	13	0.36	0.38	0.36	0.06	0.06	0.05
1934	0.20	1.30	1.22	1.22	14	0.43	0.44	0.42	0.06	0.06	0.06
1935	0.14	1.44	1.33	1.33	15	0.50	0.50	0.48	0.07	0.06	0.05
1936	0.10	1.54	1.44	1.44	15	0.57	0.57	0.55	0.07	0.06	0.08
1937	0.15	1.69	1.55	1.55	15	0.65	0.63	0.62	0.06	0.06	0.07
1938	0.10	1.79	1.66	1.66	15	0.70	0.70	0.68	0.07	0.06	0.06
1939	0.00	1.79	1.77	1.77	15	0.74	0.76	0.74	0.06	0.06	0.06
1940	0.15	1.94	1.91	1.91	15	0.83	0.82	0.80	0.05	0.06	0.06
1941	0.10	2.04	2.03	2.03	15	0.88	0.87	0.86	0.06	0.06	0.06
1942	0.15	2.19	2.14	2.14	14	0.93	0.93	0.92	0.06	0.05	0.06
1943	0.00	2.19	2.27	2.27	14	0.97	0.97	0.97	0.05	0.05	0.05
1944	0.08	2.27	2.40	2.40	14	1.02	1.02	1.00	0.05	0.05	0.02
1945	0.00	2.27	2.53	2.53	14	1.07	1.07	1.04	0.05	0.05	0.04
1946	0.10	2.37	2.68	2.68	13	1.12	1.12	1.08	0.05	0.05	0.05
1947	0.46	2.83	2.83	2.83	13	1.17	1.17	1.13	0.05	0.05	0.04
1948	0.07	2.90	2.98	2.98	13	1.22	1.22	1.18	0.05	0.06	0.06
1949	0.06	2.96	3.28	3.28	13	1.28	1.29	1.25	0.06	0.07	0.07
1950	0.37	3.33	3.59	3.59	13	1.33	1.36	1.33	0.08	0.08	0.07
1951	0.12	3.45	3.92	3.92	13	1.44	1.45	1.41	0.09	0.09	0.08
1952	0.25	3.70	4.29	4.29	13	1.55	1.55	1.52	0.10	0.10	0.10
1953	0.30	4.00	4.68	4.68	13	1.66	1.67	1.64	0.12	0.11	0.13
1954	0.00	4.00	5.10	5.10	13	1.77	1.79	1.78	0.12	0.13	0.13
1955	0.30	4.30	5.60	5.60	14	1.91	1.93	1.93	0.14	0.14	0.15
1956	2.17	6.47	6.13	6.13	14	2.03	2.08	2.09	0.15	0.15	0.17
1957	0.32	6.79	6.68	6.68	14	2.27	2.23	2.25	0.15	0.16	0.17
1958	0.40	7.19	7.26	7.26	15	2.40	2.41	2.42	0.18	0.17	0.16
1959	0.65	7.84	7.85	7.85	15	2.53	2.60	2.63	0.19	0.19	0.19
1960	0.30	8.14	8.45	8.45	16	2.83	2.80	2.86	0.20	0.22	0.26
1961	0.50	8.64	9.07	9.07	17	2.98	3.04	3.11	0.24	0.24	0.24
1962	1.69	10.33	9.73	9.73	18	3.28	3.32	3.37	0.28	0.27	0.25
1963	0.47	10.80	10.40	10.40	20	3.59	3.61	3.66	0.29	0.30	0.31
1964	0.48	11.28	10.93	10.93	22	3.92	3.95	3.97	0.34	0.33	0.31
1965	0.78	12.06	11.45	11.45	23	4.29	4.32	4.29	0.36	0.34	0.33
1966	0.23	12.29	11.96	11.96	25	4.68	4.67	4.62	0.35	0.35	0.31
1967	0.38	12.67	12.45	12.45	26	5.10	5.01	4.97	0.34	0.36	0.34
1968	0.67	13.34	12.94	12.94	27	5.35	5.37	5.34	0.37	0.37	0.39
1969	0.58	13.92	13.42	13.42	28	5.60	5.77	5.74	0.40	0.37	0.39
1970	0.41	14.33	13.80	13.80	29	6.13	6.15	6.16	0.37	0.39	0.42
1971	0.02	14.35	14.17	14.17	30	6.68	6.53	6.58	0.38	0.40	0.44
1972	0.20	14.55	14.53	14.53	30	6.97	6.98	7.00	0.45	0.39	0.41
1973	0.31	14.86	14.85	14.85	30	7.26	7.38	7.40	0.41	0.39	0.39
1974	0.36	15.22	15.16	15.16	31	7.85	7.74	7.83	0.35	0.39	0.41
1975	0.30	15.52	15.47	15.47	31	8.15	8.10	8.29	0.36	0.36	0.51
1976	0.25	15.77	15.76	15.76	32	8.45	8.46	8.71	0.36	0.34	0.45
1977	0.37	16.14	16.02	16.02	32	8.76	8.77	9.05	0.31	0.33	0.31
1978	0.18	16.32	16.34	16.34	32	9.07	9.09	9.32	0.32	0.31	0.25
1979	0.35	16.67	16.66	16.66	32	9.40	9.39	9.55	0.30	0.30	0.24
1980	0.12	16.79	16.98	16.98	32	9.73	9.67	9.77	0.28	0.28	0.22

(continued)

Table 7.5 Rest of Eurasia, gigabarrels (continued)

Year	D	CD	I Iyr SCD	Adj SCD	Predlag	Raw pred CP	I Iyr smth pred SCP	SCP	Raw pred P	3yr smth pred SP	Actual P
1981	0.15	16.94	17.28	17.28	32	9.96	9.94	9.98	0.27	0.26	0.20
1982	0.50	17.44	17.55	17.55	32	10.18	10.17	10.18	0.23	0.24	0.21
1983	0.20	17.64	17.82	17.82	32	10.40	10.37	10.37	0.20	0.22	0.19
1984	0.20	17.84	18.09	18.09	32	10.58	10.57	10.57	0.19	0.21	0.18
1985	1.27	19.11	18.35	18.35	32	10.75	10.77	10.76	0.20	0.20	0.23
1986	0.05	19.16	18.61	18.61	33	10.93	10.98	10.98	0.21	0.20	0.18
1987	0.10	19.26	18.86	18.86	33	11.19	11.19	11.19	0.21	0.21	0.24
1988	0.12	19.38	19.11	19.11	33	11.45	11.39	11.40	0.21	0.21	0.21
1989	0.00	19.38	19.35	19.35	33	11.62	11.60	11.57	0.21	0.20	0.18
1990	0.10	19.48	19.57	19.57	33	11.79	11.80	11.72	0.20	0.21	0.11
1991	0.30	19.78	19.78	19.78	33	11.96	12.00	11.89	0.20	0.21	0.15
1992	0.27	20.05	19.97	19.97	33	12.20	12.22	12.11	0.22	0.22	0.26
1993	0.22	20.27	20.09	20.09	33	12.45	12.45	12.35	0.23	0.23	0.25
1994	0.15	20.42	20.21	20.21	33	12.70	12.69	12.60	0.24	0.23	0.24
1995	0.15	20.57	20.33	20.33	33	12.94	12.94	12.82	0.24	0.23	0.23
1996	0.00	20.57	20.43	20.43	33	13.18	13.17	13.04	0.23	0.23	0.20
1997	0.10	20.67	20.56	20.56	33	13.42	13.39	13.28	0.22	0.22	0.23
1998	0.10	20.77	20.69	20.69	33	13.61	13.60	13.53	0.21	0.22	0.28
1999	0.00	20.77	20.81	20.81	33	13.80	13.80	13.78	0.20	0.22	0.24
2000	0.10	20.87	20.92	20.92	33	13.99	14.02	14.01	0.22	0.22	0.21
2001	0.10	20.97	21.04	21.04	33	14.17	14.27	14.25	0.25	0.23	0.25
2002	0.00	20.97	21.15	21.15	33	14.53	14.51	14.51	0.24	0.24	0.25
2003	0.05	21.02	21.26	21.26	33	14.85	14.74	14.77	0.23	0.24	0.28
2004	0.27	21.29	21.37	21.37	33	15.00	15.00	15.02	0.26	0.23	0.24
2005	0.18	21.47	21.47	21.47	34	15.16	15.22	15.28	0.22	0.22	0.23
2006	0.10	21.57	21.57	21.57	34	15.47	15.40	15.56	0.18	0.22	0.30
2007	0.10	21.67	21.67	21.67	34	15.62	15.61		0.20	0.22	
2008	0.10	21.76	21.76	21.76	34	15.76	15.84		0.24	0.23	
2009	0.09	21.86	21.86	21.86	34	16.02	16.08		0.24	0.25	
2010	0.09	21.95	21.95	21.95	34	16.34	16.35		0.27	0.27	
2011	0.09	22.03	22.03	22.03	34	16.66	16.66		0.30	0.28	
2012	0.09	22.12	22.12	22.12	34	16.98	16.96		0.31	0.29	
2013	0.08	22.20	22.20	22.20	34	17.28	17.26		0.30	0.29	
2014	0.08	22.28	22.28	22.28	34	17.55	17.54		0.28	0.28	
2015	0.08	22.36	22.36	22.36	34	17.82	17.82		0.27	0.26	
2016	0.08	22.44	22.44	22.44	34	18.09	18.06		0.24	0.24	
2017	0.08	22.52	22.52	22.52	34	18.35	18.27		0.21	0.23	
2018	0.07	22.59	22.59	22.59	34	18.48	18.48		0.21	0.21	
2019	0.07	22.66	22.66	22.66	34	18.61	18.68		0.21	0.21	
2020	0.07	22.73	22.73	22.73	34	18.86	18.88		0.20	0.21	
2021	0.07	22.80	22.80	22.80	34	19.11	19.10		0.22	0.22	
2022	0.07	22.86	22.86	22.86	34	19.35	19.33		0.23	0.21	
2023	0.06	22.93	22.93	22.93	34	19.57	19.56		0.22	0.21	
2024	0.06	22.99	22.99	22.99	34	19.78	19.75		0.20	0.19	
2025	0.06	23.05	23.05	23.05	34	19.97	19.92		0.17	0.17	
2026	0.06	23.11	23.11	23.11	34	20.09	20.08		0.15	0.15	
2027	0.06	23.17	23.17	23.17	34	20.21	20.21		0.13	0.14	
2028	0.06	23.22	23.22	23.22	34	20.33	20.32		0.12	0.13	
2029	0.05	23.28	23.28	23.28	34	20.43	20.44		0.12	0.12	
2030	0.05	23.33	23.33	23.33	34	20.56	20.56		0.12	0.12	
2031	0.05	23.38	23.38	23.38	34	20.69	20.68		0.12	0.12	
2032	0.05	23.44	23.44	23.44	34	20.81	20.80		0.12	0.12	
2033	0.05	23.48	23.48	23.48	34	20.92	20.92		0.12	0.12	
2034	0.05	23.53	23.53	23.53	34	21.04	21.04		0.11	0.11	
2035	0.05	23.58	23.58	23.58	34	21.15	21.15		0.11	0.11	
2036	0.05	23.62	23.62	23.62	34	21.26	21.25		0.10	0.10	
2037	0.04	23.67	23.67	23.67	34	21.37	21.33		0.09	0.09	
2038	0.04	23.71	23.71	23.71	34	21.42	21.42		0.08	0.09	
2039	0.04	23.75	23.75	23.75	34	21.47	21.50		0.08	0.08	
2040	0.04	23.80	23.80	23.80	34	21.57	21.58		0.08	0.09	
2041	0.04	23.84	23.84	23.84	34	21.67	21.66		0.09	0.09	
2042	0.04	23.87	23.87	23.87	34	21.76	21.76		0.10	0.09	
2043	0.04	23.91	23.91	23.91	34	21.86	21.85		0.09	0.09	
2044	0.04	23.95	23.95	23.95	34	21.95	21.94		0.09	0.09	
2045	0.04	23.99	23.99	23.99	34	22.03	22.03		0.09	0.09	
2046	0.04	24.02	24.02	24.02	34	22.12	22.12		0.09	0.09	
2047	0.03	24.05	24.05	24.05	34	22.20	22.20		0.08	0.08	
2048	0.03	24.09	24.09	24.09	34	22.28	22.28		0.08	0.08	
2049	0.03	24.12	24.12	24.12	34	22.36	22.36		0.08	0.08	
2050	0.03	24.15	24.15	24.15	34	22.44	22.44		0.08	0.08	
2051	0.03	24.18	24.18	24.18	34	22.52	22.51		0.08	0.08	
2052	0.03	24.21	24.21	24.21	34	22.59	22.59		0.07	0.07	
2053	0.03	24.24	24.24	24.24	34	22.66	22.66		0.07	0.07	
2054	0.03	24.27	24.27	24.27	34	22.73	22.73		0.07	0.07	
2055	0.03	24.30	24.30	24.30	34	22.80	22.80		0.07	0.07	
2056	0.03	24.32	24.32	24.32	35	22.86	22.86		0.07	0.07	
2057	0.03	24.35	24.35	24.35	35	22.93	22.93		0.06	0.06	
2058	0.03	24.38	24.38	24.38	35	22.99	22.99		0.06	0.06	
2059	0.02	24.40	24.40	24.40	35	23.05	23.05		0.06	0.06	
2060	0.02	24.42	24.42	24.42	35	23.11	23.11		0.06	0.06	
2061	0.02	24.45	24.45	24.45	35	23.17	23.17		0.06	0.06	

(continued)

Table 7.5 Rest of Eurasia, gigabarrels (continued)

Year	D	CD	1 lyr SCD	Adj SCD	Predlag	Raw pred CP	1 lyr smth pred SCP	SCP	Raw pred P	3yr smth pred SP	Actual P
2062	0.02	24.47	24.47	24.47	35	23.22	23.22		0.06	0.06	
2063	0.02	24.49	24.49	24.49	35	23.28	23.28		0.05	0.05	
2064	0.02	24.52	24.52	24.52	35	23.33	23.33		0.05	0.05	
2065	0.02	24.54	24.54	24.54	35	23.38	23.38		0.05	0.05	
2066	0.02	24.56	24.56	24.56	35	23.44	23.43		0.05	0.05	
2067	0.02	24.58	24.58	24.58	35	23.48	23.48		0.05	0.05	
2068	0.02	24.60	24.60	24.60	35	23.53	23.53		0.05	0.05	
2069	0.02	24.62	24.62	24.62	35	23.58	23.58		0.05	0.05	
2070	0.02	24.64	24.64	24.64	35	23.62	23.62		0.05	0.05	
2071	0.02	24.65	24.65	24.65	35	23.67	23.67		0.04	0.04	
2072	0.02	24.67	24.67	24.67	35	23.71	23.71		0.04	0.04	
2073	0.02	24.69	24.69	24.69	35	23.75	23.75		0.04	0.04	
2074	0.02	24.70	24.70	24.70	35	23.80	23.79		0.04	0.04	
2075	0.02	24.72	24.72	24.72	35	23.84	23.83		0.04	0.04	
2076	0.02	24.74	24.74	24.74	35	23.87	23.87		0.04	0.04	
2077	0.02	24.75	24.75	24.75	35	23.91	23.91		0.04	0.04	
2078	0.02	24.77	24.77	24.77	35	23.95	23.95		0.04	0.04	
2079	0.01	24.78	24.78	24.78	35	23.99	23.98		0.04	0.04	
2080	0.01	24.80	24.80	24.80	35	24.02	24.02		0.04	0.04	
2081	0.01	24.81	24.81	24.81	35	24.05	24.05		0.03	0.03	
2082	0.01	24.82	24.82	24.82	35	24.09	24.09		0.03	0.03	
2083	0.01	24.84	24.84	24.84	35	24.12	24.12		0.03	0.03	
2084	0.01	24.85	24.85	24.85	35	24.15	24.15		0.03	0.03	
2085	0.01	24.86	24.86	24.86	35	24.18	24.18		0.03	0.03	
2086	0.01	24.87	24.87	24.87	35	24.21	24.21		0.03	0.03	
2087	0.01	24.89	24.89	24.89	35	24.24	24.24		0.03	0.03	
2088	0.01	24.90	24.90	24.90	35	24.27	24.27		0.03	0.03	
2089	0.01	24.91	24.91	24.91	35	24.30	24.29		0.02	0.02	
2090	0.01	24.92	24.92	24.92	35	24.31	24.31		0.02	0.02	
2091	0.01	24.93	24.93	24.93	35	24.32	24.33		0.02	0.02	
2092	0.01	24.94	24.94	24.94	35	24.35	24.35		0.02	0.02	
2093	0.01	24.95	24.95	24.95	35	24.38	24.38		0.02	0.02	
2094	0.01	24.96	24.96	24.96	35	24.40	24.40		0.02	0.02	
2095	0.01	24.97	24.97	24.97	35	24.42	24.42		0.02	0.02	
2096	0.01	24.98	24.98	24.98	35	24.45	24.45		0.02	0.02	
2097	0.01	24.99	24.99	24.99	35	24.47	24.47		0.02	0.02	
2098	0.01	25.00	25.00	25.00	35	24.49	24.49		0.02	0.02	
2099	0.00	25.00	25.00	25.00	35	24.52	24.52		0.02	0.02	
2100	0.00	25.00	25.00	25.00	35	24.54	24.54		0.02	0.02	

Notes: D—discovery; CD—cumulative discovery; SCD—smoothed cumulative discovery (years = number of years centred moving average); adj—adjusted (to match cumulative production maximum); predlag—predicted lag between cumulative discovery and cumulative production; raw Pred CP—prediction using direct lag of cumulative discovery by predicted lag years; Pred SCP—raw predicted CP smoothed (with years = number of years centred moving average); SCP—smoothed actual cumulative production (years = number of years centred moving average); raw Pred P—one year change in predicted smoothed cumulative production; Pred SP—smoothed raw Pred P (years = number of years centred moving average); Actual P—actual annual oil production. Shaded numbers are interpolations, extrapolations or forecasts.

Table 7.6 Eurasia actual production, gigabarrels

Year	Russia	Conventional China	Deep China	Total China	Kazakhstan	Azerbaijan	Rest of Eurasia	Total Eurasia
(actual production)								
1870	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1871	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1872	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1873	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1874	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1875	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1876	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1877	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1878	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1879	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1880	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1881	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1882	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1883	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1884	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1885	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1886	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1887	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1888	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1889	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1890	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1891	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1892	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1893	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1894	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1895	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1896	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1897	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1898	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1899	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1901	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1902	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1903	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1904	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1905	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1906	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1907	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1908	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1909	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1910	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1911	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1912	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1913	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1914	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1915	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1916	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
1917	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.01
1918	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.02
1919	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.03
1920	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.04
1921	0.02	0.00	0.00	0.00	0.00	0.03	0.00	0.04
1922	0.02	0.00	0.00	0.00	0.00	0.03	0.00	0.05
1923	0.02	0.00	0.00	0.00	0.00	0.04	0.00	0.06
1924	0.02	0.00	0.00	0.00	0.00	0.04	0.00	0.06
1925	0.03	0.00	0.00	0.00	0.00	0.05	0.01	0.08
1926	0.03	0.00	0.00	0.00	0.00	0.05	0.02	0.10
1927	0.03	0.00	0.00	0.00	0.00	0.05	0.03	0.12
1928	0.03	0.00	0.00	0.00	0.00	0.06	0.04	0.13
1929	0.04	0.00	0.00	0.00	0.00	0.06	0.05	0.15
1930	0.04	0.00	0.00	0.00	0.00	0.07	0.06	0.17
1931	0.05	0.00	0.00	0.00	0.00	0.08	0.07	0.20
1932	0.07	0.00	0.00	0.00	0.00	0.08	0.03	0.18
1933	0.06	0.00	0.00	0.00	0.00	0.08	0.05	0.19
1934	0.07	0.00	0.00	0.00	0.00	0.09	0.06	0.22
1935	0.08	0.00	0.00	0.00	0.00	0.09	0.05	0.22
1936	0.08	0.00	0.00	0.00	0.00	0.09	0.08	0.25
1937	0.09	0.00	0.00	0.00	0.00	0.10	0.07	0.26
1938	0.10	0.00	0.00	0.00	0.00	0.11	0.06	0.26
1939	0.10	0.00	0.00	0.00	0.00	0.11	0.06	0.27
1940	0.10	0.00	0.00	0.00	0.00	0.11	0.06	0.27
1941	0.10	0.00	0.00	0.00	0.00	0.12	0.06	0.28
1942	0.09	0.00	0.00	0.00	0.00	0.12	0.06	0.27
1943	0.07	0.00	0.00	0.00	0.00	0.11	0.05	0.23
1944	0.12	0.00	0.00	0.00	0.00	0.14	0.02	0.28
1945	0.08	0.00	0.00	0.00	0.00	0.10	0.04	0.22
1946	0.04	0.00	0.00	0.00	0.01	0.09	0.05	0.18
1947	0.06	0.00	0.00	0.00	0.01	0.09	0.04	0.20
1948	0.08	0.00	0.00	0.00	0.01	0.10	0.06	0.24
1949	0.09	0.00	0.00	0.00	0.01	0.10	0.07	0.27

(continued)

Table 7.6 Eurasia actual production, gigabarrels (continued)

Year	Russia	Conventional China	Deep China	Total China	Kazakhstan	Azerbaijan	Rest of Eurasia	Total Eurasia
<i>(actual production)</i>								
1951	0.13	0.00	0.00	0.00	0.01	0.11	0.08	0.33
1952	0.16	0.00	0.00	0.00	0.01	0.11	0.10	0.38
1953	0.20	0.00	0.00	0.00	0.01	0.11	0.13	0.45
1954	0.25	0.00	0.00	0.00	0.01	0.11	0.13	0.50
1955	0.34	0.00	0.00	0.00	0.01	0.11	0.15	0.61
1956	0.41	0.00	0.00	0.00	0.01	0.11	0.17	0.70
1957	0.51	0.00	0.00	0.00	0.01	0.12	0.17	0.80
1958	0.60	0.01	0.00	0.01	0.01	0.12	0.16	0.90
1959	0.71	0.02	0.00	0.02	0.01	0.12	0.19	1.05
1960	0.82	0.02	0.00	0.02	0.01	0.13	0.26	1.24
1961	0.97	0.03	0.00	0.03	0.01	0.14	0.24	1.38
1962	1.07	0.03	0.00	0.03	0.01	0.14	0.25	1.50
1963	1.15	0.04	0.00	0.04	0.01	0.15	0.31	1.65
1964	1.29	0.04	0.00	0.04	0.01	0.15	0.31	1.80
1965	1.40	0.05	0.00	0.05	0.01	0.16	0.33	1.95
1966	1.54	0.08	0.00	0.08	0.02	0.16	0.31	2.10
1967	1.68	0.06	0.00	0.06	0.04	0.16	0.34	2.28
1968	1.78	0.08	0.00	0.08	0.05	0.15	0.39	2.45
1969	1.93	0.08	0.00	0.08	0.08	0.15	0.39	2.62
1970	2.08	0.16	0.00	0.16	0.11	0.15	0.42	2.91
1971	2.20	0.19	0.00	0.19	0.12	0.14	0.44	3.08
1972	2.35	0.21	0.00	0.21	0.13	0.13	0.41	3.23
1973	2.53	0.36	0.00	0.36	0.14	0.13	0.39	3.55
1974	2.71	0.44	0.00	0.44	0.16	0.13	0.41	3.85
1975	2.90	0.53	0.00	0.53	0.17	0.12	0.51	4.22
1976	3.17	0.64	0.00	0.64	0.17	0.12	0.45	4.55
1977	3.50	0.65	0.00	0.65	0.17	0.11	0.31	4.73
1978	3.74	0.74	0.00	0.74	0.15	0.11	0.25	4.98
1979	3.90	0.78	0.00	0.78	0.14	0.10	0.24	5.15
1980	4.02	0.78	0.00	0.78	0.14	0.10	0.22	5.25
1981	4.10	0.74	0.00	0.74	0.14	0.09	0.20	5.27
1982	4.12	0.75	0.00	0.75	0.14	0.08	0.21	5.30
1983	4.14	0.78	0.00	0.78	0.14	0.08	0.19	5.33
1984	4.12	0.83	0.00	0.83	0.15	0.08	0.18	5.36
1985	4.03	0.89	0.00	0.89	0.16	0.09	0.23	5.39
1986	4.12	0.95	0.00	0.95	0.16	0.09	0.18	5.50
1987	4.18	0.98	0.00	0.98	0.16	0.09	0.24	5.65
1988	4.18	0.98	0.00	0.98	0.16	0.09	0.21	5.62
1989	4.08	1.01	0.00	1.01	0.19	0.09	0.18	5.55
1990	3.88	1.01	0.00	1.01	0.19	0.09	0.11	5.28
1991	3.40	1.02	0.00	1.02	0.19	0.09	0.15	4.85
1992	3.00	1.05	0.00	1.05	0.19	0.08	0.26	4.57
1993	2.60	1.06	0.00	1.06	0.16	0.08	0.25	4.15
1994	2.30	1.08	0.00	1.08	0.16	0.07	0.24	3.85
1995	2.22	1.10	0.00	1.10	0.16	0.07	0.23	3.78
1996	2.18	1.13	0.00	1.13	0.17	0.07	0.20	3.75
1997	2.20	1.13	0.02	1.15	0.19	0.07	0.23	3.84
1998	2.18	1.07	0.06	1.13	0.19	0.09	0.28	3.86
1999	2.14	1.07	0.06	1.13	0.21	0.09	0.24	3.81
2000	2.28	1.06	0.07	1.13	0.24	0.10	0.21	3.97
2001	2.45	1.06	0.07	1.13	0.26	0.11	0.25	4.20
2002	2.60	1.09	0.07	1.16	0.30	0.11	0.25	4.42
2003	2.90	1.10	0.07	1.17	0.32	0.11	0.28	4.79
2004	3.24	1.10	0.07	1.17	0.36	0.11	0.24	5.12
2005	3.30	1.11	0.09	1.20	0.47	0.15	0.23	5.36
2006	3.38	1.10	0.10	1.20	0.48	0.23	0.30	5.58

Table 7.6 Eurasia predicted production

Year	Russia	Conventional China	Deep China	Total China	Kazakhstan	Azerbaijan	Rest of Eurasia	Total Eurasia
(predicted production)								
1870	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1871	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1872	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1873	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1874	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1875	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1876	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1877	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1878	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1879	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1880	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1881	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1882	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1883	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1884	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1885	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1886	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1887	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1888	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1889	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1890	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1891	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1892	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1893	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1894	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1895	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1896	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1897	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1898	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1899	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1901	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1902	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1903	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1904	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1905	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1906	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1907	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1908	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1909	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1910	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1911	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1912	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1913	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1914	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1915	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1916	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
1917	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
1918	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
1919	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.02
1920	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.03
1921	0.01	0.00	0.00	0.00	0.00	0.03	0.00	0.04
1922	0.02	0.00	0.00	0.00	0.00	0.03	0.00	0.05
1923	0.02	0.00	0.00	0.00	0.00	0.04	0.00	0.06
1924	0.03	0.00	0.00	0.00	0.00	0.04	0.01	0.08
1925	0.03	0.00	0.00	0.00	0.00	0.04	0.01	0.09
1926	0.04	0.00	0.00	0.00	0.00	0.04	0.02	0.10
1927	0.04	0.00	0.00	0.00	0.00	0.05	0.03	0.12
1928	0.04	0.00	0.00	0.00	0.00	0.05	0.04	0.13
1929	0.04	0.00	0.00	0.00	0.00	0.06	0.05	0.15
1930	0.05	0.00	0.00	0.00	0.00	0.07	0.05	0.17
1931	0.05	0.00	0.00	0.00	0.00	0.08	0.05	0.18
1932	0.06	0.00	0.00	0.00	0.00	0.08	0.06	0.20
1933	0.06	0.00	0.00	0.00	0.00	0.09	0.06	0.21
1934	0.06	0.00	0.00	0.00	0.00	0.09	0.06	0.22
1935	0.07	0.00	0.00	0.00	0.00	0.09	0.06	0.23
1936	0.07	0.00	0.00	0.00	0.00	0.10	0.06	0.24
1937	0.08	0.00	0.00	0.00	0.00	0.10	0.06	0.25
1938	0.09	0.00	0.00	0.00	0.00	0.10	0.06	0.25
1939	0.09	0.00	0.00	0.00	0.00	0.11	0.06	0.26
1940	0.09	0.00	0.00	0.00	0.00	0.11	0.06	0.26
1941	0.09	0.00	0.00	0.00	0.00	0.11	0.06	0.26
1942	0.09	0.00	0.00	0.00	0.00	0.11	0.05	0.25
1943	0.09	0.00	0.00	0.00	0.00	0.10	0.05	0.25
1944	0.09	0.00	0.00	0.00	0.00	0.10	0.05	0.24
1945	0.09	0.00	0.00	0.00	0.00	0.10	0.05	0.25
1946	0.10	0.00	0.00	0.00	0.00	0.11	0.05	0.26
1947	0.11	0.00	0.00	0.00	0.01	0.11	0.05	0.28
1948	0.12	0.00	0.00	0.00	0.01	0.11	0.06	0.29

(continued)

Table 7.6 Eurasia predicted production (continued)

Year	Russia	Conventional China	Deep China	Total China	Kazakhstan	Azerbaijan	Rest of Eurasia	Total Eurasia
(predicted production)								
1950	0.15	0.00	0.00	0.00	0.01	0.11	0.08	0.34
1951	0.17	0.00	0.00	0.00	0.01	0.11	0.09	0.37
1952	0.19	0.00	0.00	0.00	0.01	0.11	0.10	0.40
1953	0.23	0.00	0.00	0.00	0.01	0.11	0.11	0.46
1954	0.27	0.00	0.00	0.00	0.01	0.11	0.13	0.51
1955	0.31	0.00	0.00	0.00	0.01	0.11	0.14	0.56
1956	0.38	0.00	0.00	0.00	0.01	0.11	0.15	0.66
1957	0.49	0.00	0.00	0.00	0.01	0.12	0.16	0.78
1958	0.60	0.01	0.00	0.01	0.01	0.11	0.17	0.90
1959	0.70	0.01	0.00	0.01	0.01	0.12	0.19	1.04
1960	0.85	0.01	0.00	0.01	0.01	0.13	0.22	1.23
1961	0.97	0.02	0.00	0.02	0.01	0.14	0.24	1.38
1962	1.06	0.02	0.00	0.02	0.01	0.14	0.27	1.51
1963	1.18	0.03	0.00	0.03	0.02	0.15	0.30	1.68
1964	1.33	0.03	0.00	0.03	0.02	0.16	0.33	1.87
1965	1.45	0.04	0.00	0.04	0.03	0.15	0.34	2.01
1966	1.59	0.06	0.00	0.06	0.04	0.15	0.35	2.19
1967	1.74	0.08	0.00	0.08	0.05	0.15	0.36	2.38
1968	1.87	0.11	0.00	0.11	0.06	0.14	0.37	2.55
1969	1.94	0.15	0.00	0.15	0.08	0.14	0.37	2.69
1970	1.99	0.19	0.00	0.19	0.09	0.14	0.39	2.81
1971	2.10	0.22	0.00	0.22	0.10	0.14	0.40	2.96
1972	2.30	0.24	0.00	0.24	0.12	0.13	0.39	3.18
1973	2.47	0.25	0.00	0.25	0.13	0.13	0.39	3.38
1974	2.67	0.26	0.00	0.26	0.14	0.12	0.39	3.58
1975	3.00	0.32	0.00	0.32	0.15	0.12	0.36	3.94
1976	3.28	0.40	0.00	0.40	0.15	0.11	0.34	4.29
1977	3.46	0.51	0.00	0.51	0.16	0.11	0.33	4.56
1978	3.66	0.62	0.00	0.62	0.16	0.11	0.31	4.87
1979	3.88	0.75	0.00	0.75	0.16	0.10	0.30	5.18
1980	4.01	0.78	0.00	0.78	0.16	0.10	0.28	5.32
1981	4.03	0.78	0.00	0.78	0.16	0.09	0.26	5.32
1982	3.94	0.76	0.00	0.76	0.15	0.09	0.24	5.18
1983	3.95	0.75	0.00	0.75	0.15	0.08	0.22	5.15
1984	3.95	0.74	0.00	0.74	0.15	0.08	0.21	5.13
1985	3.81	0.80	0.00	0.80	0.15	0.08	0.20	5.05
1986	3.90	0.86	0.00	0.86	0.15	0.08	0.20	5.19
1987	4.09	0.93	0.00	0.93	0.15	0.08	0.21	5.46
1988	4.04	0.98	0.00	0.98	0.16	0.09	0.21	5.47
1989	3.94	1.02	0.00	1.02	0.16	0.09	0.20	5.42
1990	3.91	1.04	0.00	1.04	0.17	0.09	0.21	5.41
1991	3.57	1.06	0.00	1.06	0.17	0.08	0.21	5.09
1992	3.19	1.07	0.00	1.07	0.17	0.08	0.22	4.73
1993	2.90	1.08	0.00	1.08	0.18	0.08	0.23	4.46
1994	2.66	1.10	0.00	1.10	0.18	0.07	0.23	4.25
1995	2.48	1.11	0.00	1.11	0.19	0.07	0.23	4.08
1996	2.46	1.10	0.00	1.10	0.21	0.08	0.23	4.07
1997	2.44	1.09	0.02	1.11	0.22	0.08	0.22	4.06
1998	2.42	1.06	0.06	1.12	0.24	0.09	0.22	4.08
1999	2.37	1.03	0.06	1.09	0.26	0.09	0.22	4.03
2000	2.37	1.01	0.07	1.08	0.27	0.10	0.22	4.03
2001	2.43	1.03	0.07	1.10	0.29	0.10	0.23	4.16
2002	2.58	1.07	0.07	1.14	0.31	0.11	0.24	4.38
2003	2.81	1.11	0.07	1.18	0.34	0.12	0.24	4.69
2004	3.12	1.14	0.07	1.21	0.36	0.14	0.23	5.05
2005	3.36	1.16	0.09	1.24	0.38	0.17	0.22	5.37
2006	3.46	1.10	0.10	1.19	0.40	0.19	0.22	5.46
2007	3.43	1.02	0.11	1.14	0.41	0.23	0.22	5.42
2008	3.32	0.93	0.14	1.07	0.42	0.25	0.23	5.29
2009	3.14	0.88	0.16	1.04	0.43	0.28	0.25	5.13
2010	2.96	0.85	0.19	1.03	0.43	0.28	0.27	4.98
2011	2.93	0.81	0.23	1.04	0.44	0.30	0.28	4.99
2012	3.03	0.82	0.28	1.10	0.44	0.30	0.29	5.17
2013	3.14	0.85	0.33	1.19	0.44	0.31	0.29	5.37
2014	3.24	0.83	0.39	1.22	0.45	0.32	0.28	5.51
2015	3.32	0.81	0.44	1.24	0.45	0.33	0.26	5.61
2016	3.30	0.83	0.47	1.30	0.45	0.34	0.24	5.64
2017	3.13	0.81	0.49	1.30	0.45	0.34	0.23	5.45
2018	2.90	0.76	0.50	1.25	0.46	0.33	0.21	5.16
2019	2.65	0.75	0.50	1.25	0.46	0.30	0.21	4.87
2020	2.39	0.74	0.49	1.24	0.46	0.28	0.21	4.58
2021	2.12	0.70	0.47	1.17	0.47	0.25	0.22	4.23
2022	1.93	0.70	0.45	1.14	0.46	0.24	0.21	3.99
2023	1.82	0.74	0.41	1.14	0.46	0.24	0.21	3.87
2024	1.68	0.73	0.37	1.10	0.47	0.25	0.19	3.69
2025	1.54	0.74	0.33	1.06	0.46	0.25	0.17	3.48
2026	1.41	0.77	0.30	1.07	0.45	0.26	0.15	3.34
2027	1.23	0.78	0.28	1.05	0.46	0.27	0.14	3.15
2028	1.02	0.74	0.27	1.00	0.45	0.30	0.13	2.90

(continued)

Table 7.6 Eurasia predicted production (continued)

Year	Russia	Conventional China	Deep China	Total China	Kazakhstan	Azerbaijan	Rest of Eurasia	Total Eurasia
(predicted production)								
2029	0.84	0.71	0.26	0.97	0.45	0.33	0.12	2.70
2030	0.69	0.70	0.25	0.95	0.45	0.37	0.12	2.58
2031	0.58	0.67	0.24	0.91	0.45	0.41	0.12	2.47
2032	0.51	0.64	0.23	0.87	0.44	0.43	0.12	2.37
2033	0.47	0.63	0.23	0.85	0.45	0.45	0.12	2.34
2034	0.46	0.64	0.22	0.86	0.45	0.45	0.11	2.33
2035	0.47	0.64	0.21	0.85	0.44	0.44	0.11	2.31
2036	0.49	0.63	0.20	0.83	0.44	0.43	0.10	2.29
2037	0.52	0.64	0.19	0.83	0.44	0.41	0.09	2.29
2038	0.54	0.66	0.19	0.85	0.43	0.39	0.09	2.30
2039	0.56	0.65	0.18	0.83	0.44	0.38	0.08	2.30
2040	0.58	0.62	0.17	0.79	0.44	0.38	0.09	2.28
2041	0.60	0.63	0.16	0.79	0.42	0.38	0.09	2.28
2042	0.62	0.65	0.16	0.80	0.42	0.38	0.09	2.31
2043	0.63	0.63	0.15	0.78	0.42	0.38	0.09	2.31
2044	0.64	0.64	0.14	0.78	0.41	0.38	0.09	2.30
2045	0.64	0.67	0.13	0.80	0.41	0.37	0.09	2.32
2046	0.64	0.69	0.12	0.81	0.41	0.37	0.09	2.32
2047	0.63	0.66	0.12	0.78	0.41	0.36	0.08	2.25
2048	0.62	0.65	0.11	0.76	0.41	0.33	0.08	2.20
2049	0.61	0.67	0.10	0.77	0.42	0.30	0.08	2.17
2050	0.60	0.66	0.09	0.75	0.42	0.25	0.08	2.10
2051	0.59	0.64	0.09	0.72	0.42	0.20	0.08	2.01
2052	0.59	0.64	0.08	0.72	0.43	0.16	0.07	1.96
2053	0.58	0.65	0.07	0.72	0.43	0.12	0.07	1.93
2054	0.57	0.65	0.06	0.71	0.43	0.11	0.07	1.88
2055	0.56	0.63	0.05	0.68	0.43	0.10	0.07	1.85
2056	0.54	0.63	0.05	0.67	0.44	0.10	0.07	1.82
2057	0.51	0.64	0.04	0.68	0.43	0.11	0.06	1.80
2058	0.49	0.64	0.03	0.67	0.44	0.11	0.06	1.78
2059	0.46	0.62	0.03	0.64	0.44	0.12	0.06	1.73
2060	0.43	0.61	0.02	0.63	0.43	0.13	0.06	1.68
2061	0.42	0.63	0.02	0.64	0.42	0.13	0.06	1.67
2062	0.44	0.62	0.01	0.63	0.40	0.13	0.06	1.66
2063	0.45	0.60	0.01	0.61	0.37	0.13	0.05	1.61
2064	0.46	0.59	0.01	0.60	0.34	0.13	0.05	1.59
2065	0.48	0.60	0.00	0.61	0.32	0.13	0.05	1.58
2066	0.48	0.60	0.00	0.60	0.30	0.12	0.05	1.55
2067	0.47	0.58	0.00	0.58	0.27	0.12	0.05	1.50
2068	0.46	0.58	0.00	0.58	0.25	0.12	0.05	1.47
2069	0.45	0.60	0.00	0.60	0.22	0.12	0.05	1.44
2070	0.44	0.60	0.00	0.60	0.20	0.13	0.05	1.41
2071	0.43	0.59	0.00	0.59	0.18	0.13	0.04	1.37
2072	0.43	0.60	0.00	0.60	0.17	0.12	0.04	1.36
2073	0.42	0.61	0.00	0.61	0.16	0.12	0.04	1.35
2074	0.41	0.61	0.00	0.61	0.16	0.12	0.04	1.33
2075	0.40	0.60	0.00	0.60	0.16	0.12	0.04	1.31
2076	0.39	0.58	0.00	0.58	0.15	0.12	0.04	1.28
2077	0.38	0.56	0.00	0.56	0.15	0.12	0.04	1.24
2078	0.37	0.55	0.00	0.55	0.15	0.12	0.04	1.22
2079	0.36	0.54	0.00	0.54	0.14	0.11	0.04	1.19
2080	0.35	0.53	0.00	0.53	0.14	0.11	0.04	1.17
2081	0.34	0.54	0.00	0.54	0.14	0.11	0.03	1.16
2082	0.33	0.55	0.00	0.55	0.14	0.11	0.03	1.16
2083	0.32	0.54	0.00	0.54	0.14	0.11	0.03	1.14
2084	0.31	0.53	0.00	0.53	0.14	0.11	0.03	1.12
2085	0.30	0.52	0.00	0.52	0.13	0.10	0.03	1.09
2086	0.29	0.51	0.00	0.51	0.13	0.10	0.03	1.07
2087	0.28	0.50	0.00	0.50	0.13	0.10	0.03	1.04
2088	0.27	0.49	0.00	0.49	0.13	0.10	0.03	1.02
2089	0.26	0.48	0.00	0.48	0.13	0.10	0.02	0.99
2090	0.25	0.47	0.00	0.47	0.12	0.10	0.02	0.96
2091	0.24	0.47	0.00	0.47	0.12	0.09	0.02	0.95
2092	0.23	0.47	0.00	0.47	0.12	0.09	0.02	0.94
2093	0.22	0.45	0.00	0.45	0.12	0.09	0.02	0.91
2094	0.21	0.44	0.00	0.44	0.11	0.09	0.02	0.88
2095	0.20	0.43	0.00	0.43	0.11	0.09	0.02	0.86
2096	0.19	0.41	0.00	0.41	0.11	0.08	0.02	0.82
2097	0.18	0.39	0.00	0.39	0.10	0.08	0.02	0.79
2098	0.17	0.39	0.00	0.39	0.10	0.08	0.02	0.77
2099	0.14	0.38	0.00	0.38	0.10	0.08	0.02	0.71
2100	0.10	0.37	0.00	0.37	0.10	0.08	0.02	0.66

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Chapter 8

The East



Chapter 8 The East

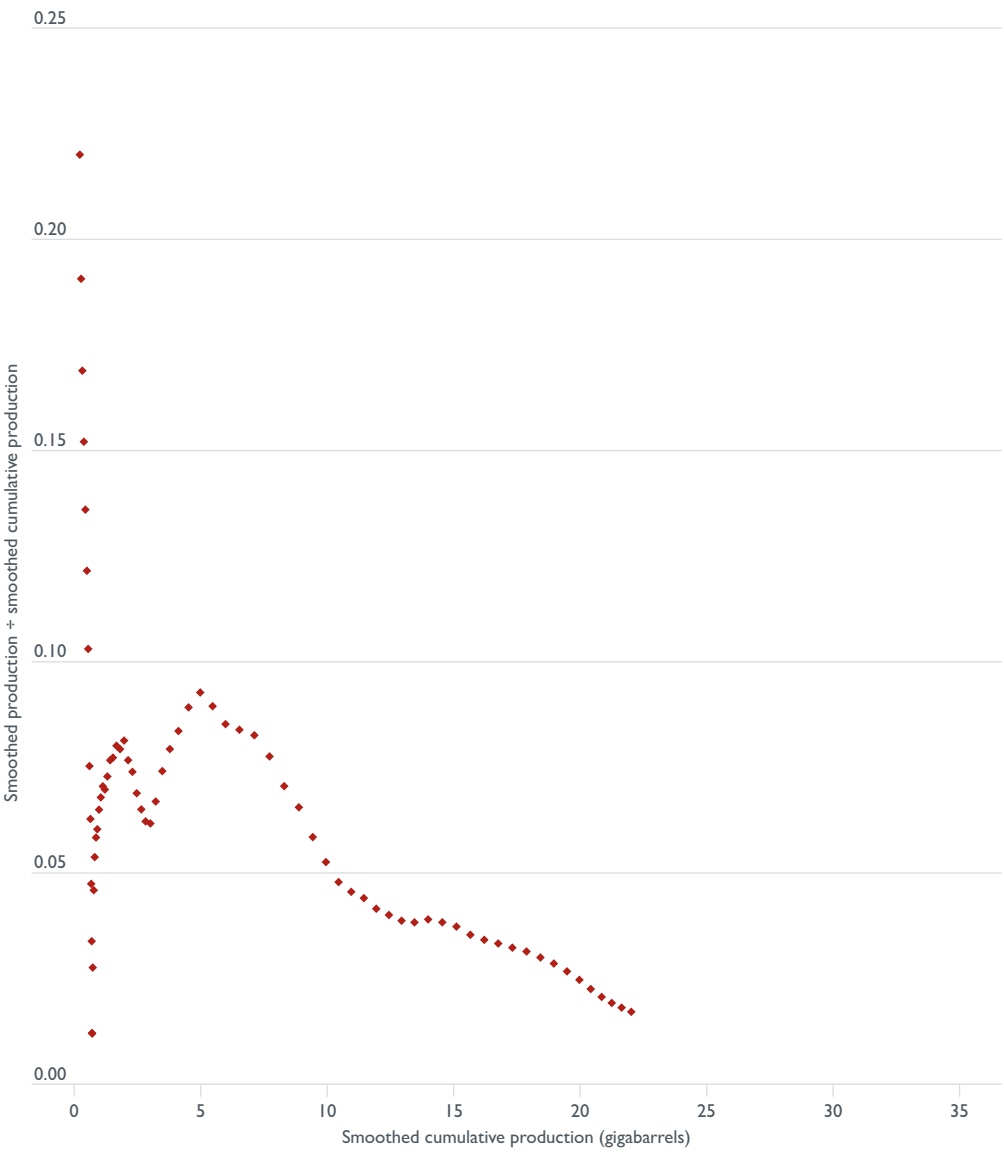
The East will be analysed as six major oil-producing subregions: conventional oil production in Indonesia, India, Malaysia, Australia and the Rest of the East, and deep water production in the Rest of the East. The five conventional areas will be analysed first. Rest of East deep water prospects will be examined in more detail in Chapter 11, but the results of that analysis as concerns The East will be summarised at the end of this chapter.

Indonesia

Table 8.1 sets out the calculations from the 11 steps to a forecast of Indonesian oil production.

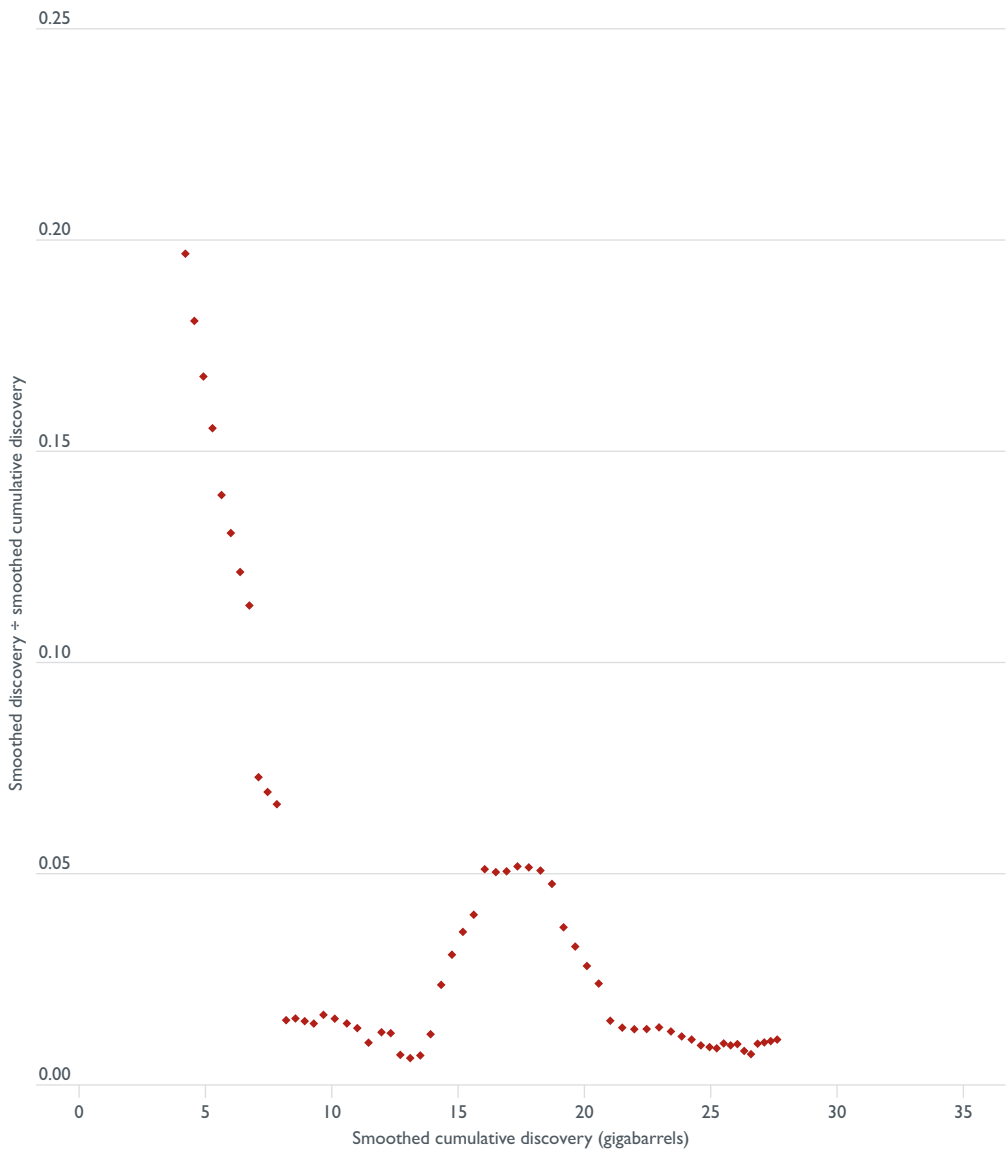
1. First, annual production (P) and cumulative production (CP) are smoothed with a three year average, generating SP and SCP (see Table 8.1).
2. The fractional growth in production (SP/SCP) is calculated and plotted against last year's cumulative production, as shown in Figure 8.1.
3. The plot is then examined and a best guess at an ultimate cumulative production (U) is made. In this case, it is 35 gigabarrels.
4. Discovery (D) is smoothed with an 11 year moving average and cumulative discovery (CD) is smoothed with a 31 year moving average.
5. The fractional growth in discovery (SD/SCD) is calculated and plotted against last year's smoothed cumulative discovery. This plot is shown in Figure 8.2.

Figure 8.1 Indonesian cumulative production growth curve



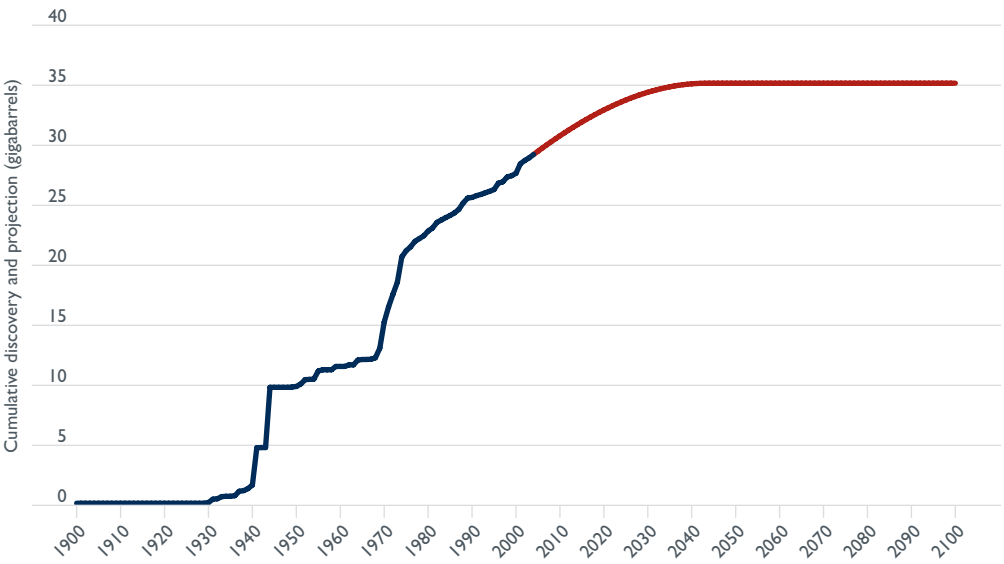
6. The plot is examined and a best guess at an ultimate discovery (UD) is made. In this case it is also 35 gigabarrels.

Figure 8.2 Indonesian cumulative discovery growth curve



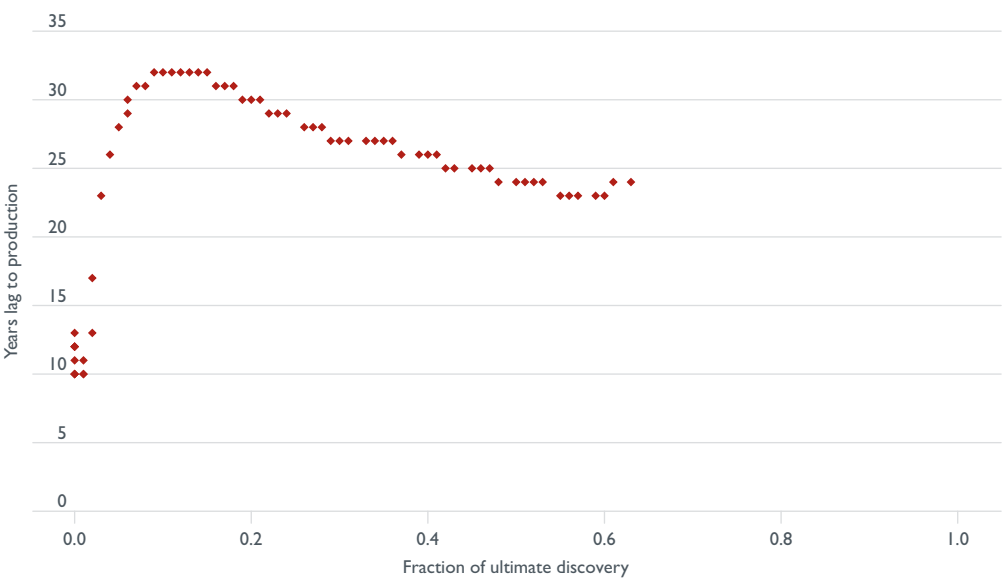
7. Cumulative discovery in 2006 is then projected to UD by bringing SD estimated for 2006 to zero in 2044. For Indonesian oil, the projection of the cumulative discovery curve is shown in Figure 8.3.

Figure 8.3 Indonesian cumulative discovery projection



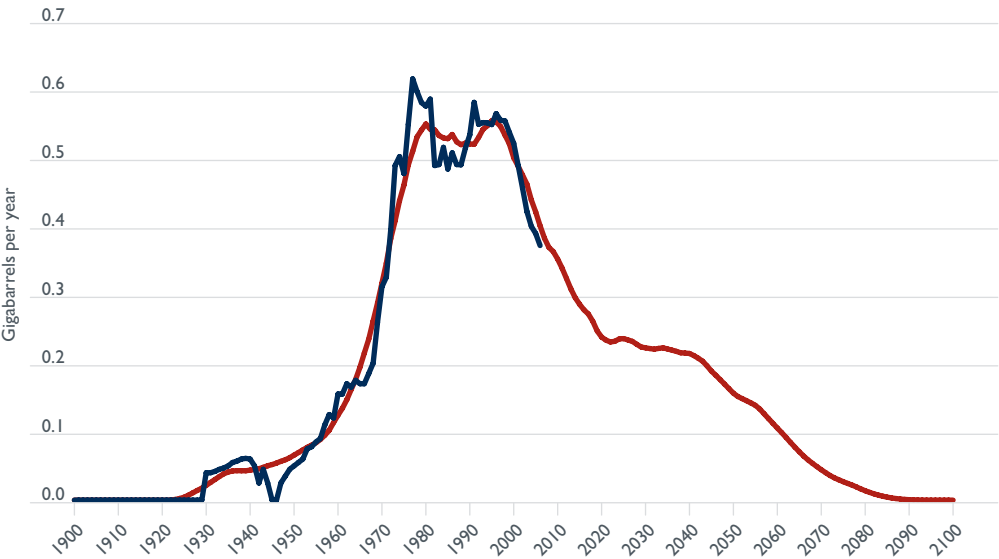
- 8. No adjustment to the cumulative discovery data is necessary.
- 9. The historical stretch lag between the cumulative discovery and production curves is calculated, and plotted against the fraction of cumulative discovery. This plot for Indonesia is shown in Figure 8.4. After some noise in the range of zero to 0.2, the stretch lag exhibits a downward trend before beginning a final uptrend. Extrapolating the trend to 30 years at 1.0 allows the rest of the cumulative production curve to be forecast from the extrapolated discovery curve and the predicted lags.

Figure 8.4 Indonesian stretch lag curve



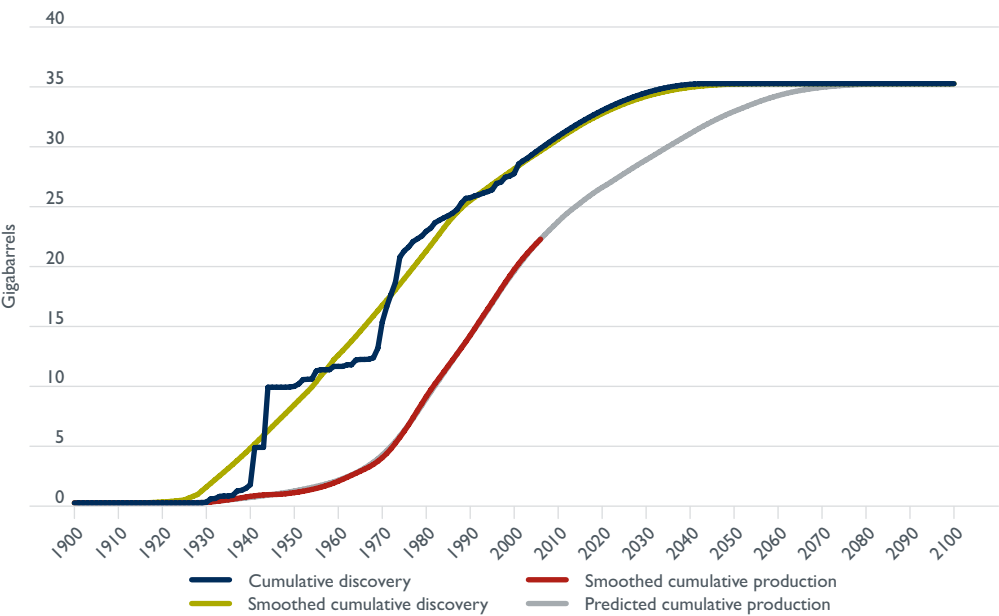
10. The predicted cumulative production curve is smoothed with an 11 year average and then differenced to give a raw predicted annual production. This is then averaged over five years to give a final annual production forecast. This is shown in Figure 8.5.

Figure 8.5 Actual and predicted Indonesian crude oil production



11. Finally the cumulative discovery and production curves (actual and forecast) are plotted in Figure 8.6. This allows a spatial understanding of the relationship between production and discovery.

Figure 8.6 Indonesian cumulative discovery and cumulative production curves

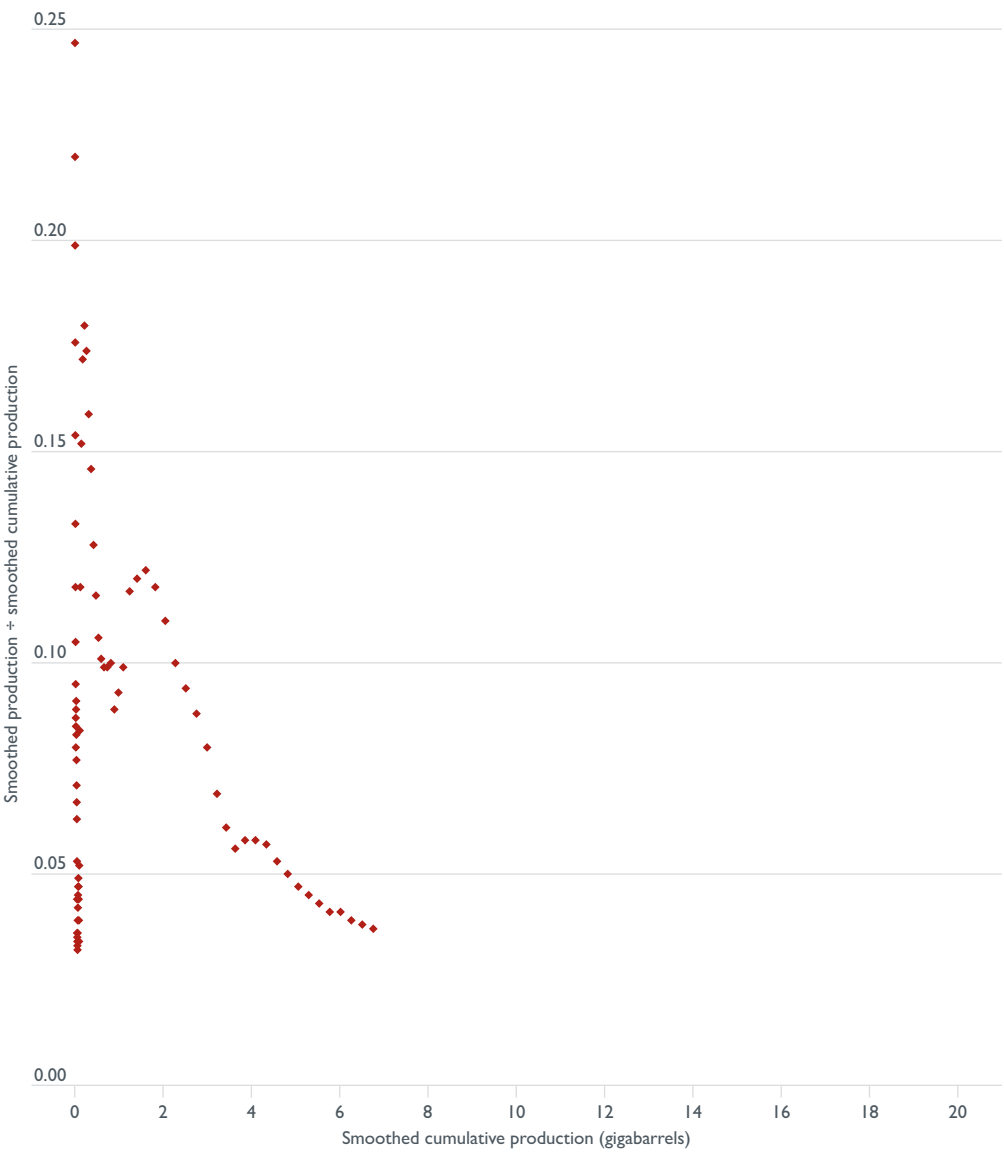


India

Table 8.2 sets out the calculations from the 11 steps to a forecast of production of Indian oil.

- 1. First, annual production (P) and cumulative production (CP) are smoothed with a three year average, generating SP and SCP (see Table 8.2).
- 2. The fractional growth in production (SP/SCP) is calculated and plotted against last year's cumulative production, as shown in Figure 8.7.

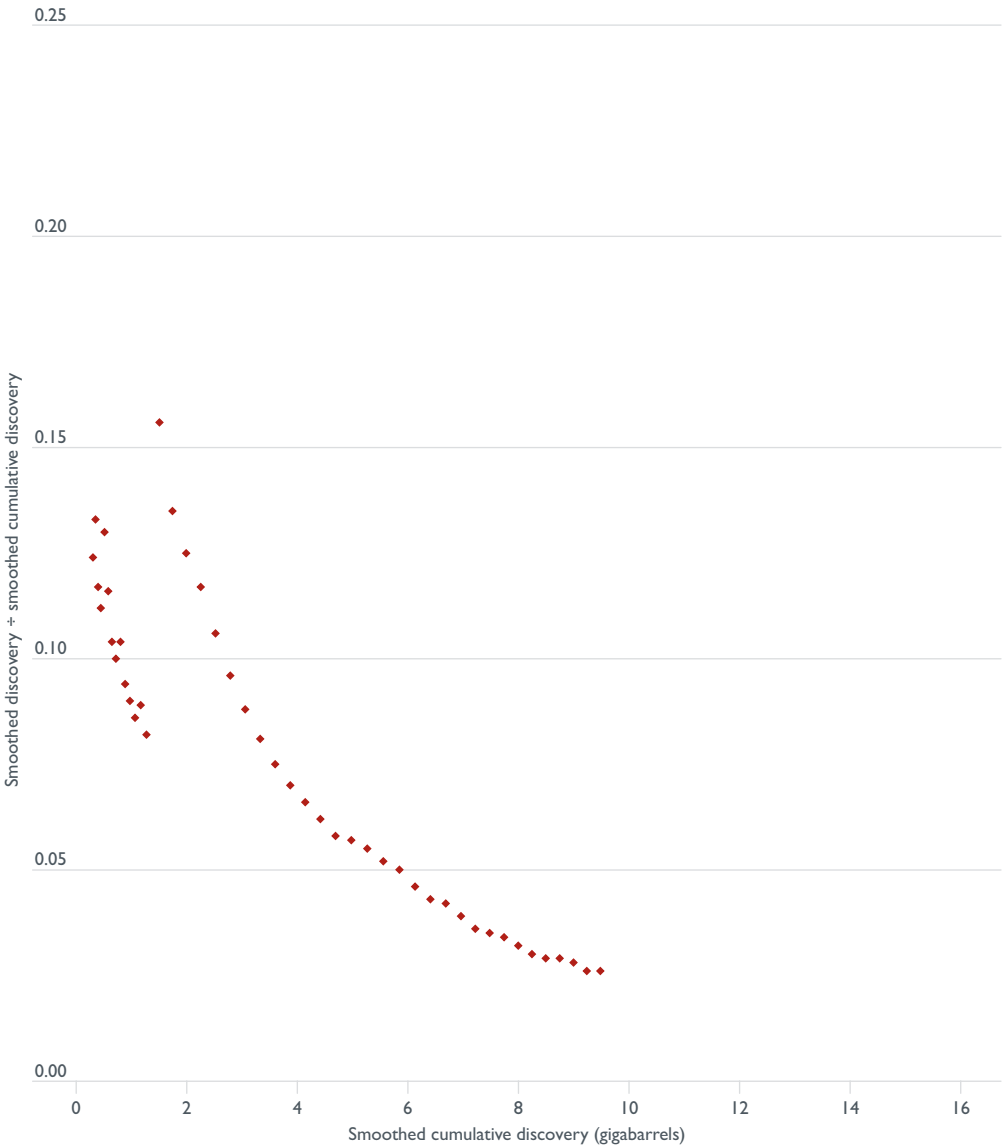
Figure 8.7 Indian cumulative production growth curve



- 3. The plot is then examined and a best guess at an ultimate cumulative production (U) is made. In this case, it is 19.5 gigabarrels.

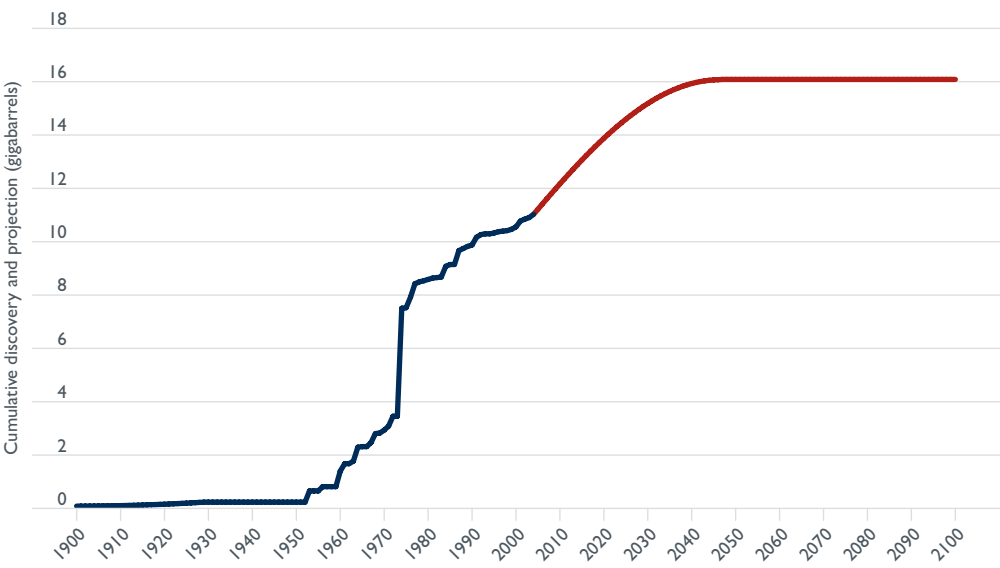
- 4. Discovery (D) and cumulative discovery (CD) are smoothed with 31 year moving averages.
- 5. The fractional growth in discovery (SD/SCD) is calculated and plotted against last year's smoothed cumulative discovery (shown in Figure 8.8).

Figure 8.8 Indian cumulative discovery growth curve



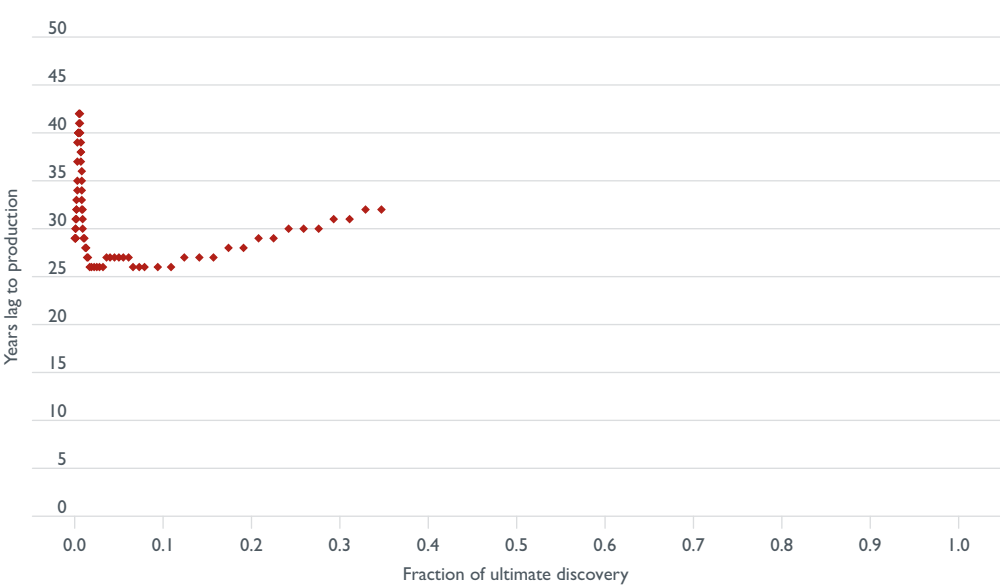
- 6. The plot is examined and a best guess at an ultimate discovery (UD) is made. In this case it is 16 gigabarrels.
- 7. Cumulative discovery in 2006 is then projected to UD by bringing SD estimated for 2006 to zero in 2047. For Indian oil, the projection of the cumulative discovery curve is shown in Figure 8.9.

Figure 8.9 Indian cumulative discovery projection



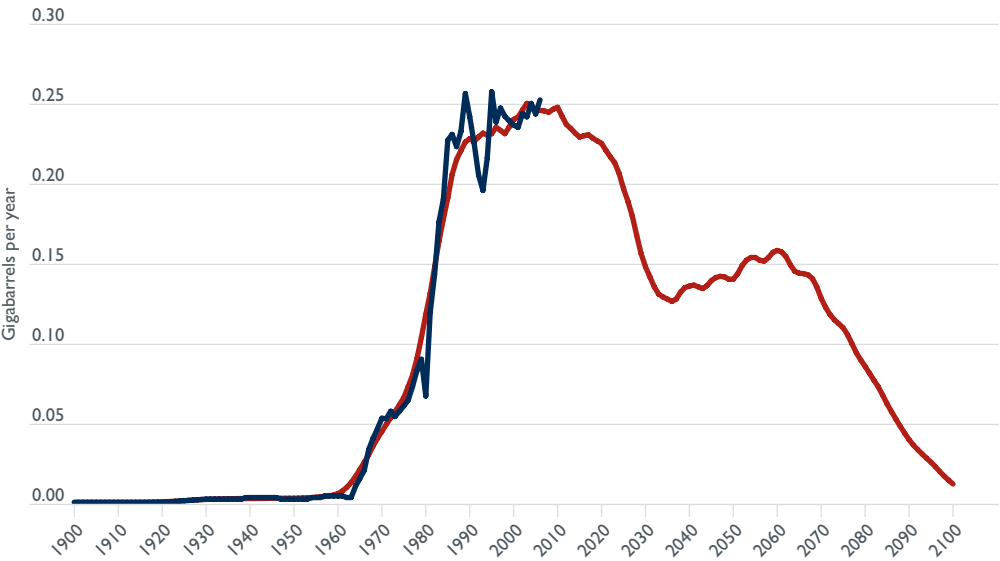
- 8. Next, the height of the cumulative discovery curve has to be adjusted to equal the more reliable cumulative production estimate. In this case, the adjustment is upward, amounting to multiplying by 19.5/16.
- 9. Next, the historical stretch lag between the cumulative discovery and production curves is calculated, and plotted against the fraction of cumulative discovery. This plot for India is shown in Figure 8.10. After some noise in the range of zero to 0.1, the stretch lag exhibits a steady rise. Extrapolating the trend to 47 years at 1.0 allows the rest of the cumulative production curve to be forecast from the extrapolated discovery curve and the predicted lags.

Figure 8.10 Indian stretch lag curve



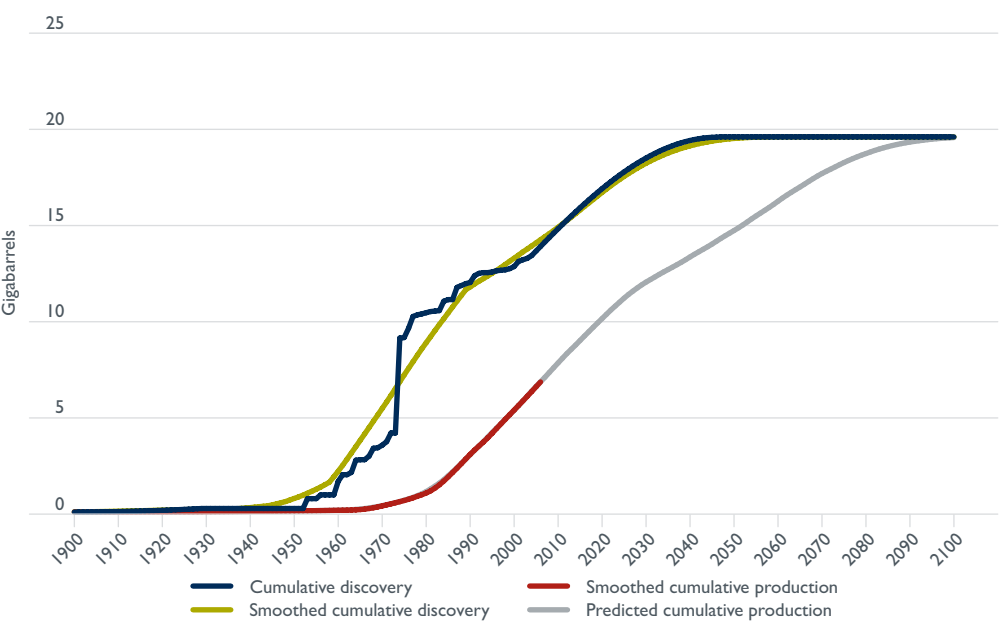
10. The predicted cumulative production curve is smoothed with an 11 year average and then differenced to give a raw predicted annual production. This is then averaged over five years to give a final annual production forecast. This is shown in Figure 8.11.

Figure 8.11 Actual and predicted Indian crude oil production



11. Finally the cumulative discovery and production curves (actual and forecast) are plotted in Figure 8.12 . This allows a spatial understanding of the relationship between production and discovery.

Figure 8.12 Indian cumulative discovery and cumulative production curves

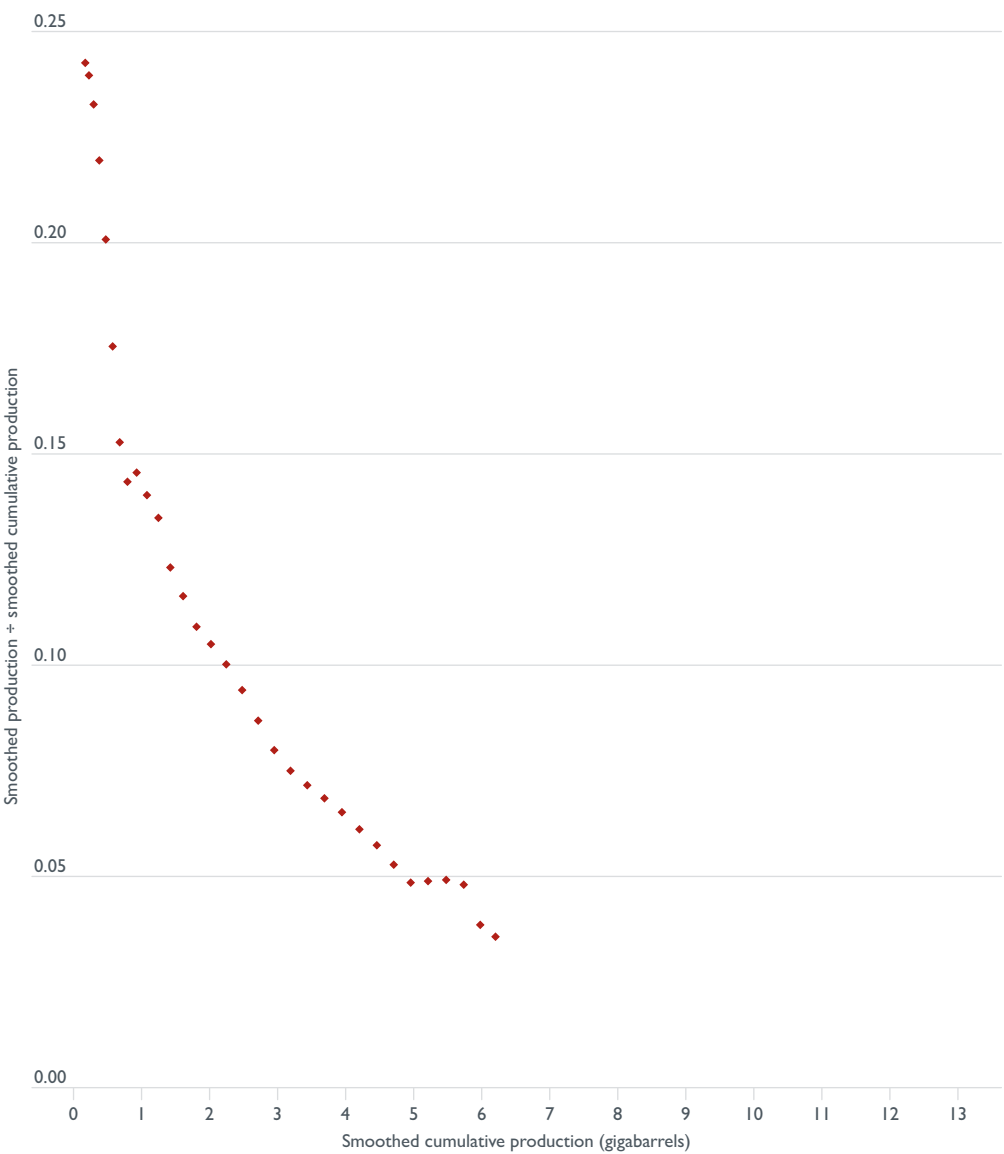


Malaysia

Table 8.3 sets out the calculations from the 11 steps to a forecast of Malaysian oil production.

- 1. First, annual production (P) and cumulative production (CP) are smoothed with three year averages, generating SP and SCP (see Table 8.3).
- 2. The fractional growth in production (SP/SCP) is calculated and plotted against last year's cumulative production, as shown in Figure 8.13.

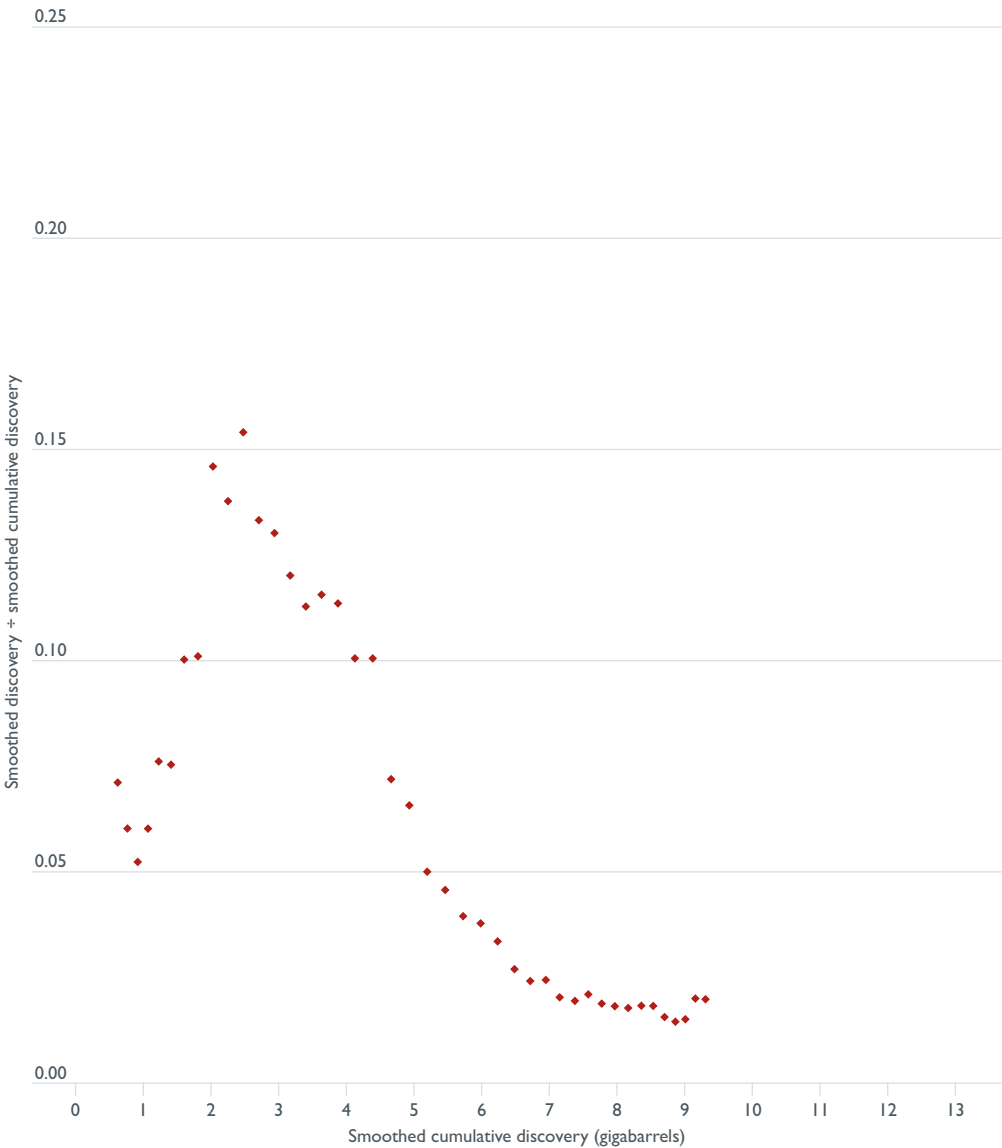
Figure 8.13 Malaysian cumulative production growth curve



- 3. The plot is then examined and a best guess at an ultimate cumulative production (U) is made. In this case, it is 13 gigabarrels.

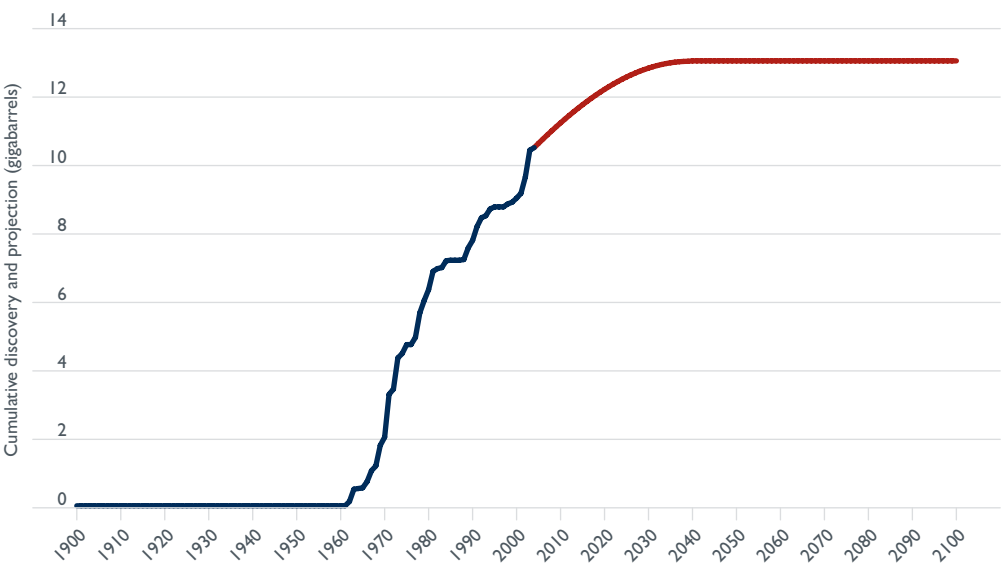
- 4. Discovery (D) is smoothed with an 11 year moving average and cumulative discovery (CD) is smoothed with a 31 year moving average.
- 5. The fractional growth in discovery (SD/SCD) is calculated and plotted against last year's smoothed cumulative discovery (shown in Figure 8.14).

Figure 8.14 Malaysian cumulative discovery growth curve



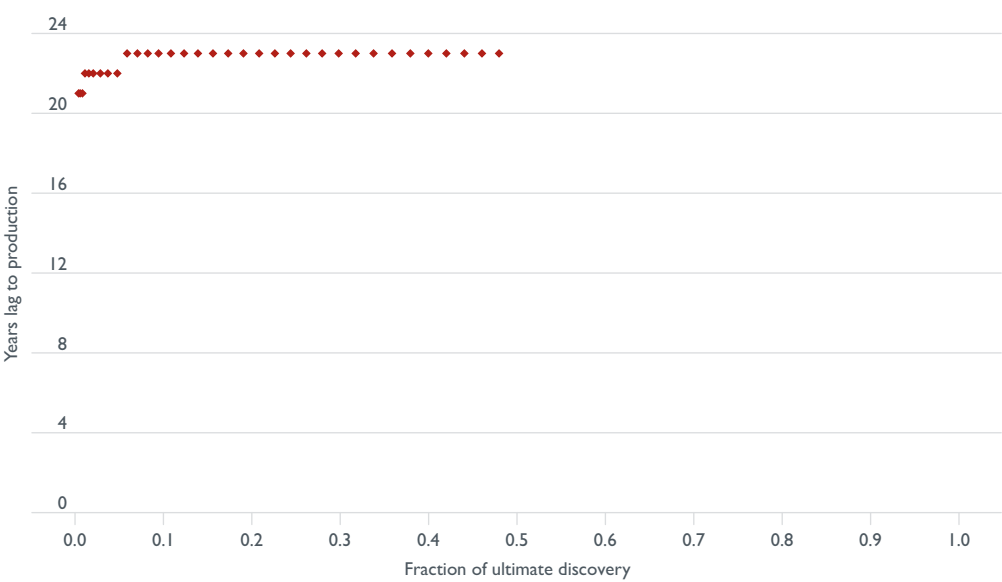
- 6. The plot is examined and a best guess at an ultimate discovery (UD) is made. In this case it is also 13 gigabarrels.
- 7. Cumulative discovery in 2006 is then projected to UD by bringing SD estimated for 2006 to zero in 2040. For Malaysian oil, the projection of the cumulative discovery curve is shown in Figure 8.15.

Figure 8.15 Malaysian cumulative discovery projection



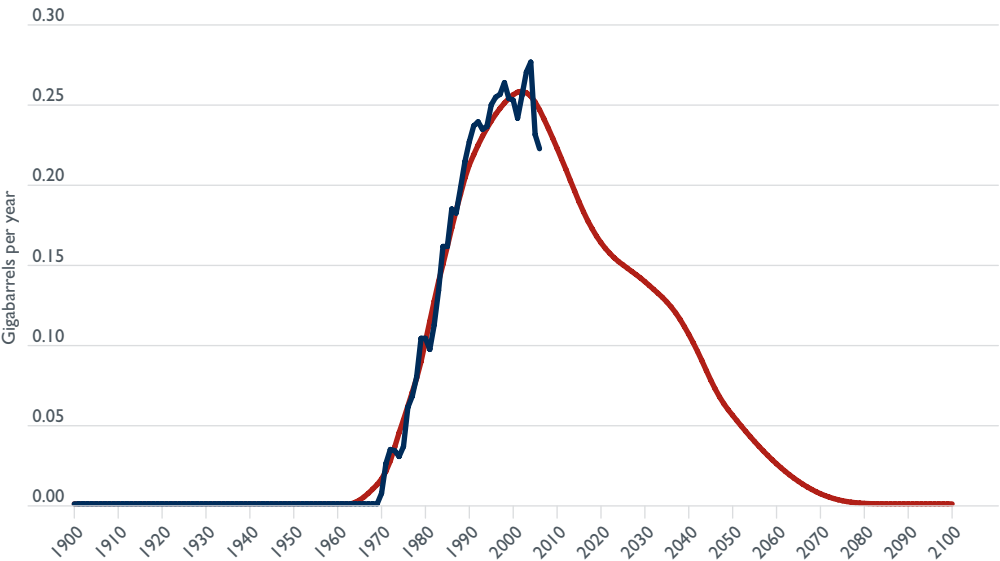
- 8. No adjustment to the cumulative discovery data is necessary.
- 9. Next, the historical stretch lag between the cumulative discovery and production curves is calculated, and plotted against the fraction of cumulative discovery. This plot for Malaysia is shown in Figure 8.16. After some noise in the range of zero to 0.05, the stretch lag is constant at 23 years. Extrapolating the trend at 23 years to 1.0 allows the rest of the cumulative production curve to be forecast from the extrapolated discovery curve and the predicted lags.

Figure 8.16 Malaysian stretch lag curve



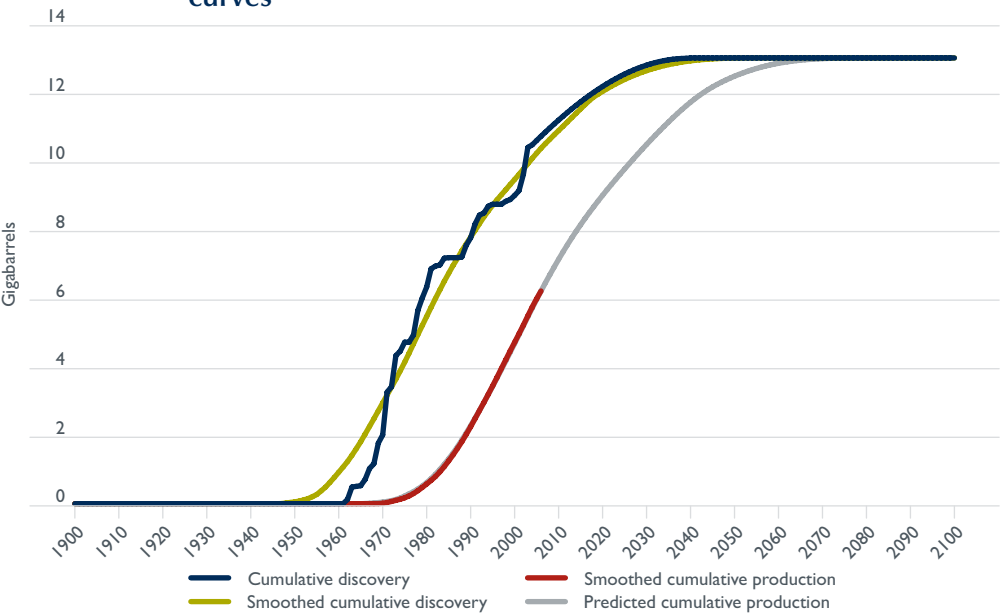
10. The predicted cumulative production curve is smoothed with an 11 year average and then differenced to give a raw predicted annual production. This is then averaged over five years to give a final annual production forecast. This is shown in Figure 8.17.

Figure 8.17 Actual and predicted Malaysian crude oil production



11. Finally the cumulative discovery and production curves (actual and forecast) are plotted in Figure 8.18. This allows a spatial understanding of the relationship between production and discovery.

Figure 8.18 Malaysian cumulative discovery and cumulative production curves

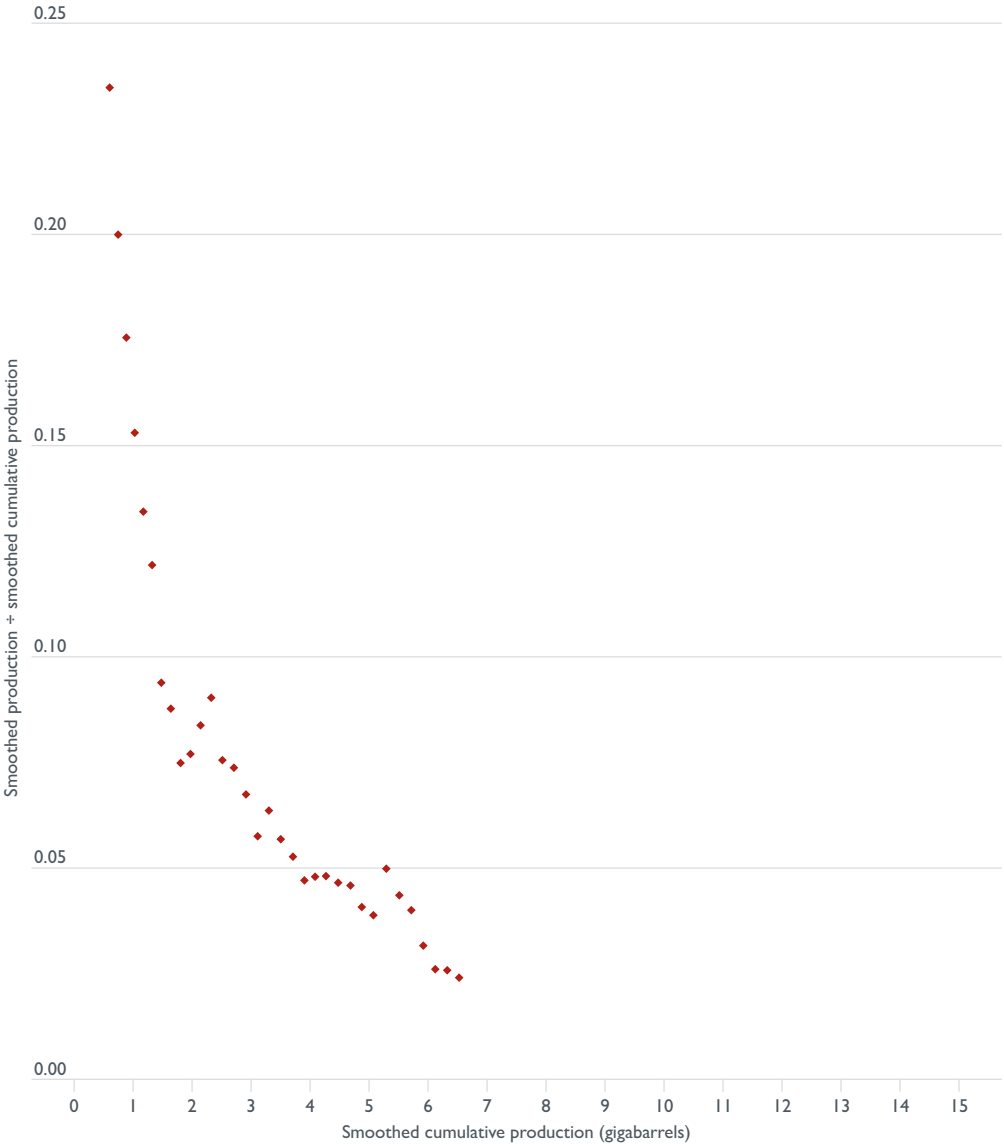


Australia

Table 8.4 sets out the calculations from the 11 steps to a forecast of Australian oil production.

- 1. First, annual production (P) and cumulative production (CP) are smoothed with 5 and 11 year averages, generating SP and SCP.
- 2. The fractional growth in production (SP/SCP) is calculated and plotted against last year's cumulative production, as shown in Figure 8.19.

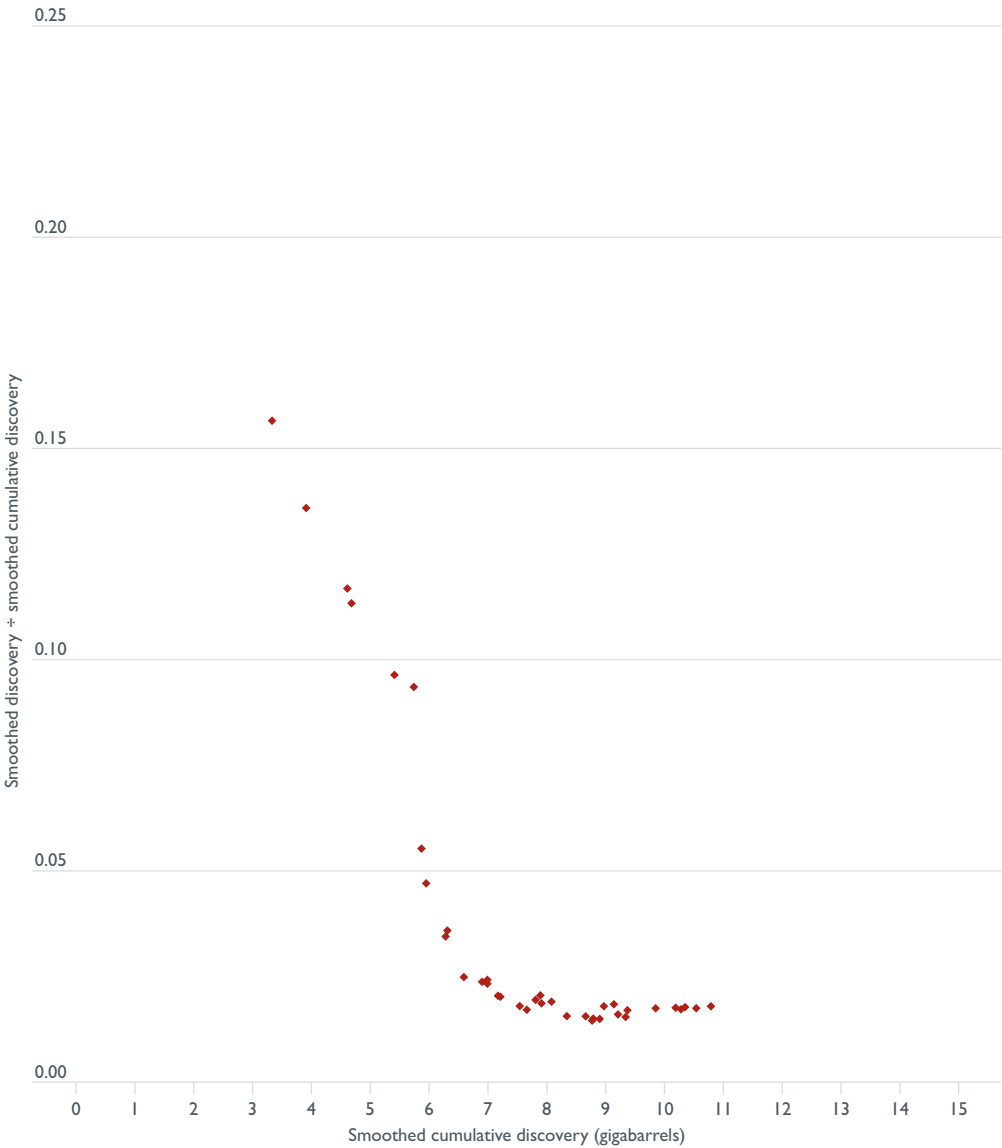
Figure 8.19 Australian cumulative production growth curve



- 3. The plot is then examined and a best guess at an ultimate cumulative production (U) is made. In this case, it is 13.5 gigabarrels.

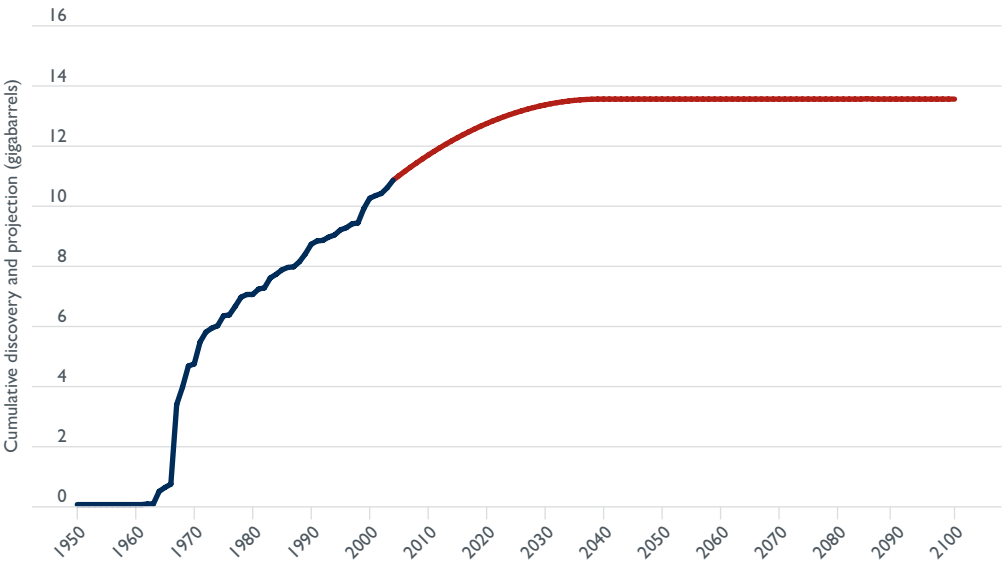
- 4. Discovery (D) is smoothed with an 11 year moving average and cumulative discovery (CD) is smoothed with progressively 3, 4, 5, 11 and 31 year moving averages (due to the abrupt start to discovery and production).
- 5. The fractional growth in discovery (SD/SCD) is calculated and plotted against last year's smoothed cumulative discovery (shown in Figure 8.20).

Figure 8.20 Australian cumulative discovery growth curve



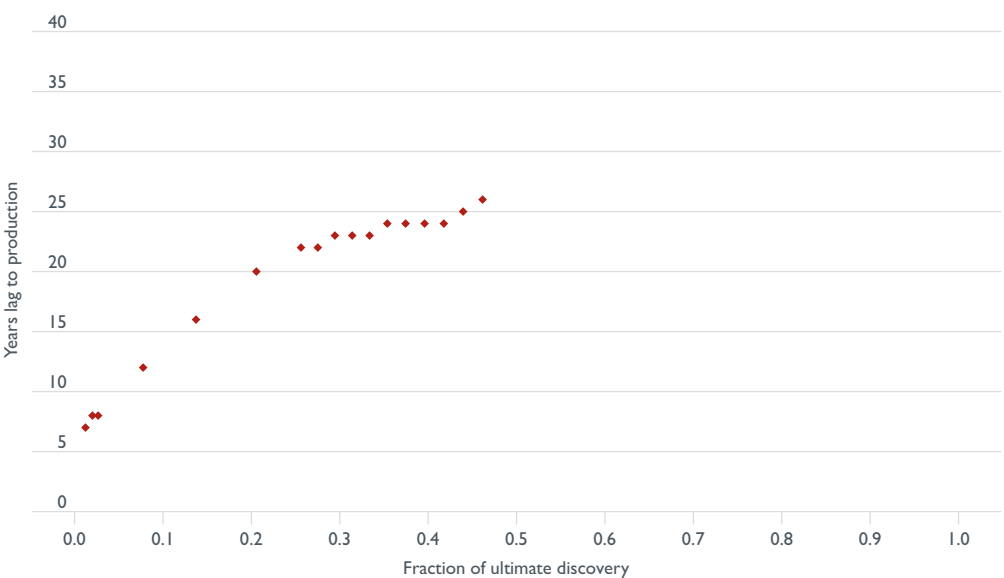
- 6. The plot is examined and a best guess at an ultimate discovery (UD) is made. In this case it is also 13.5 gigabarrels.
- 7. Cumulative discovery in 2006 is then projected to UD by bringing SD estimated for 2006 to zero in 2040. For Australian oil, the projection of the cumulative discovery curve is shown in Figure 8.21.

Figure 8.21 Australian cumulative discovery projection



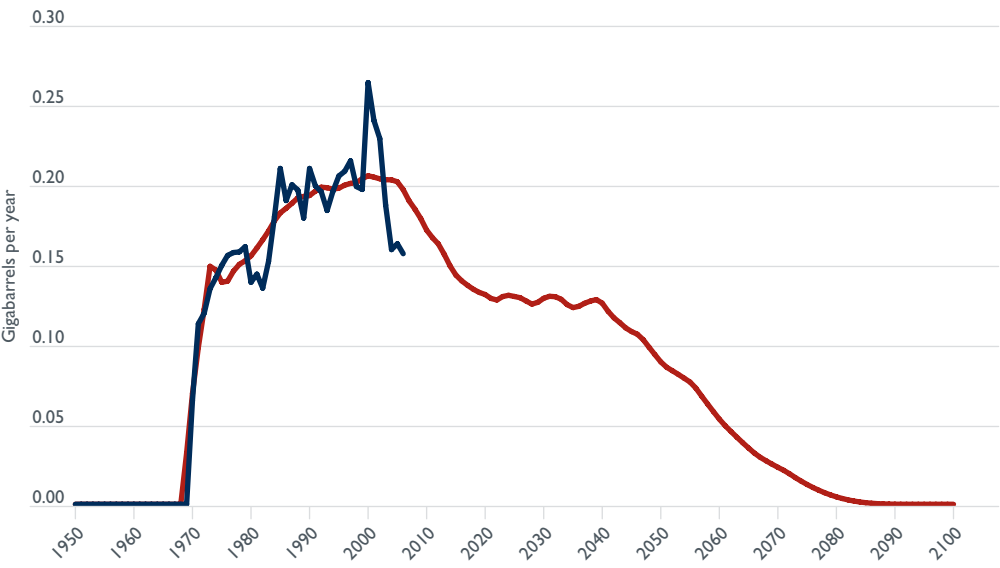
8. No adjustment to the cumulative discovery data is necessary.
9. The historical stretch lag between the cumulative discovery and production curves is calculated, and plotted against the fraction of cumulative discovery. This plot for Australia is shown in Figure 8.22. It is apparent that there is a regular relationship. The stretch lag rises quickly at first and then more slowly. Extrapolating the trend to 35 years at 1.0 allows the rest of the cumulative production curve to be forecast from the extrapolated discovery curve and the predicted lags.

Figure 8.22 Australian stretch lag curve



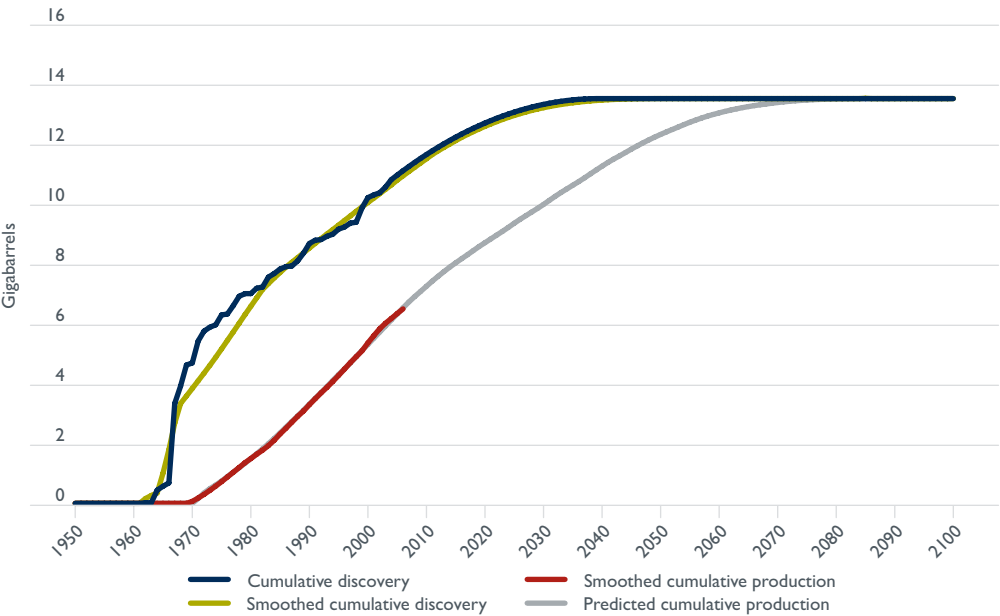
10. The predicted cumulative production curve is smoothed with an 11 year average and then differenced to give a raw predicted annual production. This is then averaged over five years to give a final annual production forecast. This is shown in Figure 8.23.

Figure 8.23 Actual and predicted Australian crude oil production



11. Finally the cumulative discovery and production curves (actual and forecast) are plotted in Figure 8.24. This allows a spatial understanding of the relationship between production and discovery.

Figure 8.24 Australian cumulative discovery and cumulative production curves

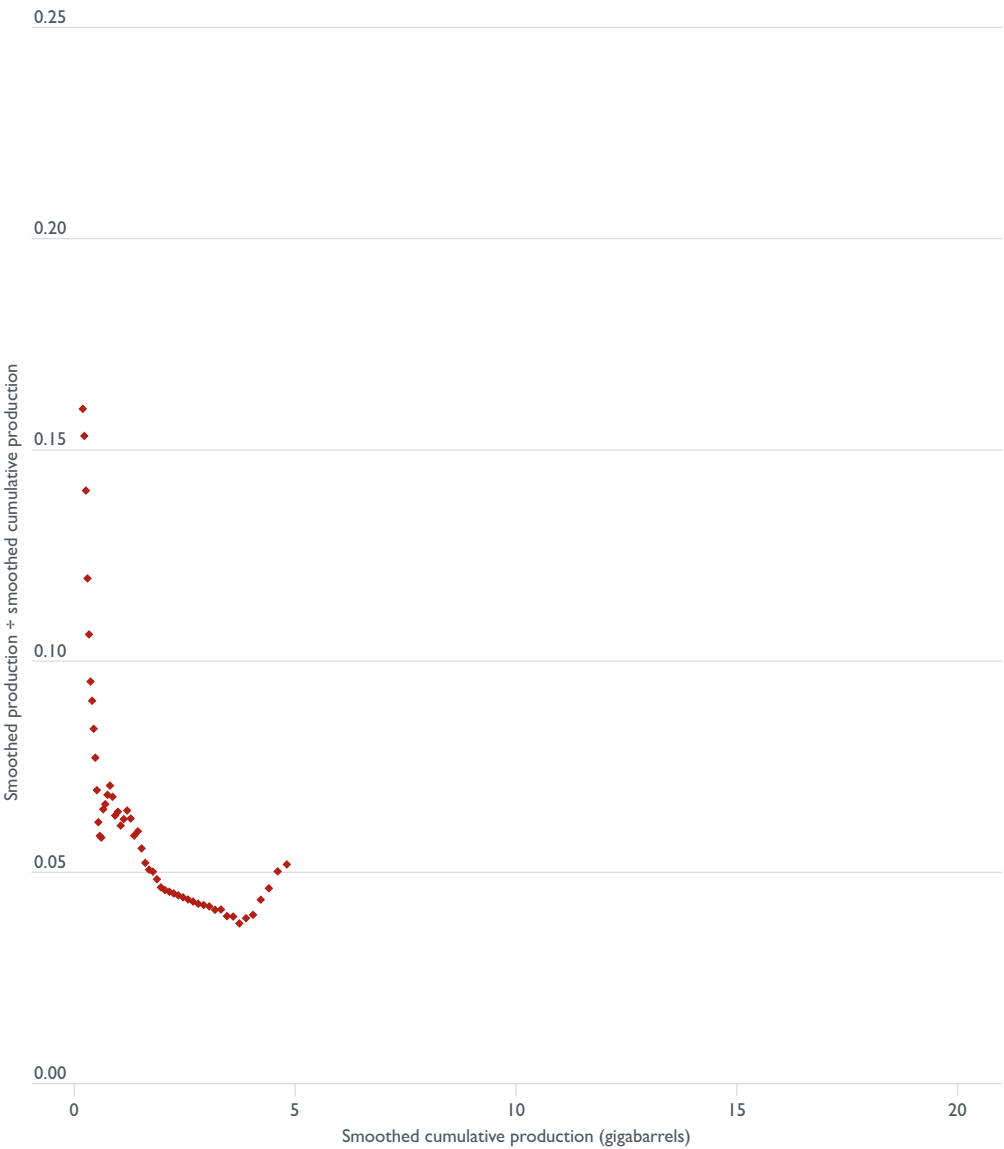


The Rest of the East

Table 8.5 sets out the calculations from the 11 steps to a forecast of production of oil in the Rest of the East. This region includes countries such as Brunei, Vietnam, Thailand, Pakistan, and Papua New Guinea.

- 1. First, annual production (P) and cumulative production (CP) are smoothed with a five year average, generating SP and SCP (see Table 8.5).
- 2. The fractional growth in production (SP/SCP) is calculated and plotted against last year's cumulative production, as shown in Figure 8.25.

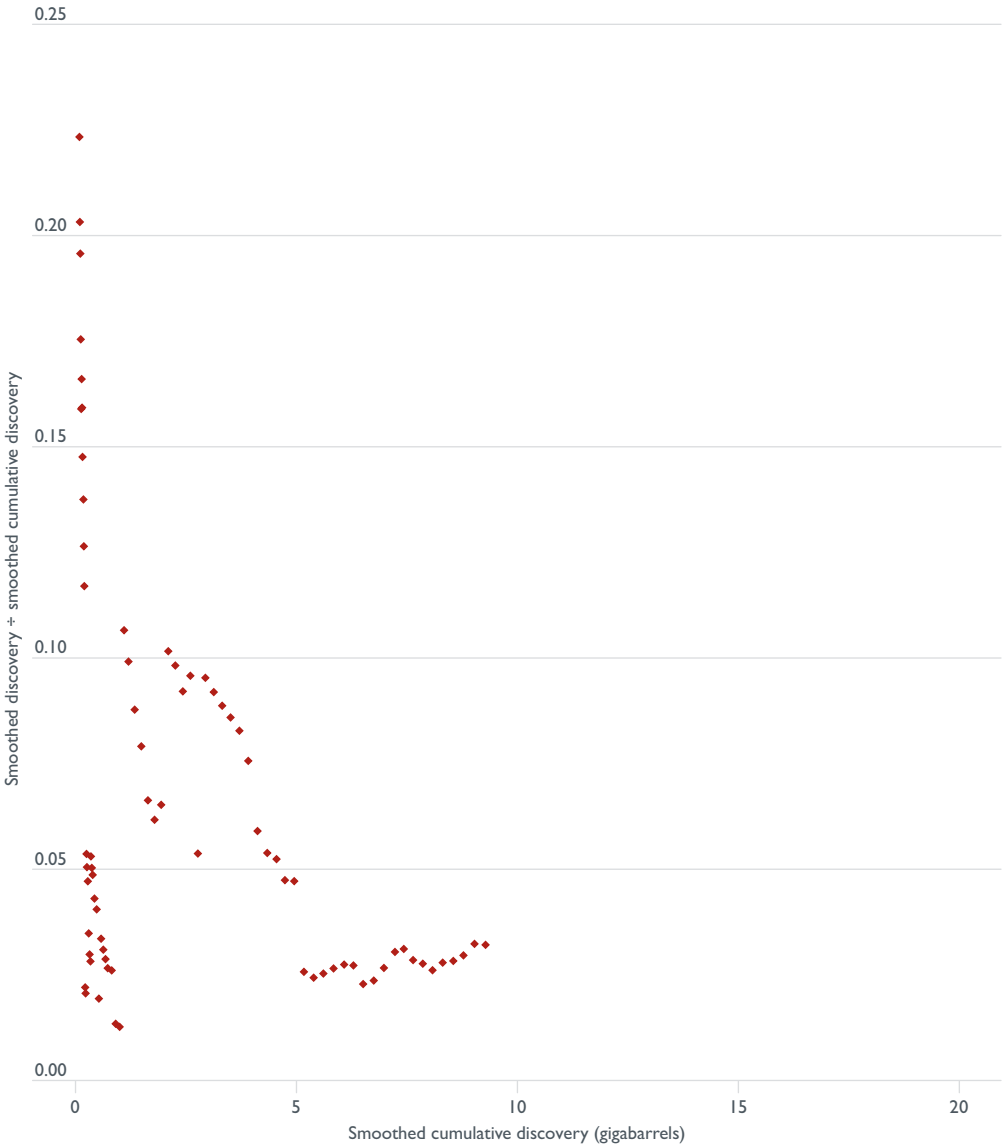
Figure 8.25 Cumulative production growth curve for the Rest of the East



- 3. The plot is then examined and a best guess at an ultimate cumulative production (U) is made. In this case, it is 20 gigabarrels.

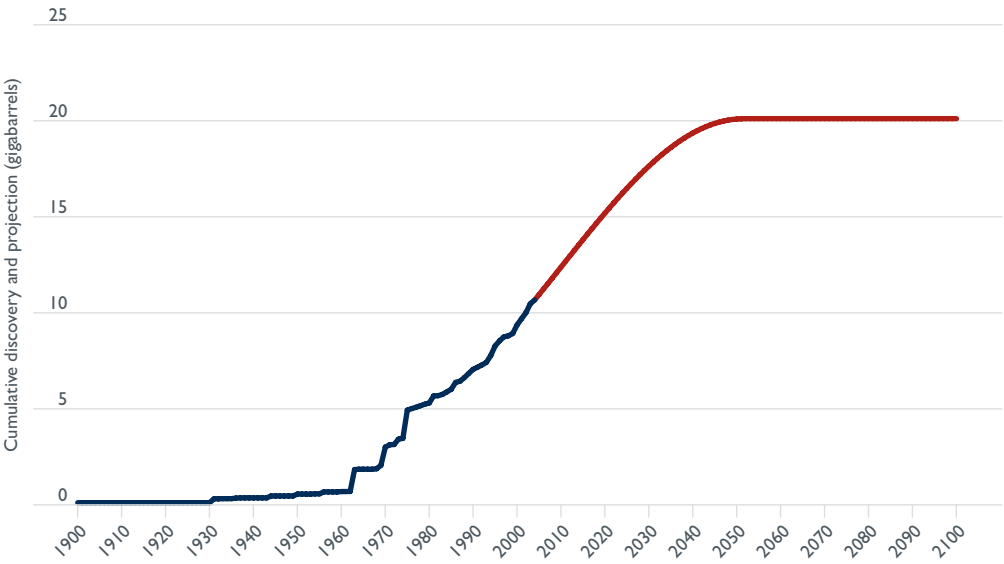
- 4. Discovery (D) is smoothed with an 11 year moving average and cumulative discovery (CD) is smoothed with a 31 year moving average.
- 5. The fractional growth in discovery (SD/SCD) is calculated and plotted against last year's smoothed cumulative discovery (shown in Figure 8.26).

Figure 8.26 Cumulative discovery growth curve for the Rest of the East



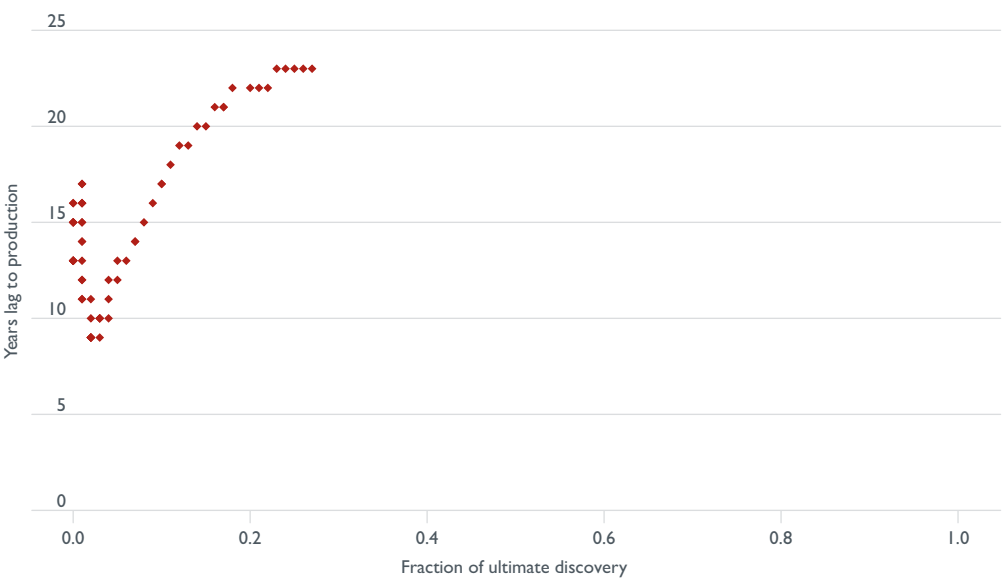
- 6. The plot is examined and a best guess at an ultimate discovery (UD) is made. In this case it is also 20 gigabarrels.
- 7. Cumulative discovery in 2006 is then projected to UD by bringing SD estimated for 2006 to zero in 2052. For the Rest of the East, the projection of the cumulative discovery curve is shown in Figure 8.27.

Figure 8.27 Cumulative discovery projection for the Rest of the East



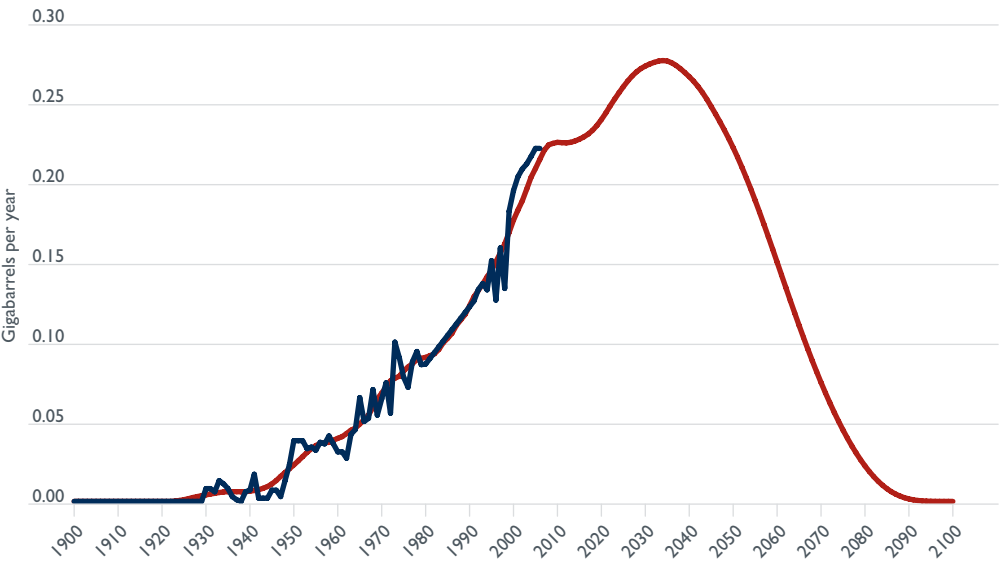
8. No adjustment to the cumulative discovery data is necessary
9. Next, the historical stretch lag between the cumulative discovery and production curves is calculated, and plotted against the fraction of cumulative discovery. This plot for the Rest of the East is shown in Figure 8.28. After some early noise, the stretch lag rises and then levels off. Extrapolating the trend at 23 years to 1.0 allows the rest of the cumulative production lag curve to be forecast from the extrapolated discovery curve and the predicted lags.

Figure 8.28 Stretch lag curve for the Rest of the East



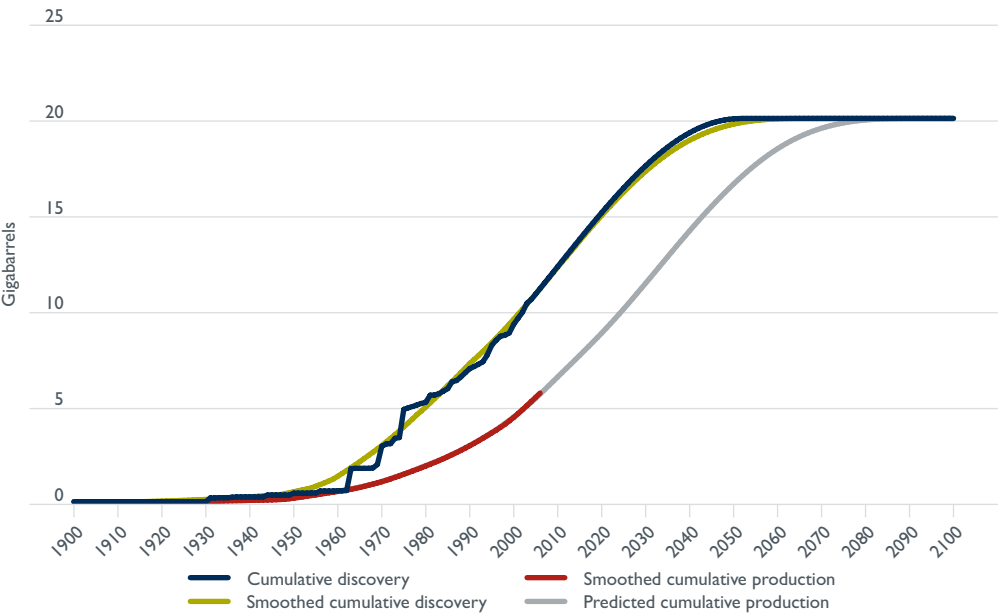
10. The predicted cumulative production curve is smoothed with an 11 year average and then differenced to give a raw predicted annual production. This is then averaged over five years to give a final annual production forecast. This is shown in Figure 8.29.

Figure 8.29 Actual and predicted crude oil production for the Rest of the East



11. Finally the cumulative discovery and production curves (actual and forecast) are plotted in Figure 8.30. This allows a spatial understanding of the relationship between production and discovery.

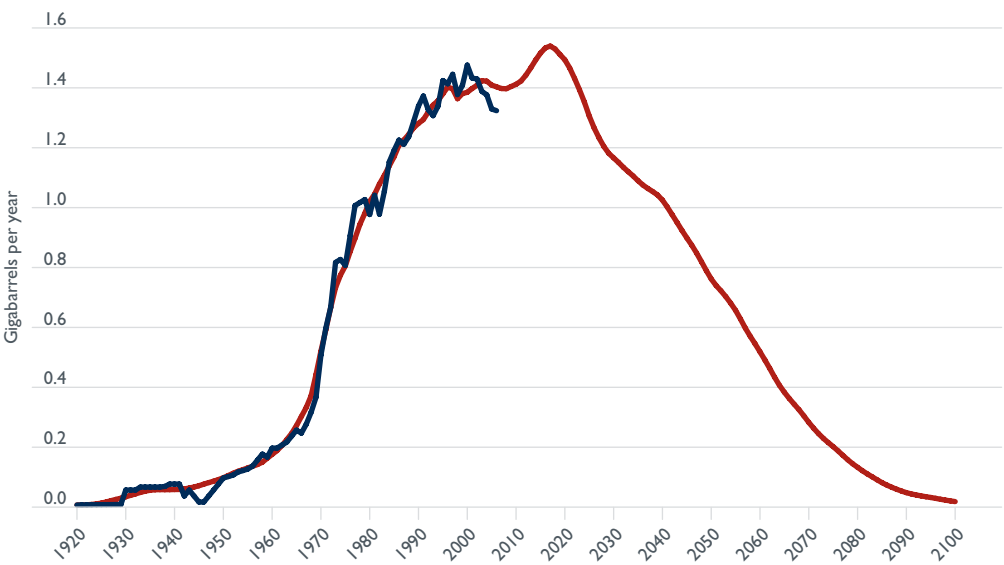
Figure 8.30 Cumulative discovery and cumulative production curves for the Rest of the East



Summary of the East

Table 8.6 sets out the summary statistics for the East. The major producing countries of the East region are all into a stage of declining production. But increasing deep water production will see a secondary peak about 2020 (see Figure 8.31).

Figure 8.31 Actual and predicted East crude oil production



The importance for the region of the trend in Indonesia and in deep water production is apparent from Figure 8.32.

Figure 8.32 Components of predicted East crude oil production

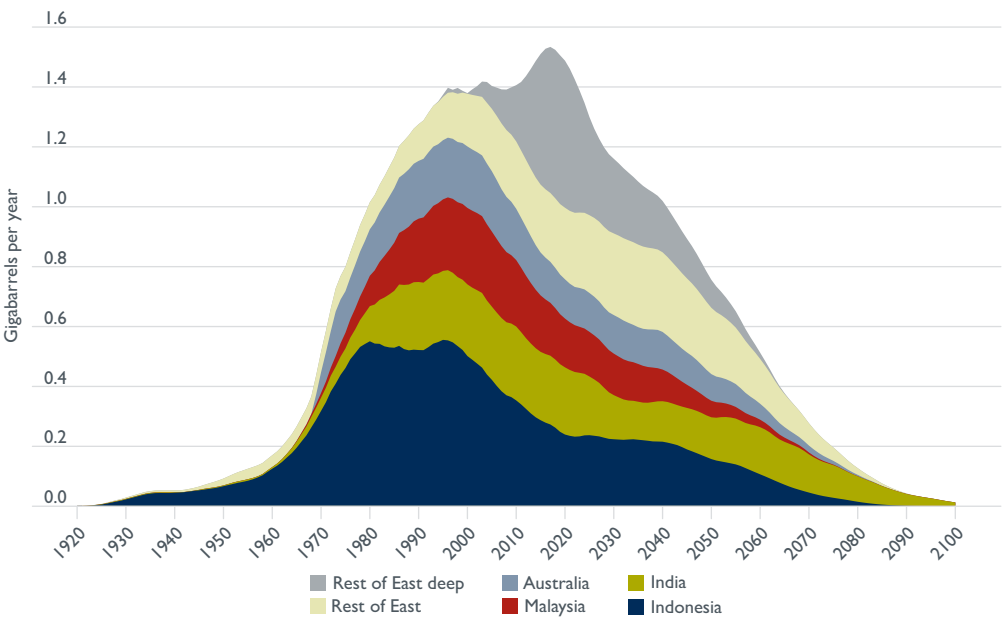


Table 8.1 Indonesia, gigabarrels

Year	D	CD	3 lyr SCD	Adj SCD	Predlag	Raw pred CP	Syr smth pred SCP	SCP	Raw pred P	Syr smth pred SP	Actual P
1900	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1901	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1902	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1903	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1904	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1905	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1906	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1907	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1908	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1909	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1910	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1911	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1912	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1913	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1914	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1915	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1916	0.00	0.00	0.01	0.01	13	0.00	0.00	0.00	0.00	0.00	0.00
1917	0.00	0.00	0.02	0.02	12	0.00	0.00	0.00	0.00	0.00	0.00
1918	0.00	0.00	0.04	0.04	12	0.00	0.00	0.00	0.00	0.00	0.00
1919	0.00	0.00	0.06	0.06	11	0.00	0.00	0.00	0.00	0.00	0.00
1920	0.00	0.00	0.08	0.08	11	0.00	0.00	0.00	0.00	0.00	0.00
1921	0.00	0.00	0.10	0.10	11	0.00	0.00	0.00	0.00	0.00	0.00
1922	0.00	0.00	0.13	0.13	10	0.00	0.00	0.00	0.00	0.00	0.00
1923	0.00	0.00	0.17	0.17	10	0.00	0.00	0.00	0.00	0.00	0.00
1924	0.00	0.00	0.21	0.21	10	0.00	0.00	0.00	0.00	0.00	0.00
1925	0.00	0.00	0.25	0.25	11	0.00	0.01	0.00	0.00	0.00	0.00
1926	0.00	0.00	0.40	0.40	12	0.00	0.01	0.00	0.01	0.01	0.00
1927	0.00	0.00	0.55	0.55	15	0.00	0.02	0.00	0.01	0.01	0.00
1928	0.00	0.00	0.70	0.70	18	0.00	0.04	0.00	0.02	0.01	0.00
1929	0.00	0.00	1.01	1.01	21	0.01	0.06	0.01	0.02	0.02	0.00
1930	0.06	0.06	1.33	1.33	25	0.04	0.08	0.04	0.02	0.02	0.04
1931	0.28	0.34	1.64	1.64	27	0.08	0.10	0.08	0.02	0.03	0.04
1932	0.03	0.37	1.95	1.95	29	0.10	0.13	0.12	0.03	0.03	0.04
1933	0.18	0.55	2.26	2.26	30	0.17	0.17	0.17	0.04	0.03	0.05
1934	0.03	0.58	2.57	2.57	31	0.21	0.21	0.22	0.04	0.04	0.05
1935	0.00	0.58	2.89	2.89	31	0.23	0.25	0.27	0.04	0.04	0.05
1936	0.05	0.63	3.21	3.21	32	0.25	0.29	0.32	0.04	0.04	0.06
1937	0.37	1.00	3.54	3.54	32	0.33	0.33	0.38	0.04	0.04	0.06
1938	0.05	1.05	3.87	3.87	32	0.40	0.38	0.44	0.04	0.04	0.06
1939	0.17	1.22	4.21	4.21	32	0.44	0.42	0.50	0.04	0.04	0.06
1940	0.30	1.52	4.56	4.56	32	0.48	0.46	0.55	0.04	0.04	0.06
1941	3.10	4.62	4.92	4.92	32	0.52	0.51	0.60	0.04	0.04	0.05
1942	0.02	4.64	5.28	5.28	32	0.55	0.55	0.64	0.05	0.05	0.03
1943	0.00	4.64	5.64	5.64	31	0.59	0.60	0.67	0.05	0.05	0.05
1944	5.02	9.66	6.01	6.01	31	0.63	0.65	0.69	0.05	0.05	0.03
1945	0.00	9.66	6.37	6.37	31	0.67	0.70	0.70	0.05	0.05	0.00
1946	0.00	9.66	6.74	6.74	30	0.70	0.76	0.71	0.05	0.05	0.00
1947	0.00	9.66	7.10	7.10	30	0.78	0.81	0.73	0.06	0.06	0.03
1948	0.00	9.66	7.46	7.46	30	0.86	0.87	0.77	0.06	0.06	0.04
1949	0.02	9.68	7.83	7.83	29	0.94	0.93	0.81	0.06	0.06	0.05
1950	0.05	9.73	8.20	8.20	29	1.01	1.00	0.86	0.06	0.07	0.05
1951	0.20	9.93	8.56	8.56	29	1.08	1.07	0.91	0.07	0.07	0.06
1952	0.37	10.30	8.93	8.93	28	1.14	1.14	0.98	0.08	0.07	0.06
1953	0.02	10.32	9.29	9.29	28	1.20	1.22	1.05	0.08	0.08	0.08
1954	0.03	10.35	9.67	9.67	28	1.26	1.30	1.13	0.08	0.08	0.08
1955	0.67	11.02	10.12	10.12	27	1.33	1.38	1.21	0.08	0.08	0.09
1956	0.10	11.12	10.60	10.60	27	1.43	1.47	1.31	0.08	0.09	0.09
1957	0.00	11.12	11.01	11.01	27	1.53	1.56	1.42	0.09	0.09	0.11
1958	0.00	11.12	11.46	11.46	27	1.64	1.66	1.53	0.10	0.10	0.13
1959	0.28	11.40	11.97	11.97	27	1.74	1.77	1.67	0.11	0.11	0.12
1960	0.00	11.40	12.34	12.34	27	1.85	1.89	1.81	0.12	0.12	0.16
1961	0.00	11.40	12.71	12.71	27	1.95	2.04	1.97	0.14	0.13	0.16
1962	0.13	11.53	13.10	13.10	26	2.11	2.18	2.13	0.15	0.15	0.17
1963	0.00	11.53	13.50	13.50	26	2.26	2.33	2.30	0.15	0.16	0.17
1964	0.40	11.93	13.91	13.91	26	2.42	2.51	2.47	0.17	0.18	0.18
1965	0.05	11.98	14.33	14.33	26	2.57	2.70	2.65	0.19	0.19	0.17
1966	0.00	11.98	14.76	14.76	25	2.89	2.92	2.82	0.21	0.21	0.17
1967	0.02	12.00	15.19	15.19	25	3.05	3.15	3.01	0.24	0.24	0.19
1968	0.12	12.12	15.62	15.62	25	3.21	3.41	3.22	0.26	0.26	0.20
1969	0.80	12.92	16.06	16.06	25	3.54	3.68	3.48	0.27	0.29	0.26
1970	2.18	15.10	16.49	16.49	25	3.87	4.01	3.78	0.33	0.32	0.31
1971	1.27	16.37	16.92	16.92	24	4.21	4.36	4.12	0.35	0.35	0.33
1972	1.05	17.42	17.35	17.35	24	4.56	4.74	4.52	0.38	0.38	0.39
1973	1.00	18.42	17.80	17.80	24	4.92	5.14	4.98	0.40	0.41	0.49
1974	2.10	20.52	18.26	18.26	24	5.28	5.59	5.47	0.45	0.44	0.50
1975	0.52	21.04	18.72	18.72	24	6.01	6.05	5.98	0.46	0.46	0.48
1976	0.32	21.36	19.17	19.17	23	6.37	6.54	6.53	0.49	0.49	0.55
1977	0.46	21.82	19.64	19.64	23	7.10	7.04	7.12	0.50	0.51	0.62
1978	0.23	22.05	20.10	20.10	23	7.46	7.59	7.72	0.55	0.53	0.60
1979	0.23	22.28	20.57	20.57	23	8.20	8.14	8.30	0.55	0.54	0.58
1980	0.40	22.68	21.02	21.02	23	8.56	8.70	8.88	0.56	0.55	0.58

(continued)

Table 8.1 Indonesia, gigabarrels (continued)

Year	D	CD	31yr SCD	Adj SCD	Predlag	Raw pred CP	5yr smth pred SCP	SCP	Raw pred P	5yr smth pred SP	Actual P
2062	0.00	35.00	35.00	35.00	30	34.23	34.20		0.09	0.09	
2063	0.00	35.00	35.00	35.00	30	34.31	34.28		0.09	0.08	
2064	0.00	35.00	35.00	35.00	30	34.39	34.36		0.08	0.08	
2065	0.00	35.00	35.00	35.00	30	34.46	34.43		0.07	0.07	
2066	0.00	35.00	35.00	35.00	30	34.53	34.49		0.06	0.06	
2067	0.00	35.00	35.00	35.00	30	34.59	34.55		0.06	0.06	
2068	0.00	35.00	35.00	35.00	30	34.64	34.60		0.05	0.05	
2069	0.00	35.00	35.00	35.00	30	34.67	34.65		0.05	0.05	
2070	0.00	35.00	35.00	35.00	30	34.70	34.70		0.04	0.04	
2071	0.00	35.00	35.00	35.00	30	34.74	34.74		0.04	0.04	
2072	0.00	35.00	35.00	35.00	30	34.78	34.77		0.04	0.04	
2073	0.00	35.00	35.00	35.00	30	34.82	34.80		0.03	0.03	
2074	0.00	35.00	35.00	35.00	30	34.85	34.83		0.03	0.03	
2075	0.00	35.00	35.00	35.00	30	34.88	34.86		0.03	0.03	
2076	0.00	35.00	35.00	35.00	30	34.90	34.88		0.03	0.02	
2077	0.00	35.00	35.00	35.00	30	34.92	34.91		0.02	0.02	
2078	0.00	35.00	35.00	35.00	30	34.94	34.93		0.02	0.02	
2079	0.00	35.00	35.00	35.00	30	34.95	34.94		0.02	0.02	
2080	0.00	35.00	35.00	35.00	30	34.97	34.96		0.01	0.01	
2081	0.00	35.00	35.00	35.00	30	34.98	34.97		0.01	0.01	
2082	0.00	35.00	35.00	35.00	30	34.98	34.97		0.01	0.01	
2083	0.00	35.00	35.00	35.00	30	34.99	34.98		0.01	0.01	
2084	0.00	35.00	35.00	35.00	30	34.99	34.99		0.01	0.01	
2085	0.00	35.00	35.00	35.00	30	35.00	34.99		0.00	0.00	
2086	0.00	35.00	35.00	35.00	30	35.00	34.99		0.00	0.00	
2087	0.00	35.00	35.00	35.00	30	35.00	35.00		0.00	0.00	
2088	0.00	35.00	35.00	35.00	30	35.00	35.00		0.00	0.00	
2089	0.00	35.00	35.00	35.00	30	35.00	35.00		0.00	0.00	
2090	0.00	35.00	35.00	35.00	30	35.00	35.00		0.00	0.00	
2091	0.00	35.00	35.00	35.00	30	35.00	35.00		0.00	0.00	
2092	0.00	35.00	35.00	35.00	30	35.00	35.00		0.00	0.00	
2093	0.00	35.00	35.00	35.00	30	35.00	35.00		0.00	0.00	
2094	0.00	35.00	35.00	35.00	30	35.00	35.00		0.00	0.00	
2095	0.00	35.00	35.00	35.00	30	35.00	35.00		0.00	0.00	
2096	0.00	35.00	35.00	35.00	30	35.00	35.00		0.00	0.00	
2097	0.00	35.00	35.00	35.00	30	35.00	35.00		0.00	0.00	
2098	0.00	35.00	35.00	35.00	30	35.00	35.00		0.00	0.00	
2099	0.00	35.00	35.00	35.00	30	35.00	35.00		0.00	0.00	
2100	0.00	35.00	35.00	35.00	30	35.00	35.00		0.00	0.00	

Notes: D—discovery; CD—cumulative discovery; SCD—smoothed cumulative discovery (years = number of years centred moving average); adj—adjusted (to match cumulative production maximum); predlag—predicted lag between cumulative discovery and cumulative production; raw Pred CP—prediction using direct lag of cumulative discovery by predicted lag years; Pred SCP—raw predicted CP smoothed (with years = number of years centred moving average); SCP—smoothed actual cumulative production (years = number of years centred moving average); raw Pred P—one year change in predicted smoothed cumulative production; Pred SP—smoothed raw Pred P (years = number of years centred moving average); Actual P—actual annual oil production. Shaded numbers are interpolations, extrapolations or forecasts.

Table 8.2 India, gigabarrels (continued)

Year	D	CD	3/yr SCD	Adj SCD	Predlag	Raw pred CP	1/yr smth pred SCP	SCP	Raw pred P	5yr smth pred SP	Actual P
2062	0.00	16.00	16.00	19.50	47	16.43	16.47		0.15	0.15	
2063	0.00	16.00	16.00	19.50	47	16.61	16.62		0.14	0.15	
2064	0.00	16.00	16.00	19.50	47	16.79	16.76		0.14	0.14	
2065	0.00	16.00	16.00	19.50	47	16.96	16.90		0.14	0.14	
2066	0.00	16.00	16.00	19.50	47	17.13	17.04		0.14	0.14	
2067	0.00	16.00	16.00	19.50	47	17.21	17.19		0.15	0.14	
2068	0.00	16.00	16.00	19.50	47	17.29	17.33		0.14	0.14	
2069	0.00	16.00	16.00	19.50	47	17.44	17.47		0.14	0.13	
2070	0.00	16.00	16.00	19.50	47	17.59	17.59		0.13	0.13	
2071	0.00	16.00	16.00	19.50	47	17.74	17.71		0.12	0.12	
2072	0.00	16.00	16.00	19.50	47	17.87	17.82		0.11	0.12	
2073	0.00	16.00	16.00	19.50	47	18.00	17.94		0.11	0.11	
2074	0.00	16.00	16.00	19.50	47	18.13	18.05		0.12	0.11	
2075	0.00	16.00	16.00	19.50	47	18.19	18.17		0.11	0.11	
2076	0.00	16.00	16.00	19.50	47	18.25	18.27		0.10	0.10	
2077	0.00	16.00	16.00	19.50	47	18.36	18.37		0.10	0.10	
2078	0.00	16.00	16.00	19.50	47	18.47	18.46		0.09	0.09	
2079	0.00	16.00	16.00	19.50	47	18.56	18.55		0.09	0.09	
2080	0.00	16.00	16.00	19.50	47	18.66	18.63		0.08	0.08	
2081	0.00	16.00	16.00	19.50	47	18.74	18.71		0.08	0.08	
2082	0.00	16.00	16.00	19.50	47	18.83	18.79		0.08	0.08	
2083	0.00	16.00	16.00	19.50	47	18.90	18.87		0.07	0.07	
2084	0.00	16.00	16.00	19.50	47	18.97	18.93		0.07	0.07	
2085	0.00	16.00	16.00	19.50	47	19.03	18.99		0.06	0.06	
2086	0.00	16.00	16.00	19.50	47	19.09	19.05		0.06	0.06	
2087	0.00	16.00	16.00	19.50	47	19.12	19.10		0.05	0.05	
2088	0.00	16.00	16.00	19.50	47	19.15	19.15		0.05	0.05	
2089	0.00	16.00	16.00	19.50	47	19.20	19.19		0.04	0.04	
2090	0.00	16.00	16.00	19.50	47	19.24	19.23		0.04	0.04	
2091	0.00	16.00	16.00	19.50	47	19.28	19.27		0.03	0.04	
2092	0.00	16.00	16.00	19.50	47	19.31	19.30		0.03	0.03	
2093	0.00	16.00	16.00	19.50	47	19.35	19.33		0.03	0.03	
2094	0.00	16.00	16.00	19.50	47	19.37	19.36		0.03	0.03	
2095	0.00	16.00	16.00	19.50	47	19.40	19.38		0.03	0.03	
2096	0.00	16.00	16.00	19.50	47	19.42	19.40		0.02	0.02	
2097	0.00	16.00	16.00	19.50	47	19.44	19.42		0.02	0.02	
2098	0.00	16.00	16.00	19.50	47	19.45	19.44		0.02	0.02	
2099	0.00	16.00	16.00	19.50	47	19.46	19.45		0.01	0.01	
2100	0.00	16.00	16.00	19.50	47	19.47	19.46		0.01	0.01	

Notes: D—discovery; CD—cumulative discovery; SCD—smoothed cumulative discovery (years = number of years centred moving average); adj—adjusted (to match cumulative production maximum); predlag—predicted lag between cumulative discovery and cumulative production; raw Pred CP—prediction using direct lag of cumulative discovery by predicted lag years; Pred SCP—raw predicted CP smoothed (with years = number of years centred moving average); SCP—smoothed actual cumulative production (years = number of years centred moving average); raw Pred P—one year change in predicted smoothed cumulative production; Pred SP—smoothed raw Pred P (years = number of years centred moving average); Actual P—actual annual oil production. Shaded numbers are interpolations, extrapolations or forecasts.

Table 8.3 Malaysia, gigabarrels (continued)

Year	D	CD	3 lyr SCD	Adj SCD	Predlag	Raw pred CP	1 lyr smth pred SCP	SCP	Raw pred P	5yr smth pred SP	Actual P
2021	0.08	12.25	12.10	12.10	23	9.16	9.15		0.16	0.16	
2022	0.08	12.32	12.17	12.17	23	9.31	9.31		0.16	0.16	
2023	0.07	12.40	12.24	12.24	23	9.46	9.46		0.15	0.15	
2024	0.07	12.46	12.31	12.31	23	9.61	9.61		0.15	0.15	
2025	0.06	12.53	12.37	12.37	23	9.76	9.76		0.15	0.15	
2026	0.06	12.59	12.43	12.43	23	9.91	9.91		0.15	0.15	
2027	0.06	12.64	12.48	12.48	23	10.07	10.05		0.15	0.15	
2028	0.05	12.70	12.54	12.54	23	10.22	10.20		0.14	0.14	
2029	0.05	12.75	12.58	12.58	23	10.37	10.34		0.14	0.14	
2030	0.04	12.79	12.63	12.63	23	10.50	10.48		0.14	0.14	
2031	0.04	12.83	12.67	12.67	23	10.63	10.61		0.14	0.14	
2032	0.04	12.86	12.71	12.71	23	10.76	10.75		0.13	0.13	
2033	0.03	12.89	12.74	12.74	23	10.88	10.88		0.13	0.13	
2034	0.03	12.92	12.78	12.78	23	11.01	11.01		0.13	0.13	
2035	0.02	12.94	12.80	12.80	23	11.13	11.13		0.13	0.13	
2036	0.02	12.96	12.83	12.83	23	11.26	11.26		0.12	0.12	
2037	0.01	12.98	12.86	12.86	23	11.39	11.38		0.12	0.12	
2038	0.01	12.98	12.88	12.88	23	11.51	11.49		0.12	0.12	
2039	0.00	12.99	12.90	12.90	23	11.64	11.60		0.11	0.11	
2040	0.01	13.00	12.91	12.91	23	11.76	11.71		0.11	0.11	
2041	0.00	13.00	12.93	12.93	23	11.86	11.81		0.10	0.10	
2042	0.00	13.00	12.94	12.94	23	11.94	11.90		0.10	0.10	
2043	0.00	13.00	12.95	12.95	23	12.02	11.99		0.09	0.09	
2044	0.00	13.00	12.96	12.96	23	12.10	12.08		0.08	0.08	
2045	0.00	13.00	12.97	12.97	23	12.17	12.15		0.08	0.08	
2046	0.00	13.00	12.98	12.98	23	12.24	12.23		0.07	0.07	
2047	0.00	13.00	12.98	12.98	23	12.31	12.29		0.07	0.07	
2048	0.00	13.00	12.99	12.99	23	12.37	12.35		0.06	0.06	
2049	0.00	13.00	12.99	12.99	23	12.43	12.41		0.06	0.06	
2050	0.00	13.00	13.00	13.00	23	12.48	12.47		0.06	0.06	
2051	0.00	13.00	13.00	13.00	23	12.54	12.52		0.05	0.05	
2052	0.00	13.00	13.00	13.00	23	12.58	12.57		0.05	0.05	
2053	0.00	13.00	13.00	13.00	23	12.63	12.61		0.05	0.05	
2054	0.00	13.00	13.00	13.00	23	12.67	12.65		0.04	0.04	
2055	0.00	13.00	13.00	13.00	23	12.71	12.69		0.04	0.04	
2056	0.00	13.00	13.00	13.00	23	12.74	12.73		0.04	0.04	
2057	0.00	13.00	13.00	13.00	23	12.78	12.76		0.03	0.03	
2058	0.00	13.00	13.00	13.00	23	12.80	12.79		0.03	0.03	
2059	0.00	13.00	13.00	13.00	23	12.83	12.82		0.03	0.03	
2060	0.00	13.00	13.00	13.00	23	12.86	12.84		0.02	0.02	
2061	0.00	13.00	13.00	13.00	23	12.88	12.87		0.02	0.02	
2062	0.00	13.00	13.00	13.00	23	12.90	12.89		0.02	0.02	
2063	0.00	13.00	13.00	13.00	23	12.91	12.90		0.02	0.02	
2064	0.00	13.00	13.00	13.00	23	12.93	12.92		0.02	0.02	
2065	0.00	13.00	13.00	13.00	23	12.94	12.93		0.01	0.01	
2066	0.00	13.00	13.00	13.00	23	12.95	12.95		0.01	0.01	
2067	0.00	13.00	13.00	13.00	23	12.96	12.96		0.01	0.01	
2068	0.00	13.00	13.00	13.00	23	12.97	12.97		0.01	0.01	
2069	0.00	13.00	13.00	13.00	23	12.98	12.97		0.01	0.01	
2070	0.00	13.00	13.00	13.00	23	12.98	12.98		0.01	0.01	
2071	0.00	13.00	13.00	13.00	23	12.99	12.98		0.01	0.01	
2072	0.00	13.00	13.00	13.00	23	12.99	12.99		0.00	0.00	
2073	0.00	13.00	13.00	13.00	23	13.00	12.99		0.00	0.00	
2074	0.00	13.00	13.00	13.00	23	13.00	12.99		0.00	0.00	
2075	0.00	13.00	13.00	13.00	23	13.00	13.00		0.00	0.00	
2076	0.00	13.00	13.00	13.00	23	13.00	13.00		0.00	0.00	
2077	0.00	13.00	13.00	13.00	23	13.00	13.00		0.00	0.00	
2078	0.00	13.00	13.00	13.00	23	13.00	13.00		0.00	0.00	
2079	0.00	13.00	13.00	13.00	23	13.00	13.00		0.00	0.00	
2080	0.00	13.00	13.00	13.00	23	13.00	13.00		0.00	0.00	
2081	0.00	13.00	13.00	13.00	23	13.00	13.00		0.00	0.00	
2082	0.00	13.00	13.00	13.00	23	13.00	13.00		0.00	0.00	
2083	0.00	13.00	13.00	13.00	23	13.00	13.00		0.00	0.00	
2084	0.00	13.00	13.00	13.00	23	13.00	13.00		0.00	0.00	
2085	0.00	13.00	13.00	13.00	23	13.00	13.00		0.00	0.00	
2086	0.00	13.00	13.00	13.00	23	13.00	13.00		0.00	0.00	
2087	0.00	13.00	13.00	13.00	23	13.00	13.00		0.00	0.00	
2088	0.00	13.00	13.00	13.00	23	13.00	13.00		0.00	0.00	
2089	0.00	13.00	13.00	13.00	23	13.00	13.00		0.00	0.00	
2090	0.00	13.00	13.00	13.00	23	13.00	13.00		0.00	0.00	

(continued)

Table 8.3 Malaysia, gigabarrels (continued)

Year	D	CD	3 1/yr SCD	Adj SCD	Predlag	Raw pred CP	1 1/yr smth pred SCP	SCP	Raw pred P	5yr smth pred SP	Actual P
2091	0.00	13.00	13.00	13.00	23	13.00	13.00		0.00	0.00	
2092	0.00	13.00	13.00	13.00	23	13.00	13.00		0.00	0.00	
2093	0.00	13.00	13.00	13.00	23	13.00	13.00		0.00	0.00	
2094	0.00	13.00	13.00	13.00	23	13.00	13.00		0.00	0.00	
2095	0.00	13.00	13.00	13.00	23	13.00	13.00		0.00	0.00	
2096	0.00	13.00	13.00	13.00	23	13.00	13.00		0.00	0.00	
2097	0.00	13.00	13.00	13.00	23	13.00	13.00		0.00	0.00	
2098	0.00	13.00	13.00	13.00	23	13.00	13.00		0.00	0.00	
2099	0.00	13.00	13.00	13.00	23	13.00	13.00		0.00	0.00	
2100	0.00	13.00	13.00	13.00	23	13.00	13.00		0.00	0.00	

Notes: D—discovery; CD—cumulative discovery; SCD—smoothed cumulative discovery (years = number of years centred moving average); adj—adjusted (to match cumulative production maximum); predlag—predicted lag between cumulative discovery and cumulative production; raw Pred CP—prediction using direct lag of cumulative discovery by predicted lag years; Pred SCP—raw predicted CP smoothed (with years = number of years centred moving average); SCP—smoothed actual cumulative production (years = number of years centred moving average); raw Pred P—one year change in predicted smoothed cumulative production; Pred SP—smoothed raw Pred P (years = number of years centred moving average); Actual P—actual annual oil production. Shaded numbers are interpolations, extrapolations or forecasts.

Table 8.4 Australia (continued)

Year	D	CD	3,4,5, 11,31yr SCD	Adj SCD	Predlag	Raw pred CP	0,11yr smth pred SCP	SCP	Raw pred P	5yr smth pred SP	Actual P
2029	0.05	13.25	13.14	13.14	35	9.88	9.83		0.12	0.13	
2030	0.04	13.30	13.19	13.19	35	10.03	9.96		0.13	0.12	
2031	0.04	13.34	13.23	13.23	35	10.10	10.09		0.13	0.12	
2032	0.03	13.37	13.26	13.26	35	10.17	10.21		0.12	0.12	
2033	0.03	13.40	13.29	13.29	35	10.32	10.33		0.12	0.12	
2034	0.03	13.43	13.32	13.32	35	10.47	10.46		0.12	0.12	
2035	0.02	13.45	13.35	13.35	35	10.61	10.58		0.12	0.12	
2036	0.02	13.46	13.37	13.37	35	10.69	10.70		0.12	0.12	
2037	0.01	13.48	13.39	13.39	35	10.77	10.81		0.12	0.12	
2038	0.01	13.49	13.41	13.41	35	10.92	10.93		0.12	0.12	
2039	0.00	13.49	13.43	13.43	35	11.06	11.05		0.12	0.12	
2040	0.00	13.49	13.44	13.44	35	11.20	11.17		0.12	0.12	
2041	0.00	13.49	13.45	13.45	35	11.34	11.28		0.11	0.12	
2042	0.00	13.49	13.46	13.46	35	11.41	11.40		0.12	0.12	
2043	0.00	13.49	13.47	13.47	35	11.48	11.52		0.12	0.11	
2044	0.00	13.49	13.48	13.48	35	11.62	11.64		0.12	0.11	
2045	0.00	13.49	13.48	13.48	35	11.75	11.74		0.11	0.11	
2046	0.00	13.49	13.48	13.48	35	11.86	11.84		0.10	0.10	
2047	0.00	13.49	13.49	13.49	35	11.98	11.94		0.09	0.10	
2048	0.00	13.49	13.49	13.49	35	12.09	12.04		0.10	0.10	
2049	0.00	13.49	13.49	13.49	35	12.20	12.13		0.10	0.09	
2050	0.00	13.49	13.49	13.49	35	12.25	12.23		0.09	0.09	
2051	0.00	13.49	13.49	13.49	35	12.29	12.31		0.09	0.09	
2052	0.00	13.49	13.49	13.49	35	12.39	12.40		0.08	0.08	
2053	0.00	13.49	13.49	13.49	35	12.48	12.48		0.08	0.08	
2054	0.00	13.49	13.49	13.49	35	12.56	12.56		0.08	0.08	
2055	0.00	13.49	13.49	13.49	35	12.65	12.63		0.07	0.07	
2056	0.00	13.49	13.49	13.49	35	12.72	12.70		0.07	0.07	
2057	0.00	13.49	13.49	13.49	35	12.80	12.77		0.07	0.07	
2058	0.00	13.49	13.49	13.49	35	12.86	12.83		0.06	0.06	
2059	0.00	13.49	13.49	13.49	35	12.93	12.89		0.06	0.06	
2060	0.00	13.49	13.49	13.49	35	12.99	12.95		0.06	0.06	
2061	0.00	13.49	13.49	13.49	35	13.02	13.00		0.05	0.05	
2062	0.00	13.49	13.49	13.49	35	13.04	13.05		0.05	0.05	
2063	0.00	13.49	13.49	13.49	35	13.10	13.10		0.05	0.05	
2064	0.00	13.49	13.49	13.49	35	13.14	13.14		0.04	0.04	
2065	0.00	13.49	13.49	13.49	35	13.19	13.18		0.04	0.04	
2066	0.00	13.49	13.49	13.49	35	13.23	13.21		0.03	0.04	
2067	0.00	13.49	13.49	13.49	35	13.26	13.24		0.03	0.03	
2068	0.00	13.49	13.49	13.49	35	13.29	13.28		0.03	0.03	
2069	0.00	13.49	13.49	13.49	35	13.32	13.31		0.03	0.03	
2070	0.00	13.49	13.49	13.49	35	13.35	13.34		0.03	0.03	
2071	0.00	13.49	13.49	13.49	35	13.37	13.36		0.02	0.02	
2072	0.00	13.49	13.49	13.49	35	13.39	13.38		0.02	0.02	
2073	0.00	13.49	13.49	13.49	35	13.41	13.40		0.02	0.02	
2074	0.00	13.49	13.49	13.49	35	13.43	13.42		0.02	0.02	
2075	0.00	13.49	13.49	13.49	35	13.44	13.43		0.01	0.01	
2076	0.00	13.49	13.49	13.49	35	13.45	13.44		0.01	0.01	
2077	0.00	13.49	13.49	13.49	35	13.46	13.45		0.01	0.01	
2078	0.00	13.49	13.49	13.49	35	13.47	13.46		0.01	0.01	
2079	0.00	13.49	13.49	13.49	35	13.48	13.47		0.01	0.01	
2080	0.00	13.49	13.49	13.49	35	13.48	13.47		0.01	0.01	
2081	0.00	13.49	13.49	13.49	35	13.48	13.48		0.00	0.01	
2082	0.00	13.49	13.49	13.49	35	13.49	13.48		0.00	0.00	
2083	0.00	13.49	13.49	13.49	35	13.49	13.48		0.00	0.00	
2084	0.00	13.49	13.49	13.49	35	13.49	13.49		0.00	0.00	
2085	0.00	13.49	13.49	13.49	35	13.49	13.49		0.00	0.00	
2086	0.00	13.49	13.49	13.49	35	13.49	13.49		0.00	0.00	
2087	0.00	13.49	13.49	13.49	35	13.49	13.49		0.00	0.00	
2088	0.00	13.49	13.49	13.49	35	13.49	13.49		0.00	0.00	
2089	0.00	13.49	13.49	13.49	35	13.49	13.49		0.00	0.00	
2090	0.00	13.49	13.49	13.49	35	13.49	13.49		0.00	0.00	
2091	0.00	13.49	13.49	13.49	35	13.49	13.49		0.00	0.00	
2092	0.00	13.49	13.49	13.49	35	13.49	13.49		0.00	0.00	
2093	0.00	13.49	13.49	13.49	35	13.49	13.49		0.00	0.00	
2094	0.00	13.49	13.49	13.49	35	13.49	13.49		0.00	0.00	
2095	0.00	13.49	13.49	13.49	35	13.49	13.49		0.00	0.00	
2096	0.00	13.49	13.49	13.49	35	13.49	13.49		0.00	0.00	
2097	0.00	13.49	13.49	13.49	35	13.49	13.49		0.00	0.00	
2098	0.00	13.49	13.49	13.49	35	13.49	13.49		0.00	0.00	
2099	0.00	13.49	13.49	13.49	35	13.49	13.49		0.00	0.00	
2100	0.00	13.49	13.49	13.49	35	13.49	13.49		0.00	0.00	

Notes: D—discovery; CD—cumulative discovery; SCD—smoothed cumulative discovery (years = number of years centred moving average); adj—adjusted (to match cumulative production maximum); predlag—predicted lag between cumulative discovery and cumulative production; raw Pred CP—prediction using direct lag of cumulative discovery by predicted lag years; Pred SCP—raw predicted CP smoothed (with years = number of years centred moving average); SCP—smoothed actual cumulative production (years = number of years centred moving average); raw Pred P—one year change in predicted smoothed cumulative production; Pred SP—smoothed raw Pred P (years = number of years centred moving average); Actual P—actual annual oil production. Shaded numbers are interpolations, extrapolations or forecasts.

Table 8.5 Rest of the East, gigabarrels (continued)

Year	D	CD	3 lyr SCD	Adj SCD	Predlag	Raw pred CP	1 lyr smth pred SCP	SCP	Raw pred P	Syr smth pred SP	Actual P
1980	0.06	5.19	4.94	4.94	23	1.86	1.89	1.87	0.09	0.09	0.09
1981	0.37	5.56	5.16	5.16	23	1.93	1.98	1.96	0.09	0.09	0.09
1982	0.01	5.57	5.38	5.38	23	2.09	2.07	2.05	0.09	0.09	0.09
1983	0.07	5.64	5.60	5.60	23	2.17	2.16	2.15	0.10	0.10	0.10
1984	0.13	5.77	5.83	5.83	23	2.25	2.26	2.25	0.10	0.10	0.10
1985	0.14	5.91	6.07	6.07	23	2.34	2.37	2.35	0.11	0.10	0.10
1986	0.36	6.27	6.28	6.28	23	2.42	2.47	2.46	0.11	0.11	0.11
1987	0.06	6.33	6.50	6.50	23	2.59	2.58	2.57	0.11	0.11	0.11
1988	0.19	6.52	6.74	6.74	23	2.67	2.69	2.68	0.11	0.11	0.11
1989	0.22	6.74	6.97	6.97	23	2.76	2.81	2.80	0.12	0.12	0.12
1990	0.21	6.95	7.22	7.22	23	2.93	2.93	2.92	0.12	0.12	0.12
1991	0.11	7.06	7.42	7.42	23	3.03	3.06	3.05	0.12	0.13	0.13
1992	0.12	7.18	7.63	7.63	23	3.12	3.19	3.18	0.14	0.13	0.13
1993	0.13	7.31	7.85	7.85	23	3.31	3.33	3.32	0.14	0.14	0.14
1994	0.36	7.67	8.07	8.07	23	3.50	3.47	3.45	0.14	0.14	0.13
1995	0.50	8.17	8.30	8.30	23	3.60	3.61	3.59	0.14	0.14	0.15
1996	0.26	8.43	8.54	8.54	23	3.70	3.76	3.73	0.15	0.15	0.13
1997	0.21	8.64	8.77	8.77	23	3.90	3.92	3.88	0.16	0.16	0.16
1998	0.05	8.69	9.02	9.02	23	4.11	4.08	4.04	0.17	0.16	0.13
1999	0.12	8.81	9.27	9.27	23	4.22	4.25	4.22	0.17	0.17	0.18
2000	0.45	9.26	9.52	9.52	23	4.33	4.42	4.40	0.17	0.18	0.19
2001	0.32	9.58	9.78	9.78	23	4.54	4.60	4.60	0.18	0.18	0.20
2002	0.31	9.89	10.04	10.04	23	4.73	4.80	4.81	0.19	0.19	0.21
2003	0.47	10.36	10.31	10.31	23	4.94	4.99	5.02	0.20	0.20	0.21
2004	0.20	10.56	10.57	10.57	23	5.16	5.19	5.23	0.20	0.20	0.22
2005	0.28	10.84	10.84	10.84	23	5.38	5.40	5.45	0.21	0.21	0.22
2006	0.28	11.12	11.12	11.12	23	5.60	5.62	5.67	0.22	0.21	0.22
2007	0.29	11.41	11.39	11.39	23	5.83	5.84		0.22	0.22	
2008	0.29	11.70	11.67	11.67	23	6.07	6.06		0.23	0.22	
2009	0.29	11.98	11.96	11.96	23	6.28	6.29		0.23	0.22	
2010	0.29	12.27	12.24	12.24	23	6.50	6.51		0.22	0.22	
2011	0.29	12.56	12.51	12.51	23	6.74	6.74		0.22	0.22	
2012	0.29	12.85	12.78	12.78	23	6.97	6.96		0.22	0.22	
2013	0.29	13.13	13.05	13.05	23	7.22	7.19		0.22	0.22	
2014	0.29	13.42	13.33	13.33	23	7.42	7.41		0.22	0.23	
2015	0.28	13.70	13.61	13.61	23	7.63	7.64		0.23	0.23	
2016	0.28	13.98	13.89	13.89	23	7.85	7.87		0.23	0.23	
2017	0.28	14.26	14.16	14.16	23	8.07	8.10		0.23	0.23	
2018	0.28	14.54	14.42	14.42	23	8.30	8.33		0.23	0.23	
2019	0.27	14.81	14.68	14.68	23	8.54	8.56		0.23	0.24	
2020	0.27	15.08	14.94	14.94	23	8.77	8.80		0.24	0.24	
2021	0.27	15.35	15.19	15.19	23	9.02	9.04		0.24	0.24	
2022	0.26	15.61	15.44	15.44	23	9.27	9.29		0.25	0.25	
2023	0.26	15.87	15.68	15.68	23	9.52	9.54		0.25	0.25	
2024	0.25	16.13	15.92	15.92	23	9.78	9.80		0.26	0.26	
2025	0.25	16.37	16.16	16.16	23	10.04	10.06		0.26	0.26	
2026	0.24	16.62	16.38	16.38	23	10.31	10.32		0.26	0.26	
2027	0.24	16.86	16.61	16.61	23	10.57	10.59		0.27	0.27	
2028	0.23	17.09	16.83	16.83	23	10.84	10.86		0.27	0.27	
2029	0.22	17.31	17.04	17.04	23	11.12	11.13		0.27	0.27	
2030	0.22	17.53	17.24	17.24	23	11.39	11.40		0.27	0.27	
2031	0.21	17.74	17.44	17.44	23	11.67	11.68		0.27	0.27	
2032	0.20	17.94	17.63	17.63	23	11.96	11.95		0.28	0.27	
2033	0.19	18.14	17.81	17.81	23	12.24	12.23		0.28	0.28	
2034	0.19	18.32	17.99	17.99	23	12.51	12.50		0.28	0.28	
2035	0.18	18.50	18.15	18.15	23	12.78	12.78		0.28	0.28	
2036	0.17	18.67	18.31	18.31	23	13.05	13.06		0.28	0.27	
2037	0.16	18.83	18.46	18.46	23	13.33	13.33		0.27	0.27	
2038	0.15	18.98	18.60	18.60	23	13.61	13.60		0.27	0.27	
2039	0.14	19.12	18.74	18.74	23	13.89	13.87		0.27	0.27	
2040	0.13	19.25	18.86	18.86	23	14.16	14.14		0.27	0.27	
2041	0.12	19.37	18.98	18.98	23	14.42	14.40		0.26	0.26	
2042	0.11	19.48	19.09	19.09	23	14.68	14.66		0.26	0.26	
2043	0.10	19.58	19.19	19.19	23	14.94	14.92		0.26	0.26	
2044	0.09	19.67	19.28	19.28	23	15.19	15.17		0.25	0.25	
2045	0.08	19.75	19.37	19.37	23	15.44	15.42		0.25	0.25	
2046	0.07	19.82	19.45	19.45	23	15.68	15.66		0.24	0.24	
2047	0.06	19.88	19.52	19.52	23	15.92	15.90		0.24	0.24	
2048	0.05	19.92	19.59	19.59	23	16.16	16.13		0.23	0.23	
2049	0.03	19.96	19.65	19.65	23	16.38	16.36		0.23	0.23	
2050	0.02	19.98	19.70	19.70	23	16.61	16.58		0.22	0.22	
2051	0.01	19.99	19.75	19.75	23	16.83	16.79		0.22	0.22	
2052	0.00	20.00	19.79	19.79	23	17.04	17.00		0.21	0.21	
2053	0.00	20.00	19.83	19.83	23	17.24	17.21		0.20	0.20	
2054	0.00	20.00	19.86	19.86	23	17.44	17.40		0.20	0.20	
2055	0.00	20.00	19.89	19.89	23	17.63	17.59		0.19	0.19	
2056	0.00	20.00	19.92	19.92	23	17.81	17.77		0.18	0.18	
2057	0.00	20.00	19.94	19.94	23	17.99	17.95		0.17	0.17	
2058	0.00	20.00	19.95	19.95	23	18.15	18.11		0.17	0.17	
2059	0.00	20.00	19.97	19.97	23	18.31	18.27		0.16	0.16	

(continued)

Table 8.5 Rest of the East, gigabarrels (continued)

Year	D	CD	3 lyr SCD	Adj SCD	Predlag	Raw pred CP	1 lyr smth pred SCP	SCP	Raw pred P	5yr smth pred SP	Actual P
2060	0.00	20.00	19.98	19.98	23	18.46	18.42		0.15	0.15	
2061	0.00	20.00	19.99	19.99	23	18.60	18.56		0.14	0.14	
2062	0.00	20.00	19.99	19.99	23	18.74	18.69		0.13	0.13	
2063	0.00	20.00	20.00	20.00	23	18.86	18.82		0.13	0.13	
2064	0.00	20.00	20.00	20.00	23	18.98	18.94		0.12	0.12	
2065	0.00	20.00	20.00	20.00	23	19.09	19.05		0.11	0.11	
2066	0.00	20.00	20.00	20.00	23	19.19	19.15		0.10	0.10	
2067	0.00	20.00	20.00	20.00	23	19.28	19.25		0.10	0.10	
2068	0.00	20.00	20.00	20.00	23	19.37	19.33		0.09	0.09	
2069	0.00	20.00	20.00	20.00	23	19.45	19.41		0.08	0.08	
2070	0.00	20.00	20.00	20.00	23	19.52	19.49		0.07	0.07	
2071	0.00	20.00	20.00	20.00	23	19.59	19.56		0.07	0.07	
2072	0.00	20.00	20.00	20.00	23	19.65	19.62		0.06	0.06	
2073	0.00	20.00	20.00	20.00	23	19.70	19.67		0.06	0.06	
2074	0.00	20.00	20.00	20.00	23	19.75	19.72		0.05	0.05	
2075	0.00	20.00	20.00	20.00	23	19.79	19.77		0.04	0.04	
2076	0.00	20.00	20.00	20.00	23	19.83	19.81		0.04	0.04	
2077	0.00	20.00	20.00	20.00	23	19.86	19.84		0.03	0.03	
2078	0.00	20.00	20.00	20.00	23	19.89	19.87		0.03	0.03	
2079	0.00	20.00	20.00	20.00	23	19.92	19.90		0.03	0.03	
2080	0.00	20.00	20.00	20.00	23	19.94	19.92		0.02	0.02	
2081	0.00	20.00	20.00	20.00	23	19.95	19.94		0.02	0.02	
2082	0.00	20.00	20.00	20.00	23	19.97	19.95		0.02	0.02	
2083	0.00	20.00	20.00	20.00	23	19.98	19.96		0.01	0.01	
2084	0.00	20.00	20.00	20.00	23	19.99	19.97		0.01	0.01	
2085	0.00	20.00	20.00	20.00	23	19.99	19.98		0.01	0.01	
2086	0.00	20.00	20.00	20.00	23	20.00	19.99		0.01	0.01	
2087	0.00	20.00	20.00	20.00	23	20.00	19.99		0.00	0.01	
2088	0.00	20.00	20.00	20.00	23	20.00	20.00		0.00	0.00	
2089	0.00	20.00	20.00	20.00	23	20.00	20.00		0.00	0.00	
2090	0.00	20.00	20.00	20.00	23	20.00	20.00		0.00	0.00	
2091	0.00	20.00	20.00	20.00	23	20.00	20.00		0.00	0.00	
2092	0.00	20.00	20.00	20.00	23	20.00	20.00		0.00	0.00	
2093	0.00	20.00	20.00	20.00	23	20.00	20.00		0.00	0.00	
2094	0.00	20.00	20.00	20.00	23	20.00	20.00		0.00	0.00	
2095	0.00	20.00	20.00	20.00	23	20.00	20.00		0.00	0.00	
2096	0.00	20.00	20.00	20.00	23	20.00	20.00		0.00	0.00	
2097	0.00	20.00	20.00	20.00	23	20.00	20.00		0.00	0.00	
2098	0.00	20.00	20.00	20.00	23	20.00	20.00		0.00	0.00	
2099	0.00	20.00	20.00	20.00	23	20.00	20.00		0.00	0.00	
2100	0.00	20.00	20.00	20.00	23	20.00	20.00		0.00	0.00	

Notes: D—discovery; CD—cumulative discovery; SCD—smoothed cumulative discovery (years = number of years centred moving average); adj—adjusted (to match cumulative production maximum); predlag—predicted lag between cumulative discovery and cumulative production; raw Pred CP—prediction using direct lag of cumulative discovery by predicted lag years; Pred SCP—raw predicted CP smoothed (with years = number of years centred moving average); SCP—smoothed actual cumulative production (years = number of years centred moving average); raw Pred P—one year change in predicted smoothed cumulative production; Pred SP—smoothed raw Pred P (years = number of years centred moving average); Actual P—actual annual oil production. Shaded numbers are interpolations, extrapolations or forecasts.

Table 8.6 The East actual production, gigabarrels (continued)

Year	Actual Prod Indonesia	Actual Prod India	Actual Prod Malaysia	Actual Prod Australia	Conven rest East	Deep rest East	Total rest East	Actual Prod total East
1951	0.06	0.00	0.00	0.00	0.04	0.00	0.04	0.10
1952	0.06	0.00	0.00	0.00	0.04	0.00	0.04	0.10
1953	0.08	0.00	0.00	0.00	0.03	0.00	0.03	0.11
1954	0.08	0.00	0.00	0.00	0.03	0.00	0.03	0.12
1955	0.09	0.00	0.00	0.00	0.03	0.00	0.03	0.12
1956	0.09	0.00	0.00	0.00	0.04	0.00	0.04	0.13
1957	0.11	0.00	0.00	0.00	0.04	0.00	0.04	0.15
1958	0.13	0.00	0.00	0.00	0.04	0.00	0.04	0.17
1959	0.12	0.00	0.00	0.00	0.04	0.00	0.04	0.16
1960	0.16	0.00	0.00	0.00	0.03	0.00	0.03	0.19
1961	0.16	0.00	0.00	0.00	0.03	0.00	0.03	0.19
1962	0.17	0.00	0.00	0.00	0.03	0.00	0.03	0.20
1963	0.17	0.00	0.00	0.00	0.04	0.00	0.04	0.21
1964	0.18	0.01	0.00	0.00	0.05	0.00	0.05	0.23
1965	0.17	0.02	0.00	0.00	0.07	0.00	0.07	0.25
1966	0.17	0.02	0.00	0.00	0.05	0.00	0.05	0.24
1967	0.19	0.03	0.00	0.00	0.05	0.00	0.05	0.27
1968	0.20	0.04	0.00	0.00	0.07	0.00	0.07	0.31
1969	0.26	0.05	0.00	0.00	0.05	0.00	0.05	0.36
1970	0.31	0.05	0.01	0.06	0.06	0.00	0.06	0.50
1971	0.33	0.05	0.03	0.11	0.07	0.00	0.07	0.59
1972	0.39	0.06	0.03	0.12	0.06	0.00	0.06	0.66
1973	0.49	0.05	0.03	0.13	0.10	0.00	0.10	0.81
1974	0.50	0.06	0.03	0.14	0.09	0.00	0.09	0.82
1975	0.48	0.06	0.04	0.15	0.08	0.00	0.08	0.80
1976	0.55	0.06	0.06	0.16	0.07	0.00	0.07	0.90
1977	0.62	0.07	0.07	0.16	0.09	0.00	0.09	1.00
1978	0.60	0.08	0.08	0.16	0.09	0.00	0.09	1.01
1979	0.58	0.09	0.10	0.16	0.09	0.00	0.09	1.02
1980	0.58	0.07	0.10	0.14	0.09	0.00	0.09	0.97
1981	0.59	0.12	0.10	0.14	0.09	0.00	0.09	1.03
1982	0.49	0.14	0.11	0.14	0.09	0.00	0.09	0.97
1983	0.49	0.18	0.13	0.15	0.10	0.00	0.10	1.05
1984	0.52	0.19	0.16	0.18	0.10	0.00	0.10	1.15
1985	0.48	0.23	0.16	0.21	0.10	0.00	0.10	1.18
1986	0.51	0.23	0.18	0.19	0.11	0.00	0.11	1.22
1987	0.49	0.22	0.18	0.20	0.11	0.00	0.11	1.20
1988	0.49	0.23	0.20	0.20	0.11	0.00	0.11	1.23
1989	0.51	0.26	0.21	0.18	0.12	0.00	0.12	1.28
1990	0.53	0.24	0.23	0.21	0.12	0.00	0.12	1.33
1991	0.58	0.22	0.24	0.20	0.13	0.00	0.13	1.37
1992	0.55	0.20	0.24	0.20	0.13	0.00	0.13	1.32
1993	0.55	0.19	0.23	0.18	0.14	0.00	0.14	1.30
1994	0.55	0.22	0.24	0.20	0.13	0.00	0.13	1.33
1995	0.55	0.26	0.25	0.21	0.15	0.00	0.15	1.41
1996	0.56	0.24	0.25	0.21	0.13	0.00	0.13	1.39
1997	0.55	0.25	0.26	0.21	0.16	0.00	0.16	1.43
1998	0.55	0.24	0.26	0.20	0.13	0.00	0.13	1.39
1999	0.54	0.24	0.25	0.20	0.18	0.00	0.18	1.41
2000	0.52	0.24	0.25	0.26	0.19	0.00	0.20	1.47
2001	0.49	0.23	0.24	0.24	0.20	0.03	0.23	1.44
2002	0.46	0.24	0.25	0.23	0.21	0.05	0.25	1.44
2003	0.42	0.24	0.27	0.19	0.21	0.06	0.27	1.39
2004	0.40	0.25	0.28	0.16	0.22	0.06	0.28	1.36
2005	0.39	0.24	0.23	0.16	0.22	0.06	0.28	1.31
2006	0.37	0.25	0.22	0.16	0.22	0.07	0.29	1.29

Table 8.6 The East predicted production, gigabarrels (continued)

Year	Pred prod Indonesia	Pred prod India	Pred prod Malaysia	Pred prod Australia	Conven rest East	Deep rest East	Total rest East	Pred prod total East
1951	0.07	0.00	0.00	0.00	0.03	0.00	0.03	0.10
1952	0.07	0.01	0.00	0.00	0.03	0.00	0.03	0.11
1953	0.08	0.01	0.00	0.00	0.03	0.00	0.03	0.11
1954	0.08	0.01	0.00	0.00	0.03	0.00	0.03	0.12
1955	0.08	0.01	0.00	0.00	0.03	0.00	0.03	0.12
1956	0.09	0.00	0.00	0.00	0.04	0.00	0.04	0.13
1957	0.09	0.00	0.00	0.00	0.04	0.00	0.04	0.14
1958	0.10	0.00	0.00	0.00	0.04	0.00	0.04	0.14
1959	0.11	0.01	0.00	0.00	0.04	0.00	0.04	0.16
1960	0.12	0.01	0.00	0.00	0.04	0.00	0.04	0.17
1961	0.13	0.01	0.00	0.00	0.04	0.00	0.04	0.18
1962	0.15	0.01	0.00	0.00	0.04	0.00	0.04	0.20
1963	0.16	0.01	0.00	0.00	0.04	0.00	0.04	0.22
1964	0.18	0.02	0.00	0.00	0.05	0.00	0.05	0.24
1965	0.19	0.02	0.00	0.00	0.05	0.00	0.05	0.27
1966	0.21	0.03	0.00	0.00	0.05	0.00	0.05	0.30
1967	0.24	0.03	0.01	0.00	0.05	0.00	0.05	0.33
1968	0.26	0.04	0.01	0.00	0.06	0.00	0.06	0.37
1969	0.29	0.04	0.01	0.03	0.06	0.00	0.06	0.44
1970	0.32	0.04	0.02	0.07	0.07	0.00	0.07	0.51
1971	0.35	0.05	0.02	0.10	0.07	0.00	0.07	0.58
1972	0.38	0.05	0.03	0.12	0.08	0.00	0.08	0.66
1973	0.41	0.06	0.04	0.15	0.08	0.00	0.08	0.73
1974	0.44	0.06	0.04	0.15	0.08	0.00	0.08	0.77
1975	0.46	0.07	0.05	0.14	0.08	0.00	0.08	0.80
1976	0.49	0.07	0.06	0.14	0.08	0.00	0.08	0.85
1977	0.51	0.08	0.07	0.15	0.09	0.00	0.09	0.89
1978	0.53	0.09	0.08	0.15	0.09	0.00	0.09	0.94
1979	0.54	0.10	0.09	0.15	0.09	0.00	0.09	0.97
1980	0.55	0.12	0.10	0.16	0.09	0.00	0.09	1.01
1981	0.54	0.13	0.11	0.16	0.09	0.00	0.09	1.04
1982	0.54	0.15	0.13	0.17	0.09	0.00	0.09	1.07
1983	0.53	0.16	0.14	0.17	0.10	0.00	0.10	1.10
1984	0.53	0.18	0.15	0.18	0.10	0.00	0.10	1.13
1985	0.53	0.19	0.16	0.18	0.10	0.00	0.10	1.16
1986	0.53	0.20	0.17	0.18	0.11	0.00	0.11	1.20
1987	0.52	0.21	0.18	0.19	0.11	0.00	0.11	1.22
1988	0.52	0.22	0.19	0.19	0.11	0.00	0.11	1.24
1989	0.52	0.23	0.20	0.19	0.12	0.00	0.12	1.26
1990	0.52	0.23	0.21	0.19	0.12	0.00	0.12	1.27
1991	0.52	0.23	0.22	0.20	0.13	0.00	0.13	1.29
1992	0.53	0.23	0.22	0.20	0.13	0.00	0.13	1.31
1993	0.54	0.23	0.23	0.20	0.14	0.00	0.14	1.34
1994	0.55	0.23	0.23	0.20	0.14	0.00	0.14	1.35
1995	0.55	0.23	0.24	0.20	0.14	0.01	0.15	1.37
1996	0.55	0.23	0.24	0.20	0.15	0.02	0.17	1.40
1997	0.55	0.23	0.25	0.20	0.16	0.01	0.16	1.39
1998	0.53	0.23	0.25	0.20	0.16	-0.02	0.14	1.36
1999	0.52	0.23	0.25	0.20	0.17	-0.01	0.16	1.37
2000	0.50	0.24	0.26	0.21	0.18	0.00	0.18	1.38
2001	0.49	0.24	0.26	0.20	0.18	0.02	0.20	1.39
2002	0.47	0.25	0.26	0.20	0.19	0.03	0.22	1.40
2003	0.46	0.25	0.26	0.20	0.20	0.05	0.25	1.42
2004	0.44	0.25	0.25	0.20	0.20	0.07	0.27	1.42
2005	0.42	0.24	0.25	0.20	0.21	0.08	0.28	1.40
2006	0.40	0.24	0.25	0.20	0.21	0.09	0.31	1.40
2007	0.38	0.24	0.24	0.19	0.22	0.11	0.33	1.39
2008	0.37	0.24	0.23	0.18	0.22	0.14	0.36	1.39
2009	0.36	0.25	0.23	0.18	0.22	0.16	0.38	1.40
2010	0.35	0.25	0.22	0.17	0.22	0.19	0.41	1.40
2011	0.34	0.24	0.22	0.17	0.22	0.23	0.45	1.42
2012	0.32	0.24	0.21	0.16	0.22	0.28	0.50	1.43
2013	0.31	0.23	0.20	0.16	0.22	0.33	0.56	1.46
2014	0.30	0.23	0.20	0.15	0.23	0.39	0.62	1.49
2015	0.29	0.23	0.19	0.14	0.23	0.44	0.66	1.51
2016	0.28	0.23	0.18	0.14	0.23	0.47	0.70	1.53
2017	0.27	0.23	0.18	0.14	0.23	0.49	0.72	1.53
2018	0.26	0.23	0.17	0.13	0.23	0.50	0.73	1.52
2019	0.25	0.23	0.17	0.13	0.24	0.50	0.73	1.50
2020	0.24	0.22	0.16	0.13	0.24	0.49	0.73	1.49
2021	0.23	0.22	0.16	0.13	0.24	0.47	0.72	1.46
2022	0.23	0.22	0.16	0.13	0.25	0.45	0.69	1.42
2023	0.23	0.21	0.15	0.13	0.25	0.41	0.66	1.39
2024	0.24	0.21	0.15	0.13	0.26	0.37	0.62	1.35
2025	0.24	0.20	0.15	0.13	0.26	0.33	0.59	1.30
2026	0.23	0.19	0.15	0.13	0.26	0.30	0.56	1.26
2027	0.23	0.18	0.15	0.13	0.27	0.28	0.54	1.23
2028	0.23	0.17	0.14	0.13	0.27	0.27	0.53	1.20
2029	0.22	0.16	0.14	0.13	0.27	0.26	0.53	1.17
2030	0.22	0.15	0.14	0.13	0.27	0.25	0.52	1.16
2031	0.22	0.14	0.14	0.13	0.27	0.24	0.52	1.14

(continued)

Table 8.6 The East predicted production, gigabarrels (continued)

Year	Pred prod Indonesia	Pred prod India	Pred prod Malaysia	Pred prod Australia	Conven rest East	Deep rest East	Total rest East	Pred prod total East
2032	0.22	0.13	0.13	0.13	0.27	0.23	0.51	1.13
2033	0.22	0.13	0.13	0.13	0.28	0.23	0.50	1.11
2034	0.22	0.13	0.13	0.12	0.28	0.22	0.49	1.10
2035	0.22	0.13	0.13	0.12	0.28	0.21	0.49	1.08
2036	0.22	0.13	0.12	0.12	0.27	0.20	0.48	1.07
2037	0.22	0.13	0.12	0.13	0.27	0.19	0.47	1.06
2038	0.22	0.13	0.12	0.13	0.27	0.19	0.46	1.05
2039	0.21	0.13	0.11	0.13	0.27	0.18	0.45	1.04
2040	0.21	0.14	0.11	0.13	0.27	0.17	0.44	1.02
2041	0.21	0.14	0.10	0.12	0.26	0.16	0.43	0.99
2042	0.21	0.13	0.10	0.12	0.26	0.16	0.42	0.97
2043	0.20	0.13	0.09	0.11	0.26	0.15	0.40	0.94
2044	0.20	0.14	0.08	0.11	0.25	0.14	0.39	0.92
2045	0.19	0.14	0.08	0.11	0.25	0.13	0.38	0.89
2046	0.18	0.14	0.07	0.11	0.24	0.12	0.37	0.87
2047	0.18	0.14	0.07	0.10	0.24	0.12	0.35	0.84
2048	0.17	0.14	0.06	0.10	0.23	0.11	0.34	0.81
2049	0.16	0.14	0.06	0.09	0.23	0.10	0.33	0.78
2050	0.16	0.14	0.06	0.09	0.22	0.09	0.32	0.75
2051	0.15	0.14	0.05	0.09	0.22	0.09	0.30	0.73
2052	0.15	0.15	0.05	0.08	0.21	0.08	0.29	0.72
2053	0.15	0.15	0.05	0.08	0.20	0.07	0.27	0.70
2054	0.14	0.15	0.04	0.08	0.20	0.06	0.26	0.67
2055	0.14	0.15	0.04	0.08	0.19	0.05	0.24	0.65
2056	0.13	0.15	0.04	0.07	0.18	0.05	0.23	0.62
2057	0.13	0.15	0.03	0.07	0.17	0.04	0.21	0.59
2058	0.12	0.15	0.03	0.06	0.17	0.03	0.20	0.56
2059	0.11	0.16	0.03	0.06	0.16	0.03	0.18	0.54
2060	0.11	0.16	0.02	0.05	0.15	0.02	0.17	0.51
2061	0.10	0.16	0.02	0.05	0.14	0.02	0.16	0.48
2062	0.09	0.15	0.02	0.05	0.13	0.01	0.15	0.46
2063	0.08	0.15	0.02	0.04	0.13	0.01	0.13	0.43
2064	0.08	0.14	0.02	0.04	0.12	0.01	0.12	0.40
2065	0.07	0.14	0.01	0.04	0.11	0.00	0.11	0.38
2066	0.06	0.14	0.01	0.03	0.10	0.00	0.10	0.36
2067	0.06	0.14	0.01	0.03	0.10	0.00	0.10	0.34
2068	0.05	0.14	0.01	0.03	0.09	0.00	0.09	0.32
2069	0.05	0.13	0.01	0.03	0.08	0.00	0.08	0.30
2070	0.04	0.13	0.01	0.02	0.07	0.00	0.07	0.28
2071	0.04	0.12	0.01	0.02	0.07	0.00	0.07	0.26
2072	0.04	0.12	0.00	0.02	0.06	0.00	0.06	0.24
2073	0.03	0.11	0.00	0.02	0.06	0.00	0.06	0.22
2074	0.03	0.11	0.00	0.01	0.05	0.00	0.05	0.21
2075	0.03	0.11	0.00	0.01	0.04	0.00	0.04	0.19
2076	0.02	0.10	0.00	0.01	0.04	0.00	0.04	0.18
2077	0.02	0.10	0.00	0.01	0.03	0.00	0.03	0.17
2078	0.02	0.09	0.00	0.01	0.03	0.00	0.03	0.15
2079	0.02	0.09	0.00	0.01	0.03	0.00	0.03	0.14
2080	0.01	0.08	0.00	0.01	0.02	0.00	0.02	0.13
2081	0.01	0.08	0.00	0.00	0.02	0.00	0.02	0.11
2082	0.01	0.08	0.00	0.00	0.02	0.00	0.02	0.10
2083	0.01	0.07	0.00	0.00	0.01	0.00	0.01	0.09
2084	0.01	0.07	0.00	0.00	0.01	0.00	0.01	0.08
2085	0.00	0.06	0.00	0.00	0.01	0.00	0.01	0.07
2086	0.00	0.06	0.00	0.00	0.01	0.00	0.01	0.07
2087	0.00	0.05	0.00	0.00	0.01	0.00	0.01	0.06
2088	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.05
2089	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.05
2090	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.04
2091	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.04
2092	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.03
2093	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.03
2094	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.03
2095	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.03
2096	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.02
2097	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.02
2098	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.02
2099	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01
2100	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01

Notes: Actual Prod—actual annual production; Pred Prod—predicted annual production; Conven—conventional oil (excluding deep water).

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Chapter 9

Non-Gulf Middle East



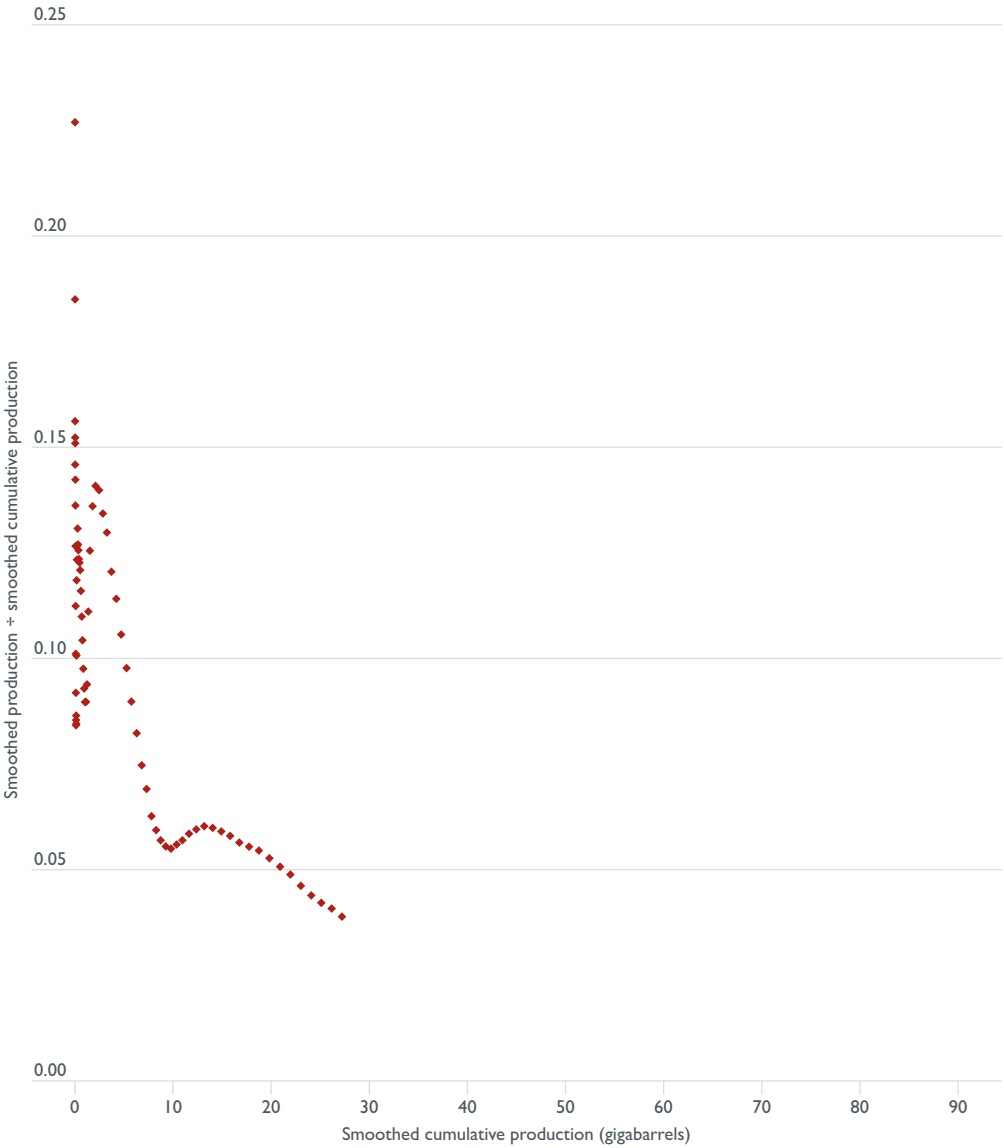
Chapter 9 Non-Gulf Middle East

The Non-Gulf Middle East ('other' than the Gulf producers) includes countries such as Oman, Qatar, Syria, Dubai, Yemen, Bahrain, Turkey and Sharjah.

Table 9.1 sets out the calculations from the 11 steps to a forecast of production of Non-Gulf Middle East oil.

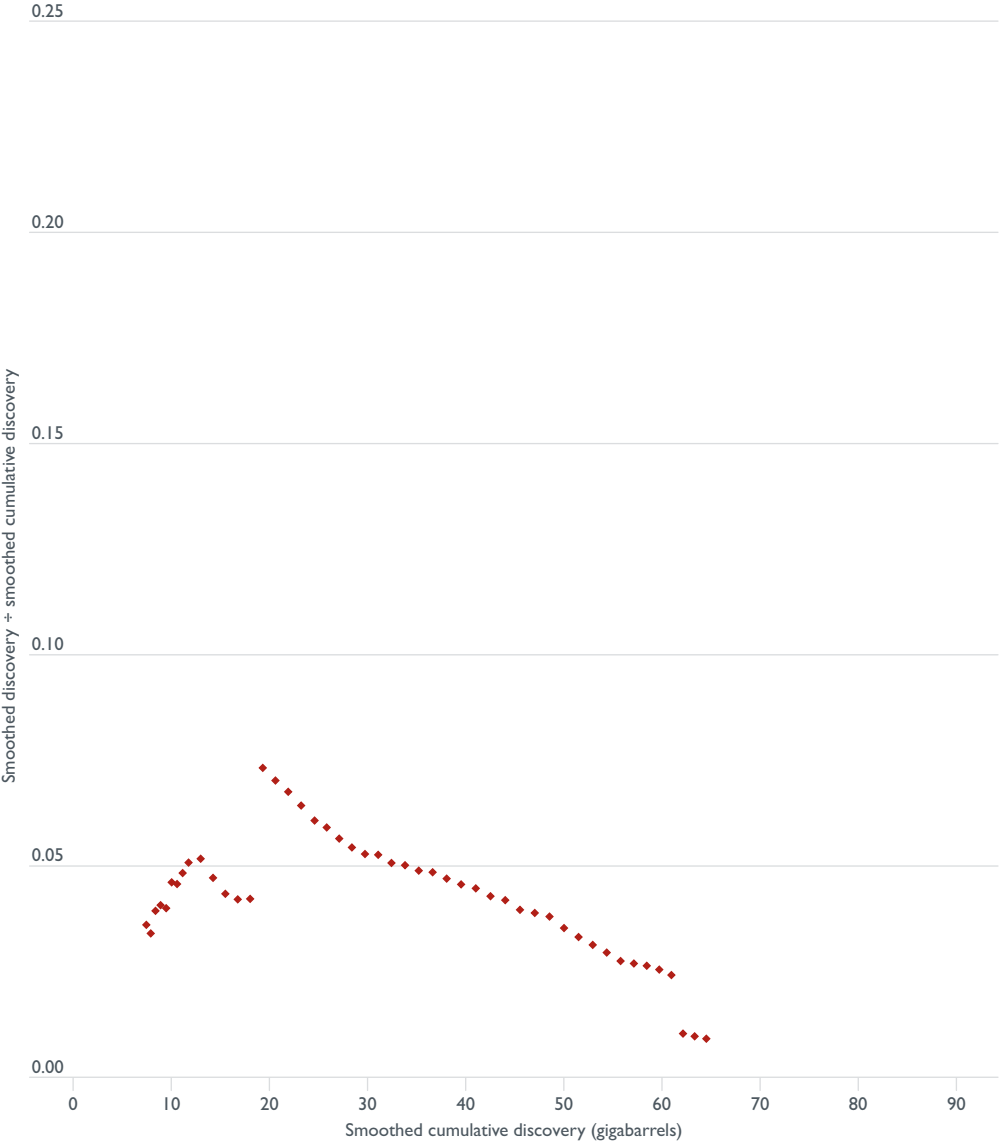
1. First, annual production (P) and cumulative production (CP) are smoothed with five and three year averages, generating SP and SCP (Table 9.1).
2. The fractional growth in production (SP/SCP) is calculated and plotted against last year's cumulative production, as shown in Figure 9.1.
3. The plot is then examined and a best guess at an ultimate cumulative production (U) is made. In this case, it is 80 gigabarrels.
4. Discovery (D) is smoothed with a 31 year moving average and cumulative discovery (CD) is smoothed with a 41 year moving average.
5. The fractional growth in discovery (SD/SCD) is calculated and plotted against last year's smoothed cumulative discovery (Figure 9.2).

Figure 9.1 Cumulative production growth curve for Non-Gulf Middle East



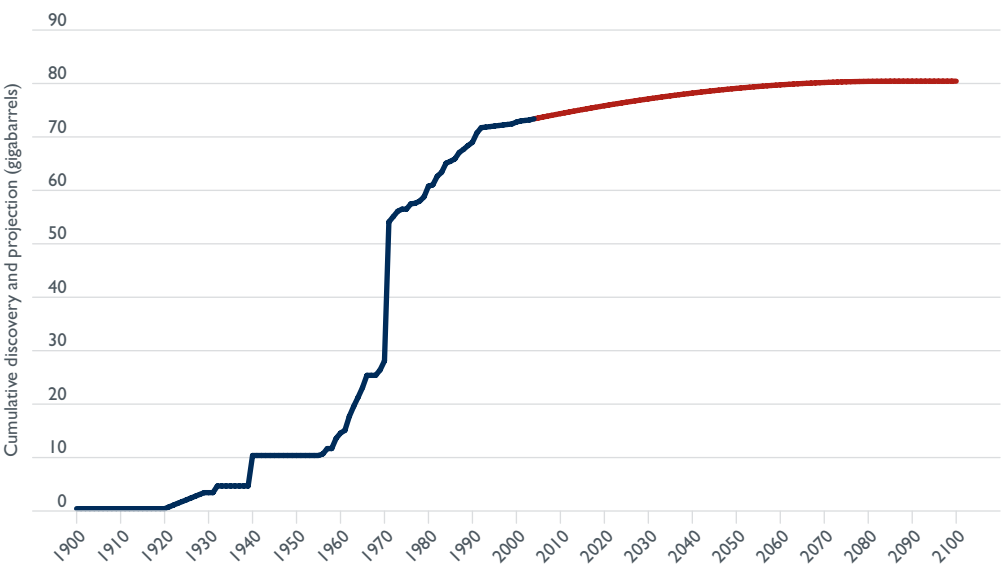
6. The plot is examined and a best guess at an ultimate discovery (UD) is made. In this case it is also 80 gigabarrels.

Figure 9.2 Cumulative discovery growth curve for Non-Gulf Middle East



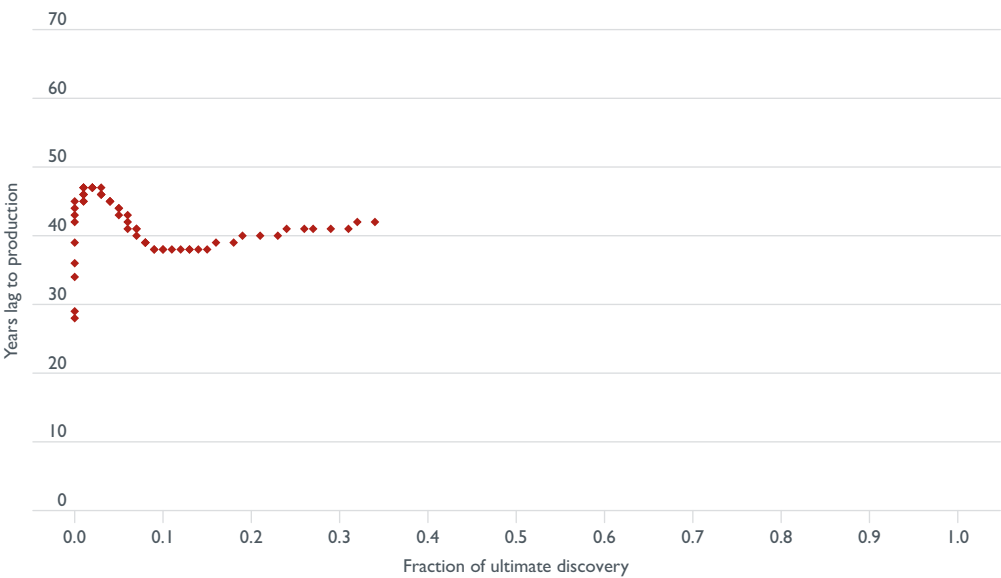
7. Cumulative discovery in 2006 is then projected to UD by bringing SD estimated for 2006 to zero in 2085. For Non-Gulf Middle East oil, the projection of the cumulative discovery curve is shown in Figure 9.3.

Figure 9.3 Cumulative discovery projection for Non-Gulf Middle East



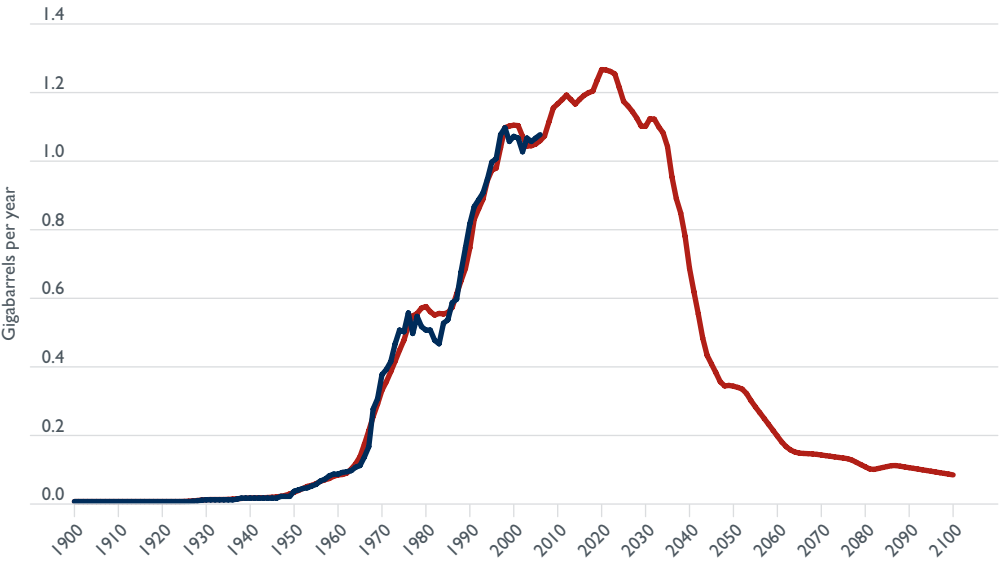
8. No adjustment to the cumulative discovery data is necessary.
9. Next, the historical stretch lag between the cumulative discovery and production curves is calculated, and plotted against the fraction of cumulative discovery. This plot for Non-Gulf Middle East oil is shown in Figure 9.4. After some noise in the range of zero to 0.1, the stretch lag rises slowly. Extrapolating the trend to 50 years at 1.0 allows the rest of the cumulative production curve to be forecast from the extrapolated discovery curve and the predicted lags.

Figure 9.4 Stretch lag curve for Non-Gulf Middle East



10. The predicted cumulative production curve is smoothed with a five year average and then differenced to give a raw predicted annual production. This is then averaged over five years to give a final annual production forecast. This is shown in Figure 9.5.

Figure 9.5 Actual and predicted Non-Gulf Middle East crude oil production



11. Finally the cumulative discovery and production curves (actual and forecast) are plotted in Figure 9.6. This allows a spatial understanding of the relationship between production and discovery.

Figure 9.6 Cumulative discovery and cumulative production curves for Non-Gulf Middle East

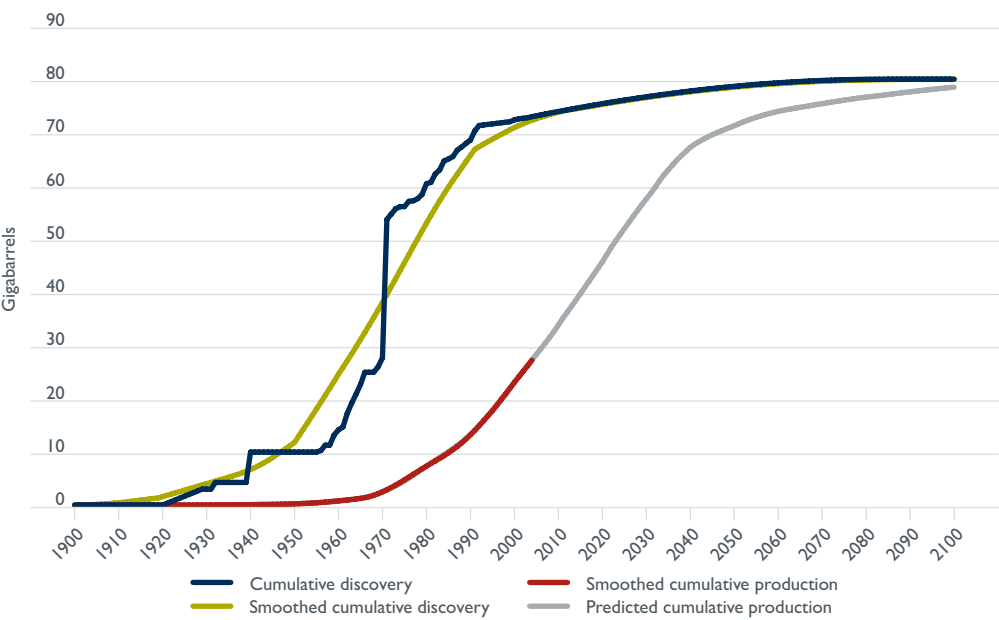


Table 9.1 Non-Gulf Middle East, gigabarrels

Year	D	CD	4 lyr SCD	Adj SCD	Predlag	Raw pred CP	Syr smth pred SCP	SCP	Raw pred P	Syr smth pred SP	Actual P
1900	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1901	0.00	0.00	0.01	0.01	28		0.00	0.00	0.00	0.00	0.00
1902	0.00	0.00	0.02	0.02	29		0.00	0.00	0.00	0.00	0.00
1903	0.00	0.00	0.05	0.05	33		0.00	0.00	0.00	0.00	0.00
1904	0.00	0.00	0.08	0.08	36		0.00	0.00	0.00	0.00	0.00
1905	0.00	0.00	0.12	0.12	39		0.00	0.00	0.00	0.00	0.00
1906	0.00	0.00	0.17	0.17	41		0.00	0.00	0.00	0.00	0.00
1907	0.00	0.00	0.23	0.23	43		0.00	0.00	0.00	0.00	0.00
1908	0.00	0.00	0.29	0.29	44		0.00	0.00	0.00	0.00	0.00
1909	0.00	0.00	0.37	0.37	44		0.00	0.00	0.00	0.00	0.00
1910	0.00	0.00	0.44	0.44	45		0.00	0.00	0.00	0.00	0.00
1911	0.00	0.00	0.51	0.51	45		0.00	0.00	0.00	0.00	0.00
1912	0.00	0.00	0.62	0.62	46		0.00	0.00	0.00	0.00	0.00
1913	0.00	0.00	0.72	0.72	46		0.00	0.00	0.00	0.00	0.00
1914	0.00	0.00	0.82	0.82	46		0.00	0.00	0.00	0.00	0.00
1915	0.00	0.00	0.93	0.93	47		0.00	0.00	0.00	0.00	0.00
1916	0.00	0.00	1.03	1.03	47		0.00	0.00	0.00	0.00	0.00
1917	0.00	0.00	1.13	1.13	47		0.00	0.00	0.00	0.00	0.00
1918	0.00	0.00	1.24	1.24	47		0.00	0.00	0.00	0.00	0.00
1919	0.00	0.00	1.34	1.34	47		0.00	0.00	0.00	0.00	0.00
1920	0.00	0.00	1.58	1.58	47		0.00	0.00	0.00	0.00	0.00
1921	0.00	0.33	1.83	1.83	47		0.00	0.00	0.00	0.00	0.00
1922	0.00	0.67	2.07	2.07	47		0.00	0.00	0.00	0.00	0.00
1923	0.00	1.00	2.31	2.31	46		0.00	0.00	0.00	0.00	0.00
1924	0.00	1.33	2.55	2.55	46		0.00	0.00	0.00	0.00	0.00
1925	0.00	1.67	2.80	2.80	46		0.00	0.00	0.00	0.00	0.00
1926	0.00	2.00	3.04	3.04	45		0.00	0.00	0.00	0.00	0.00
1927	0.00	2.33	3.28	3.28	45		0.00	0.00	0.00	0.00	0.00
1928	0.00	2.67	3.53	3.53	45		0.01	0.00	0.00	0.00	0.00
1929	0.00	3.00	3.77	3.77	44	0.01	0.01	0.01	0.01	0.00	0.00
1930	0.00	3.00	4.01	4.01	44	0.02	0.02	0.01	0.01	0.01	0.01
1931	0.00	3.00	4.25	4.25	43	0.02	0.02	0.02	0.01	0.01	0.01
1932	1.25	4.25	4.50	4.50	43	0.03	0.03	0.02	0.01	0.01	0.01
1933	0.00	4.25	4.74	4.74	42	0.03	0.03	0.03	0.01	0.01	0.01
1934	0.00	4.25	4.98	4.98	42	0.04	0.04	0.03	0.01	0.01	0.01
1935	0.00	4.25	5.22	5.22	41	0.04	0.05	0.04	0.01	0.01	0.01
1936	0.00	4.25	5.47	5.47	40	0.05	0.05	0.04	0.01	0.01	0.01
1937	0.00	4.25	5.75	5.75	40	0.06	0.06	0.05	0.01	0.01	0.01
1938	0.00	4.25	6.02	6.02	40	0.07	0.07	0.06	0.01	0.01	0.01
1939	0.00	4.25	6.34	6.34	39	0.08	0.08	0.07	0.01	0.01	0.01
1940	5.70	9.95	6.69	6.69	39	0.09	0.09	0.08	0.01	0.01	0.01
1941	0.00	9.95	7.05	7.05	38	0.10	0.10	0.09	0.01	0.01	0.01
1942	0.00	9.95	7.46	7.46	38	0.11	0.11	0.10	0.01	0.01	0.01
1943	0.00	9.95	7.91	7.91	38	0.12	0.12	0.11	0.01	0.01	0.01
1944	0.00	9.95	8.39	8.39	38	0.13	0.13	0.12	0.01	0.01	0.01
1945	0.00	9.95	8.91	8.91	38	0.15	0.15	0.13	0.01	0.01	0.01
1946	0.00	9.95	9.48	9.48	38	0.16	0.16	0.14	0.01	0.01	0.01
1947	0.00	9.95	10.04	10.04	38	0.17	0.17	0.15	0.01	0.02	0.02
1948	0.00	9.95	10.59	10.59	38	0.19	0.19	0.17	0.02	0.02	0.02
1949	0.00	9.95	11.16	11.16	38	0.21	0.21	0.19	0.02	0.02	0.02
1950	0.00	9.95	11.76	11.76	38	0.23	0.24	0.22	0.02	0.03	0.03
1951	0.00	9.95	13.00	13.00	39	0.26	0.27	0.25	0.04	0.03	0.03
1952	0.00	9.95	14.26	14.26	39	0.29	0.31	0.29	0.04	0.04	0.04
1953	0.00	9.95	15.51	15.51	40	0.37	0.35	0.33	0.04	0.04	0.04
1954	0.00	9.95	16.77	16.77	40	0.40	0.40	0.37	0.05	0.05	0.05
1955	0.00	9.95	18.04	18.04	40	0.44	0.46	0.42	0.05	0.05	0.05
1956	0.30	10.25	19.33	19.33	41	0.51	0.51	0.48	0.05	0.06	0.06
1957	1.00	11.25	20.62	20.62	41	0.56	0.57	0.55	0.06	0.06	0.07
1958	0.00	11.25	21.92	21.92	41	0.62	0.65	0.62	0.08	0.07	0.08
1959	1.90	13.15	23.24	23.24	41	0.72	0.72	0.70	0.07	0.07	0.08
1960	1.00	14.15	24.60	24.60	41	0.82	0.79	0.78	0.07	0.08	0.08
1961	0.50	14.65	25.84	25.84	42	0.88	0.88	0.87	0.08	0.08	0.09
1962	2.60	17.25	27.11	27.11	42	0.93	0.96	0.95	0.08	0.08	0.09
1963	1.90	19.15	28.41	28.41	42	1.03	1.04	1.05	0.08	0.09	0.09
1964	1.70	20.85	29.74	29.74	42	1.13	1.13	1.14	0.09	0.11	0.10
1965	1.80	22.65	31.08	31.08	43	1.24	1.27	1.26	0.13	0.13	0.11
1966	2.30	24.95	32.44	32.44	43	1.34	1.42	1.39	0.16	0.17	0.13
1967	0.00	24.95	33.82	33.82	43	1.58	1.61	1.57	0.19	0.21	0.16
1968	0.00	24.95	35.22	35.22	43	1.83	1.88	1.82	0.26	0.25	0.27
1969	1.00	25.95	36.63	36.63	43	2.07	2.17	2.13	0.29	0.28	0.30
1970	1.70	27.65	38.06	38.06	44	2.55	2.51	2.48	0.34	0.32	0.37
1971	26.00	53.65	39.53	39.53	44	2.80	2.85	2.87	0.34	0.35	0.39
1972	1.00	54.65	41.03	41.03	44	3.28	3.23	3.29	0.39	0.38	0.41
1973	1.00	55.65	42.53	42.53	44	3.53	3.62	3.74	0.39	0.41	0.46
1974	0.40	56.05	44.03	44.03	45	4.01	4.06	4.23	0.44	0.44	0.50
1975	0.00	56.05	45.53	45.53	45	4.50	4.55	4.74	0.49	0.47	0.50
1976	1.00	57.05	47.04	47.04	45	4.98	5.05	5.26	0.50	0.51	0.55
1977	0.10	57.15	48.54	48.54	45	5.75	5.59	5.78	0.54	0.54	0.49
1978	0.40	57.55	50.02	50.02	45	6.02	6.18	6.30	0.59	0.55	0.54
1979	0.80	58.35	51.50	51.50	46	6.69	6.77	6.81	0.59	0.56	0.51
1980	2.00	60.35	52.95	52.95	46	7.46	7.29	7.32	0.53	0.57	0.50

(continued)

Table 9.1 Non-Gulf Middle East, gigabarrels (continued)

Year	D	CD	4 lyr SCD	Adj SCD	Predlag	Raw pred CP	5yr smth pred SCP	SCP	Raw pred P	5yr smth pred SP	Actual P
1981	0.25	60.60	54.37	54.37	46	7.91	7.87	7.81	0.58	0.55	0.50
1982	1.60	62.20	55.78	55.78	46	8.39	8.43	8.28	0.56	0.54	0.47
1983	0.75	62.95	57.14	57.14	47	8.91	8.95	8.77	0.52	0.55	0.46
1984	1.70	64.65	58.45	58.45	47	9.48	9.48	9.27	0.54	0.55	0.52
1985	0.35	65.00	59.72	59.72	47	10.04	10.04	9.81	0.55	0.55	0.53
1986	0.45	65.45	60.96	60.96	47	10.59	10.61	10.38	0.57	0.57	0.58
1987	1.20	66.65	62.14	62.14	47	11.16	11.19	10.99	0.58	0.61	0.59
1988	0.60	67.25	63.33	63.33	47	11.76	11.78	11.66	0.59	0.64	0.67
1989	0.70	67.95	64.52	64.52	48	12.38	12.51	12.40	0.73	0.68	0.74
1990	0.60	68.55	65.69	65.69	48	13.00	13.26	13.20	0.74	0.74	0.81
1991	1.75	70.30	66.82	66.82	48	14.26	14.01	14.05	0.75	0.82	0.86
1992	1.00	71.30	67.32	67.32	48	14.88	14.88	14.93	0.88	0.85	0.88
1993	0.10	71.40	67.81	67.81	48	15.51	15.89	15.84	1.01	0.88	0.90
1994	0.10	71.50	68.27	68.27	48	16.77	16.78	16.78	0.88	0.94	0.94
1995	0.10	71.60	68.72	68.72	48	18.04	17.67	17.76	0.89	0.97	0.99
1996	0.10	71.70	69.18	69.18	48	18.68	18.69	18.78	1.02	0.97	1.00
1997	0.10	71.80	69.62	69.62	48	19.33	19.72	19.83	1.03	1.03	1.07
1998	0.10	71.90	70.05	70.05	48	20.62	20.75	20.90	1.04	1.09	1.09
1999	0.10	72.00	70.49	70.49	49	21.92	21.94	21.97	1.18	1.10	1.05
2000	0.35	72.35	70.90	70.90	49	23.24	23.12	23.03	1.18	1.10	1.07
2001	0.20	72.55	71.27	71.27	49	24.60	24.16	24.08	1.04	1.10	1.06
2002	0.10	72.65	71.64	71.64	49	25.22	25.20	25.12	1.04	1.06	1.02
2003	0.10	72.75	71.97	71.97	49	25.84	26.24	26.17	1.03	1.04	1.06
2004	0.20	72.95	72.29	72.29	49	27.11	27.26	27.22	1.03	1.04	1.05
2005	0.17	73.12	72.57	72.57	49	28.41	28.30	28.28	1.04	1.04	1.06
2006	0.16	73.28	72.84	72.84	49	29.74	29.35	29.35	1.05	1.05	1.07
2007	0.16	73.44	73.10	73.10	49	30.41	30.42		1.06	1.07	
2008	0.16	73.60	73.34	73.34	49	31.08	31.50		1.08	1.11	
2009	0.16	73.76	73.57	73.57	49	32.44	32.59		1.10	1.15	
2010	0.16	73.92	73.78	73.78	49	33.82	33.84		1.24	1.16	
2011	0.16	74.08	73.98	73.98	49	35.22	35.09		1.25	1.17	
2012	0.15	74.23	74.14	74.14	49	36.63	36.22		1.12	1.19	
2013	0.15	74.38	74.28	74.28	49	37.35	37.36		1.14	1.17	
2014	0.15	74.53	74.42	74.42	49	38.06	38.52		1.16	1.16	
2015	0.15	74.68	74.56	74.56	49	39.53	39.70		1.18	1.17	
2016	0.15	74.83	74.70	74.70	49	41.03	40.89		1.19	1.18	
2017	0.14	74.97	74.85	74.85	49	42.53	42.08		1.19	1.19	
2018	0.14	75.11	74.99	74.99	49	43.28	43.28		1.20	1.20	
2019	0.14	75.26	75.13	75.13	49	44.03	44.48		1.20	1.23	
2020	0.14	75.39	75.27	75.27	49	45.53	45.68		1.20	1.26	
2021	0.14	75.53	75.40	75.40	49	47.04	47.03		1.35	1.26	
2022	0.14	75.67	75.53	75.53	49	48.54	48.38		1.35	1.25	
2023	0.13	75.80	75.67	75.67	49	50.02	49.57		1.19	1.25	
2024	0.13	75.93	75.80	75.80	49	50.76	50.75		1.18	1.21	
2025	0.13	76.06	75.93	75.93	49	51.50	51.92		1.17	1.17	
2026	0.13	76.19	76.05	76.05	49	52.95	53.07		1.15	1.15	
2027	0.13	76.32	76.18	76.18	49	54.37	54.21		1.14	1.14	
2028	0.12	76.44	76.30	76.30	49	55.78	55.34		1.13	1.12	
2029	0.12	76.56	76.42	76.42	49	56.46	56.44		1.10	1.09	
2030	0.12	76.68	76.54	76.54	49	57.14	57.51		1.07	1.09	
2031	0.12	76.80	76.66	76.66	49	58.45	58.55		1.04	1.12	
2032	0.12	76.91	76.77	76.77	50	59.72	59.68		1.14	1.12	
2033	0.11	77.03	76.89	76.89	50	60.96	60.92		1.24	1.09	
2034	0.11	77.14	77.00	77.00	50	62.14	62.02		1.09	1.07	
2035	0.11	77.25	77.11	77.11	50	63.33	62.98		0.96	1.03	
2036	0.11	77.36	77.21	77.21	50	63.92	63.92		0.95	0.95	
2037	0.11	77.46	77.32	77.32	50	64.52	64.86		0.94	0.88	
2038	0.10	77.57	77.42	77.42	50	65.69	65.66		0.80	0.84	
2039	0.10	77.67	77.52	77.52	50	66.82	66.43		0.78	0.77	
2040	0.10	77.77	77.62	77.62	50	67.32	67.18		0.75	0.68	
2041	0.10	77.86	77.72	77.72	50	67.81	67.79		0.61	0.61	
2042	0.10	77.96	77.81	77.81	50	68.27	68.26		0.47	0.55	
2043	0.09	78.05	77.91	77.91	50	68.72	68.72		0.46	0.48	
2044	0.09	78.14	78.00	78.00	50	69.18	69.17		0.45	0.43	
2045	0.09	78.23	78.08	78.08	50	69.62	69.57		0.40	0.40	
2046	0.09	78.32	78.17	78.17	50	70.05	69.92		0.35	0.38	
2047	0.08	78.40	78.25	78.25	50	70.27	70.26		0.34	0.35	
2048	0.08	78.49	78.34	78.34	50	70.49	70.60		0.33	0.34	
2049	0.08	78.57	78.42	78.42	50	70.90	70.91		0.32	0.34	
2050	0.08	78.65	78.49	78.49	50	71.27	71.25		0.34	0.34	
2051	0.08	78.72	78.57	78.57	50	71.64	71.61		0.36	0.33	
2052	0.07	78.79	78.64	78.64	50	71.97	71.95		0.33	0.33	
2053	0.07	78.87	78.71	78.71	50	72.29	72.26		0.31	0.31	
2054	0.07	78.94	78.78	78.78	50	72.57	72.55		0.29	0.29	
2055	0.07	79.00	78.85	78.85	50	72.84	72.83		0.27	0.28	
2056	0.07	79.07	78.92	78.92	50	73.10	73.08		0.26	0.26	
2057	0.06	79.13	78.98	78.98	50	73.34	73.33		0.24	0.24	
2058	0.06	79.19	79.04	79.04	50	73.57	73.56		0.23	0.23	
2059	0.06	79.25	79.10	79.10	50	73.78	73.76		0.21	0.21	
2060	0.06	79.31	79.15	79.15	50	73.98	73.95		0.19	0.19	
2061	0.05	79.36	79.21	79.21	50	74.14	74.12		0.17	0.17	

(continued)

Table 9.1 Non-Gulf Middle East, gigabarrels (continued)

Year	D	CD	4 lyr SCD	Adj SCD	Predlag	Raw pred CP	Syr smth pred SCP	SCP	Raw pred P	Syr smth pred SP	Actual P
2062	0.05	79.41	79.26	79.26	50	74.28	74.28		0.16	0.16	
2063	0.05	79.46	79.31	79.31	50	74.42	74.42		0.14	0.15	
2064	0.05	79.51	79.35	79.35	50	74.56	74.56		0.14	0.14	
2065	0.05	79.56	79.40	79.40	50	74.70	74.71		0.14	0.14	
2066	0.04	79.60	79.44	79.44	50	74.85	74.85		0.14	0.14	
2067	0.04	79.64	79.48	79.48	50	74.99	74.99		0.14	0.14	
2068	0.04	79.68	79.52	79.52	50	75.13	75.13		0.14	0.14	
2069	0.04	79.71	79.56	79.56	50	75.27	75.26		0.14	0.14	
2070	0.03	79.75	79.59	79.59	50	75.40	75.40		0.14	0.14	
2071	0.03	79.78	79.63	79.63	50	75.53	75.53		0.13	0.13	
2072	0.03	79.81	79.66	79.66	50	75.67	75.66		0.13	0.13	
2073	0.03	79.84	79.69	79.69	50	75.80	75.80		0.13	0.13	
2074	0.02	79.86	79.72	79.72	50	75.93	75.92		0.13	0.13	
2075	0.02	79.88	79.74	79.74	50	76.05	76.05		0.13	0.13	
2076	0.02	79.91	79.77	79.77	50	76.18	76.18		0.12	0.12	
2077	0.02	79.92	79.79	79.79	50	76.30	76.30		0.12	0.12	
2078	0.02	79.94	79.81	79.81	50	76.42	76.42		0.12	0.11	
2079	0.01	79.95	79.83	79.83	50	76.54	76.53		0.11	0.11	
2080	0.01	79.96	79.85	79.85	50	76.66	76.62		0.09	0.10	
2081	0.01	79.97	79.87	79.87	50	76.72	76.71		0.09	0.10	
2082	0.01	79.98	79.88	79.88	50	76.77	76.81		0.09	0.09	
2083	0.01	79.98	79.89	79.89	50	76.89	76.90		0.09	0.10	
2084	0.00	79.99	79.91	79.91	50	77.00	77.00		0.10	0.10	
2085	0.01	80.00	79.92	79.92	50	77.11	77.10		0.11	0.10	
2086	0.00	80.00	79.93	79.93	50	77.21	77.21		0.11	0.10	
2087	0.00	80.00	79.94	79.94	50	77.32	77.32		0.10	0.10	
2088	0.00	80.00	79.95	79.95	50	77.42	77.42		0.10	0.10	
2089	0.00	80.00	79.96	79.96	50	77.52	77.52		0.10	0.10	
2090	0.00	80.00	79.96	79.96	50	77.62	77.62		0.10	0.10	
2091	0.00	80.00	79.97	79.97	50	77.72	77.72		0.10	0.10	
2092	0.00	80.00	79.98	79.98	50	77.81	77.81		0.09	0.09	
2093	0.00	80.00	79.98	79.98	50	77.91	77.90		0.09	0.09	
2094	0.00	80.00	79.98	79.98	50	78.00	77.99		0.09	0.09	
2095	0.00	80.00	79.99	79.99	50	78.08	78.08		0.09	0.09	
2096	0.00	80.00	79.99	79.99	50	78.17	78.17		0.09	0.09	
2097	0.00	80.00	79.99	79.99	50	78.25	78.25		0.08	0.08	
2098	0.00	80.00	79.99	79.99	50	78.34	78.33		0.08	0.08	
2099	0.00	80.00	80.00	80.00	50	78.42	78.41		0.08	0.08	
2100	0.00	80.00	80.00	80.00	50	78.49	78.49		0.08	0.08	

Notes: D—discovery; CD—cumulative discovery; SCD—smoothed cumulative discovery (years = number of years centred moving average); adj—adjusted (to match cumulative production maximum); predlag—predicted lag between cumulative discovery and cumulative production; raw Pred CP—prediction using direct lag of cumulative discovery by predicted lag years; Pred SCP—raw predicted CP smoothed (with years = number of years centred moving average); SCP—smoothed actual cumulative production (years = number of years centred moving average); raw Pred P—one year change in predicted smoothed cumulative production; Pred SP—smoothed raw Pred P (years = number of years centred moving average); Actual P—actual annual oil production. Shaded numbers are interpolations, extrapolations or forecasts.

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Chapter 10

The Middle East Gulf



Chapter 10 The Middle East Gulf

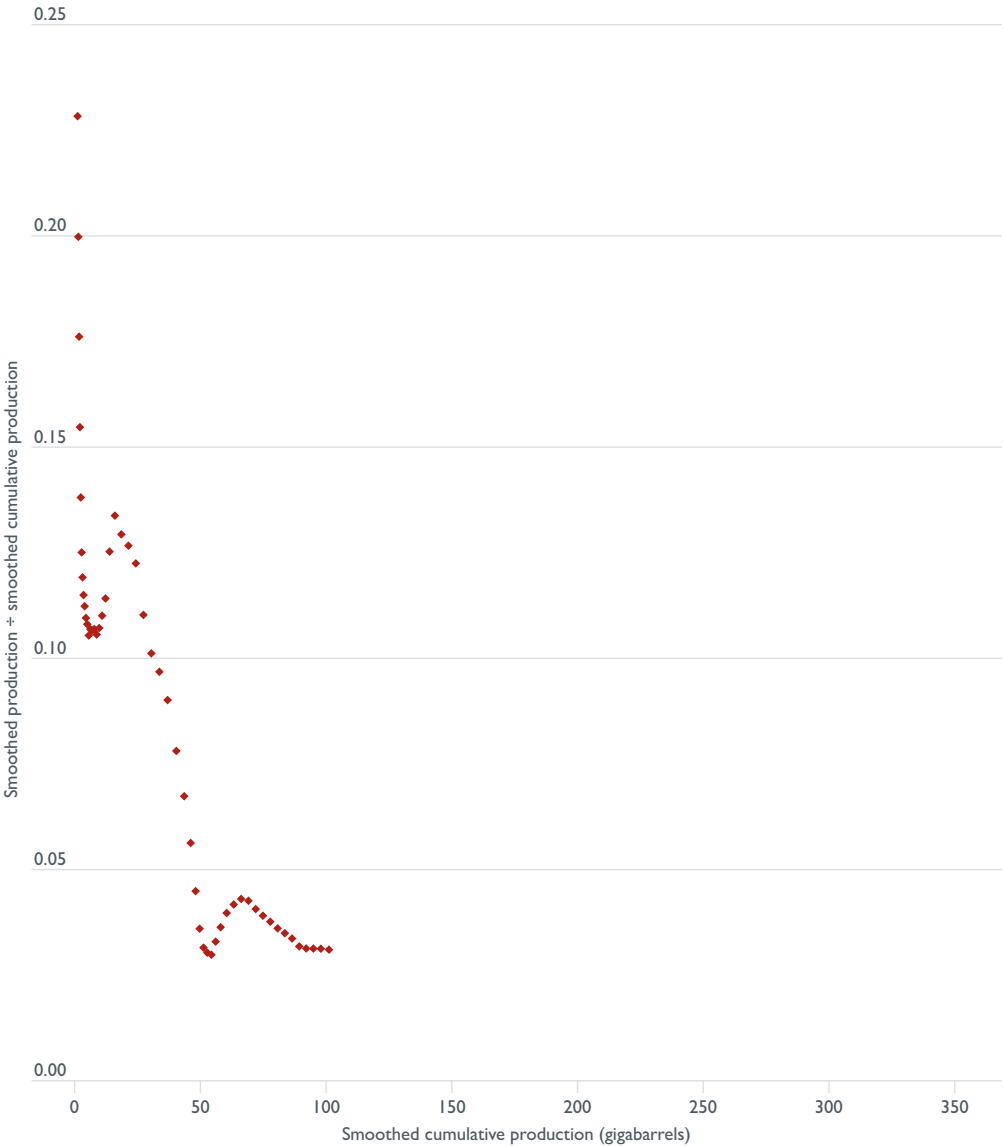
The Middle East Gulf will be analysed as five major oil-producing subregions: Saudi Arabia, Iran, Iraq, Kuwait and Rest of the Middle East Gulf.

Saudi Arabia

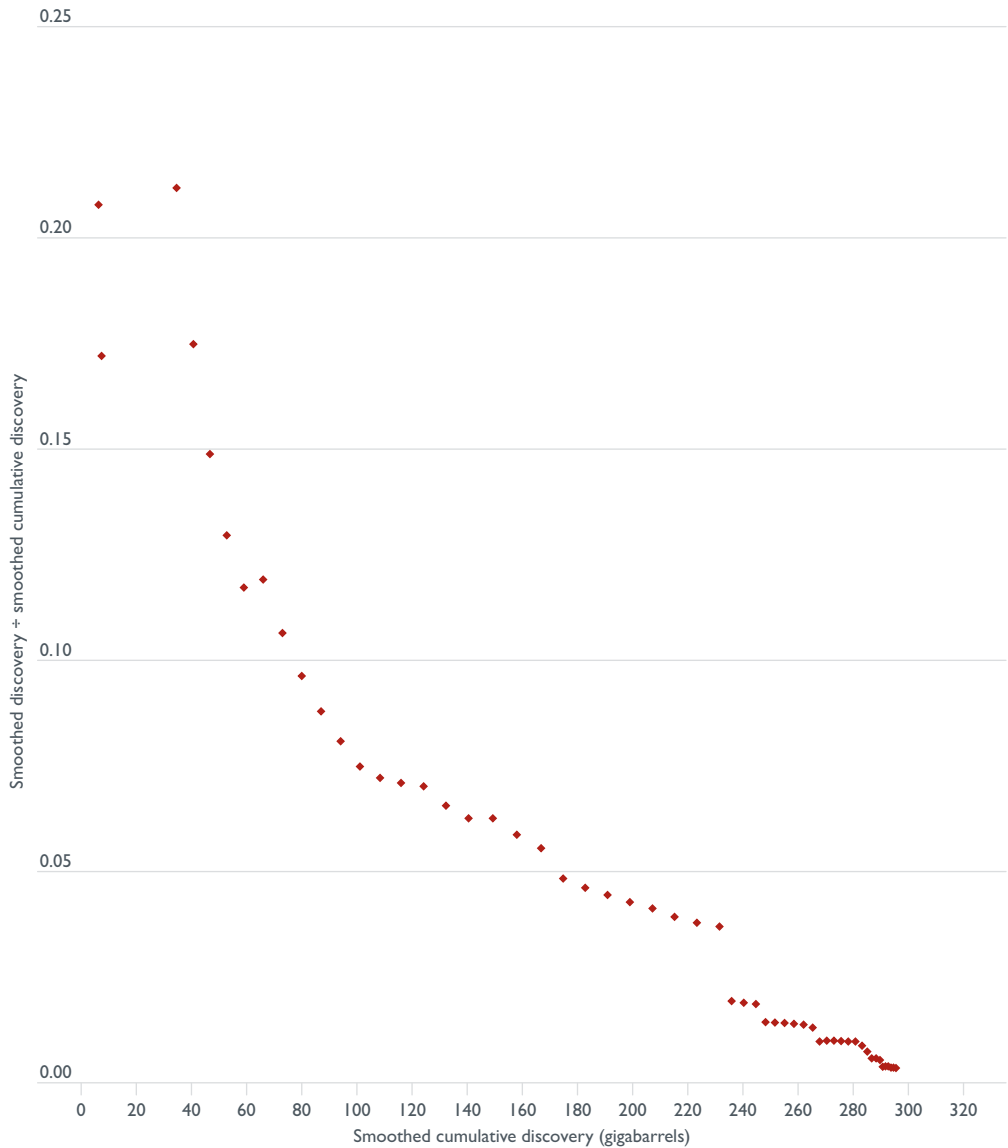
Table 10.1 sets out the calculations from the 11 steps to a forecast of production of Saudi oil (not including Neutral Zone production).

1. Annual production (P) and cumulative production (CP) are smoothed with five and three year averages, generating SP and SCP (Table 10.1).
2. The fractional growth in production (SP/SCP) is calculated and plotted against last year's cumulative production, as shown in Figure 10.1.
3. The plot is then examined and a best guess at an ultimate cumulative production (U) is made. In this case, it is 300 gigabarrels.
4. Discovery (D) and cumulative discovery (CD) are smoothed with 31 year moving averages.
5. The fractional growth in discovery (SD/SCD) is calculated and plotted against last year's smoothed cumulative discovery (Figure 10.2).

Figure 10.1 Saudi cumulative production growth curve

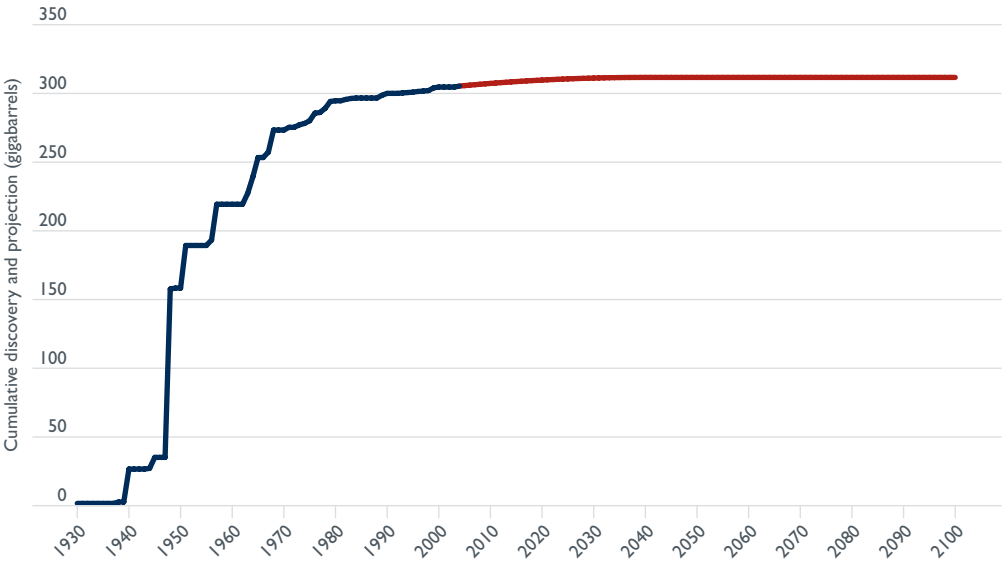


6. The plot is examined and a best guess at an ultimate discovery (UD) is made. In this case it is 310 gigabarrels.

Figure 10.2 Saudi cumulative discovery growth curve

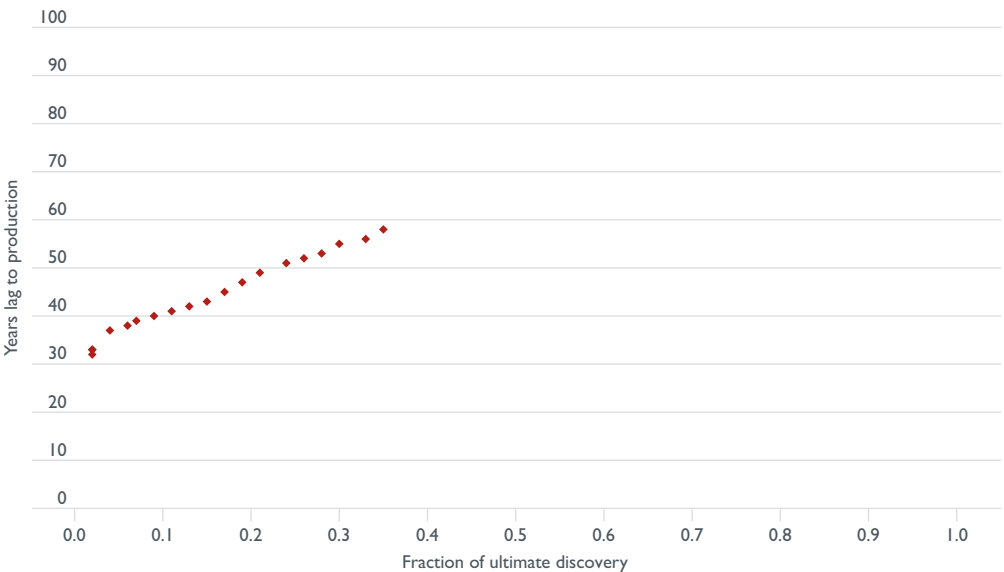
7. Cumulative discovery in 2006 is then projected to UD by bringing SD estimated for 2006 to zero in 2040. For Saudi oil, the projection of the cumulative discovery curve is shown in Figure 10.3.

Figure 10.3 Saudi cumulative discovery projection



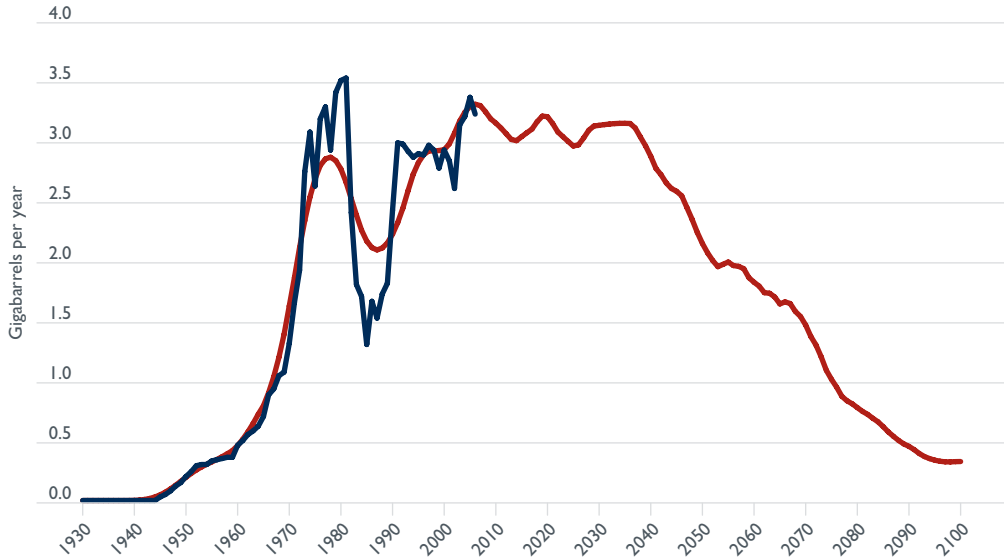
- 8. Next, the height of the cumulative discovery curve has to be adjusted to equal the more reliable cumulative production estimate. In this case, the adjustment is downward, amounting to multiplying by 300/310.
- 9. Next, the historical stretch lag between the cumulative discovery and production curves is calculated, and plotted against the fraction of cumulative discovery. This plot for Saudi Arabia is shown in Figure 10.4. The stretch lag exhibits steady rises until the mid-1970s saw a faster rate of increase (OPEC go-slow). The rate of increase in the lag has since slowed (production increased). Extrapolating the trend to 96 years at 1.0 allows the rest of the cumulative production curve to be forecast from the extrapolated discovery curve and the predicted lags.

Figure 10.4 Saudi stretch lag curve



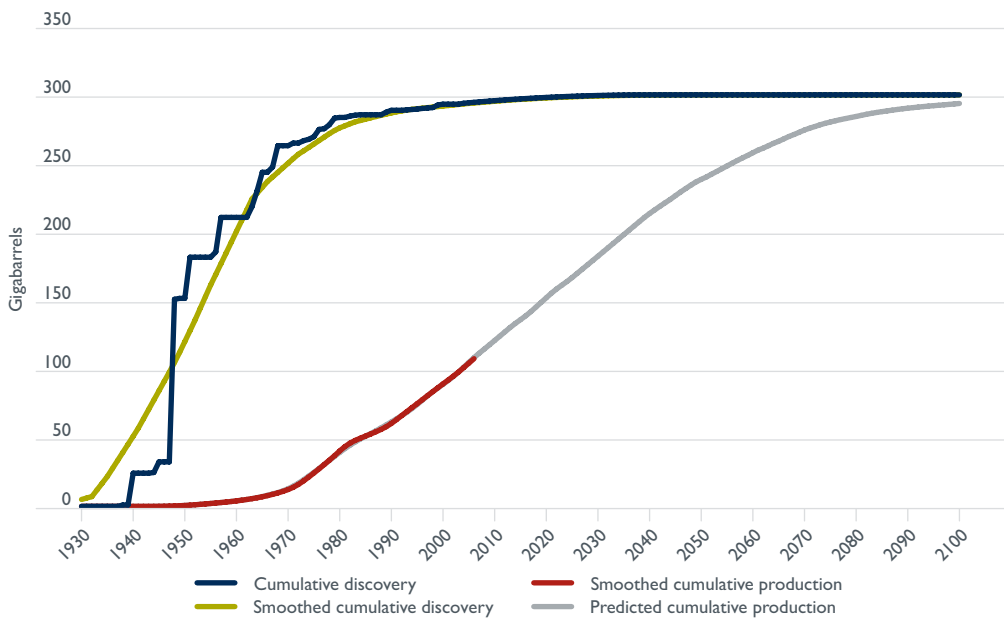
10. The predicted cumulative production curve is smoothed with a five year average and then differenced to give a raw predicted annual production. This is then averaged over seven years to give a final annual production forecast. This is shown in Figure 10.5.

Figure 10.5 Actual and predicted Saudi crude oil production



11. Finally the cumulative discovery and production curves (actual and forecast) are plotted in Figure 10.6. This allows a spatial understanding of the relationship between production and discovery.

Figure 10.6 Saudi cumulative discovery and cumulative production curves

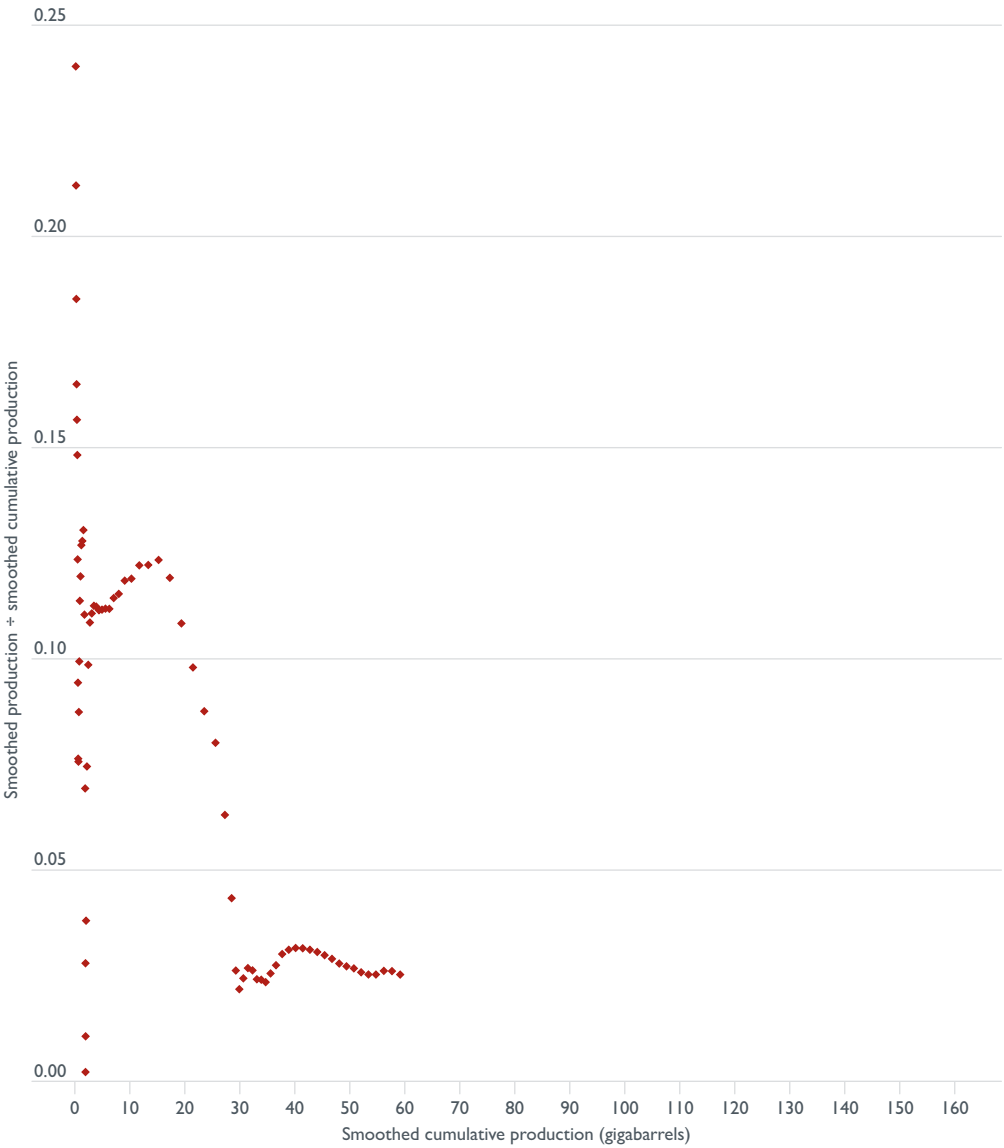


Iran

Table 10.2 sets out the calculations from the 11 steps to a forecast of production of Iranian oil.

- 1. First, annual production (P) and cumulative production (CP) are smoothed with three year averages, generating SP and SCP (see Table 10.2).
- 2. The fractional growth in production (SP/SCP) is calculated and plotted against last year's cumulative production, as shown in Figure 10.7.

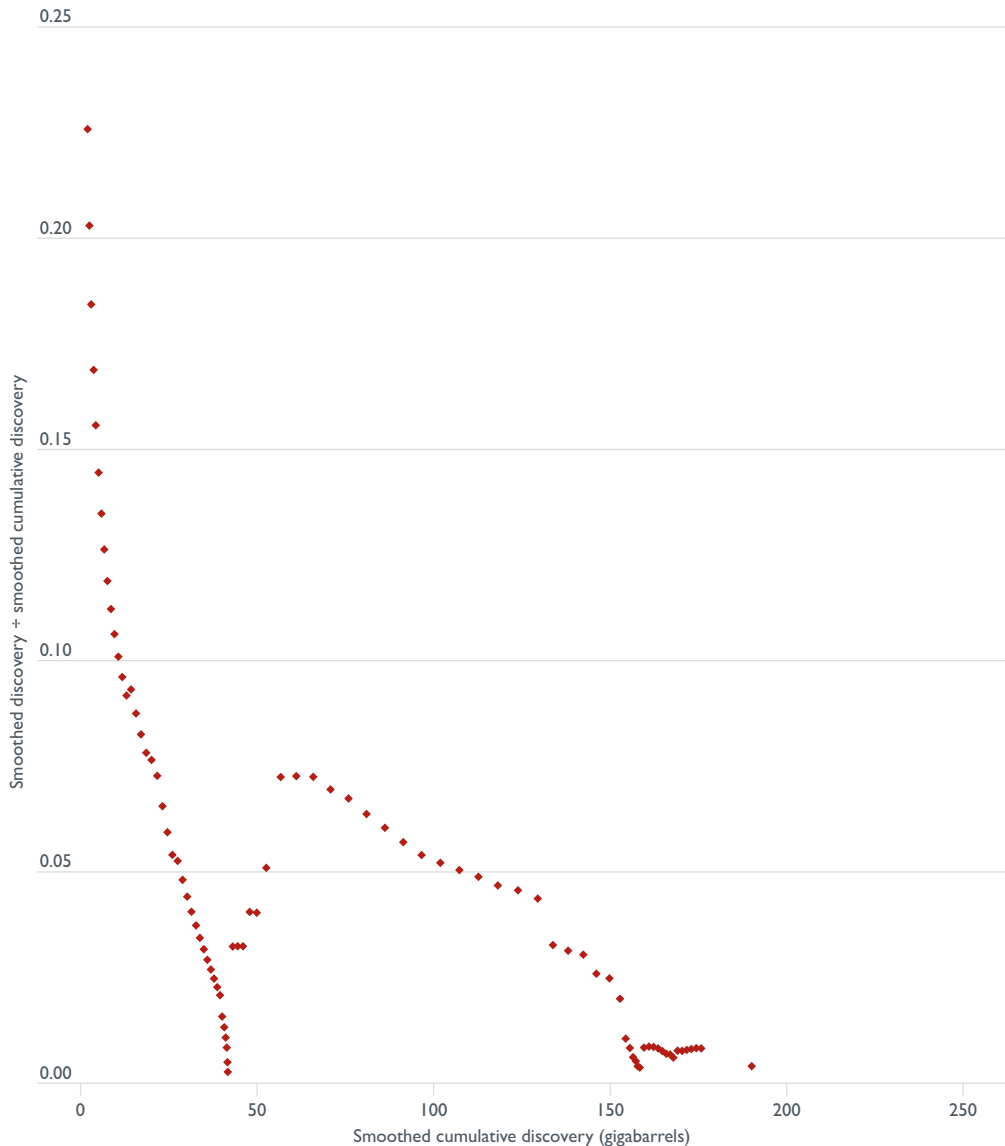
Figure 10.7 Iranian cumulative production growth curve



- 3. The plot is then examined and a best guess at an ultimate cumulative production (U) is made. In this case, it is 160 gigabarrels.

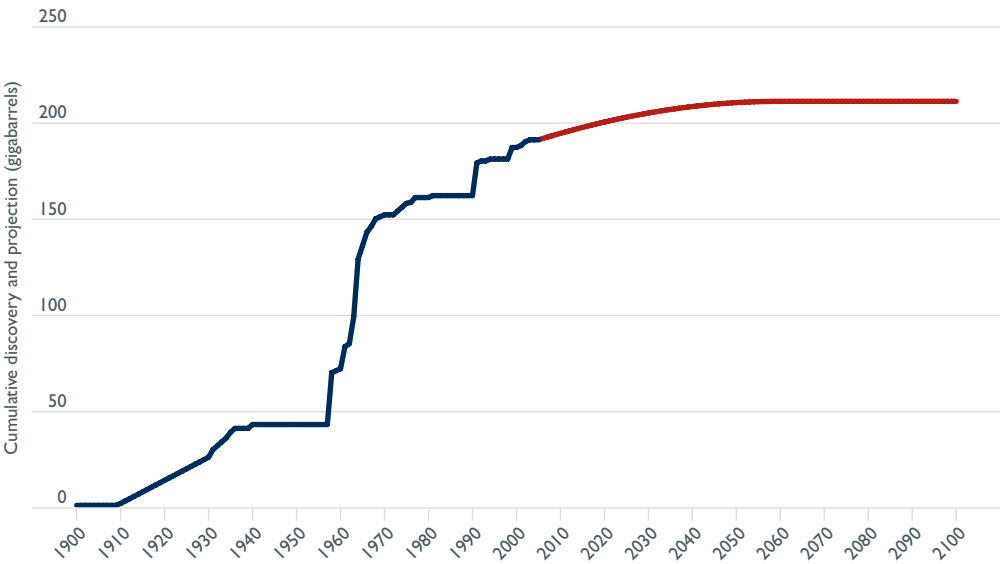
4. Discovery (D) and cumulative discovery (CD) are smoothed with 21 year moving averages.
5. The fractional growth in discovery (SD/SCD) is calculated and plotted against last year's smoothed cumulative discovery (Figure 10.8).

Figure 10.8 Iranian cumulative discovery growth curve



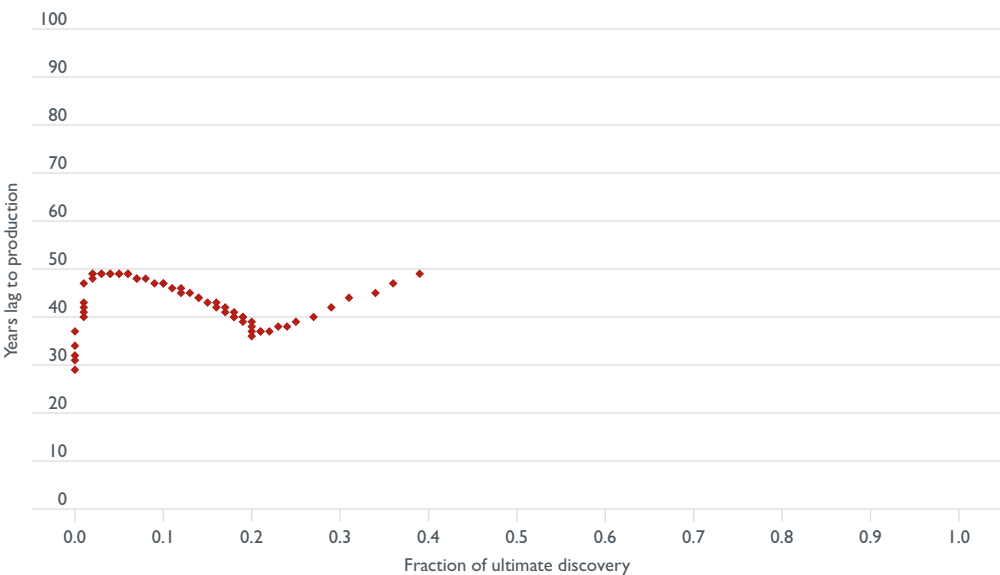
6. The plot is examined and a best guess at an ultimate discovery (UD) is made. In this case it is 210 gigabarrels.
7. Cumulative discovery in 2006 is then projected to UD by bringing SD estimated for 2006 to zero in 2061. For Iranian oil, the projection of the cumulative discovery curve is shown in Figure 10.9.

Figure 10.9 Iranian cumulative discovery projection



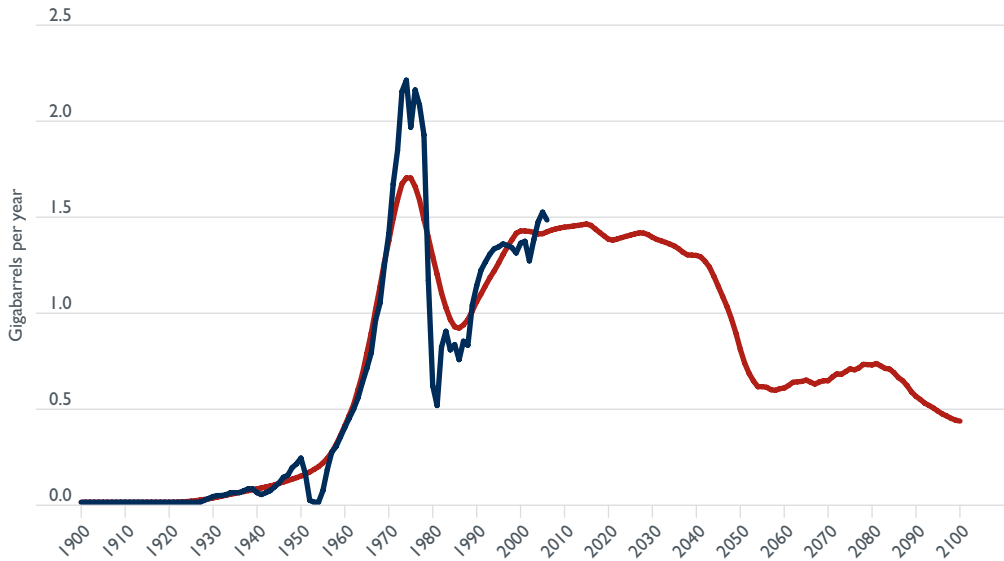
- 8. Next, the height of the cumulative discovery curve has to be adjusted to equal the more reliable cumulative production estimate. In this case, the adjustment is downward, amounting to multiplying by 160/210.
- 9. Next, the historical stretch lag between the cumulative discovery and production curves is calculated, and plotted against the fraction of cumulative discovery. This plot for Iran is shown in Figure 10.10. After some ups and downs in the range of zero to 0.2, the stretch lag rises steadily. Extrapolating the trend to 95 years at 1.0 allows the rest of the cumulative production curve to be forecast from the extrapolated discovery curve and the predicted lags.

Figure 10.10 Iranian stretch lag curve



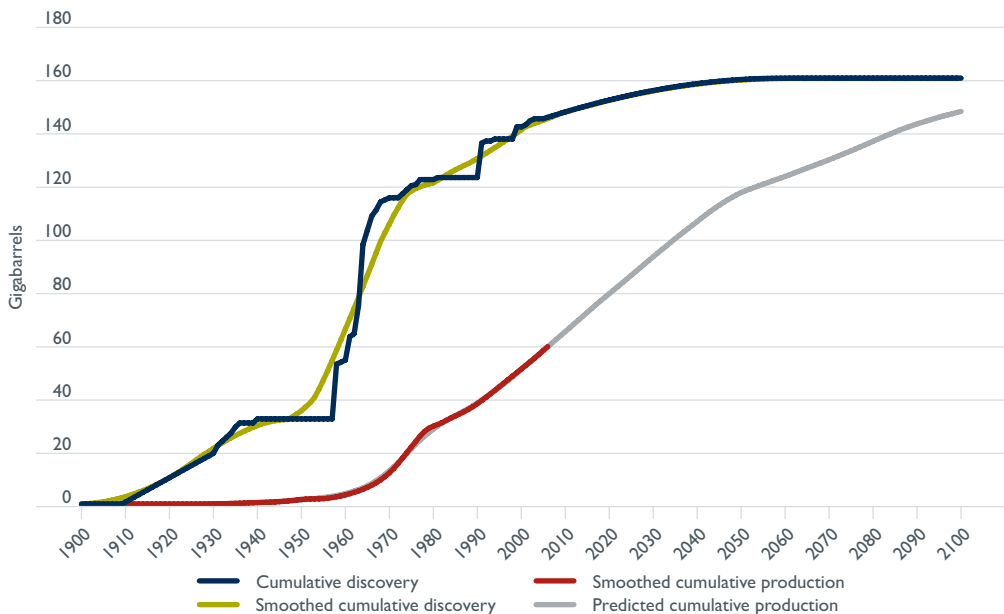
10. The predicted cumulative production curve is smoothed with an 11 year average and then differenced to give a raw predicted annual production. This is then averaged over five years to give a final annual production forecast. This is shown in Figure 10.11.

Figure 10.11 Actual and predicted Iranian crude oil production



11. Finally the cumulative discovery and production curves (actual and forecast) are plotted in Figure 10.12. This allows a spatial understanding of the relationship between production and discovery.

Figure 10.12 Iranian cumulative discovery and cumulative production curves

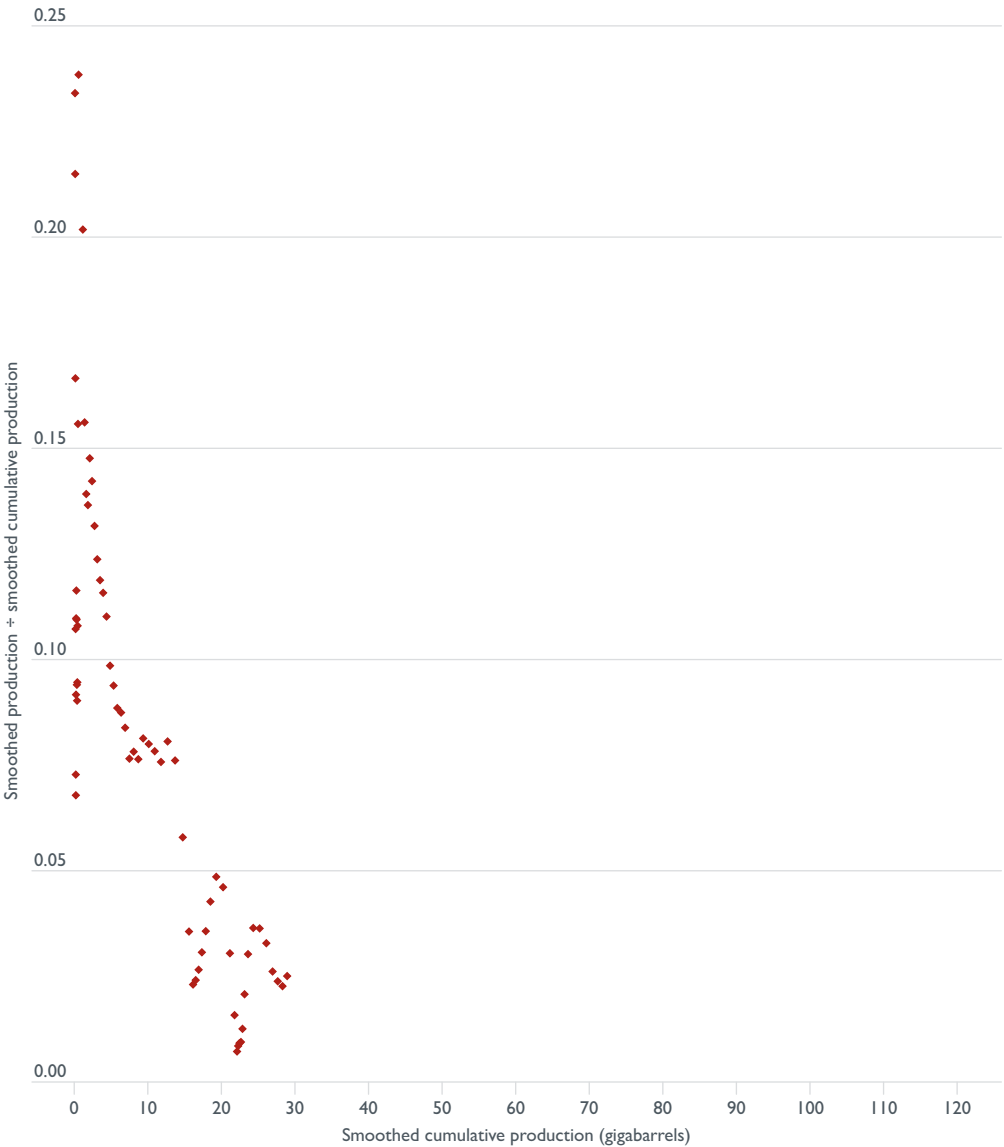


Iraq

Table 10.3 sets out the calculations from the 11 steps to a forecast of production of Iraqi oil.

- 1. First, annual production (P) and cumulative production (CP) are smoothed with three year averages, generating SP and SCP (Table 10.3).
- 2. The fractional growth in production (SP/SCP) is calculated and plotted against last year's cumulative production, as shown in Figure 10.13.

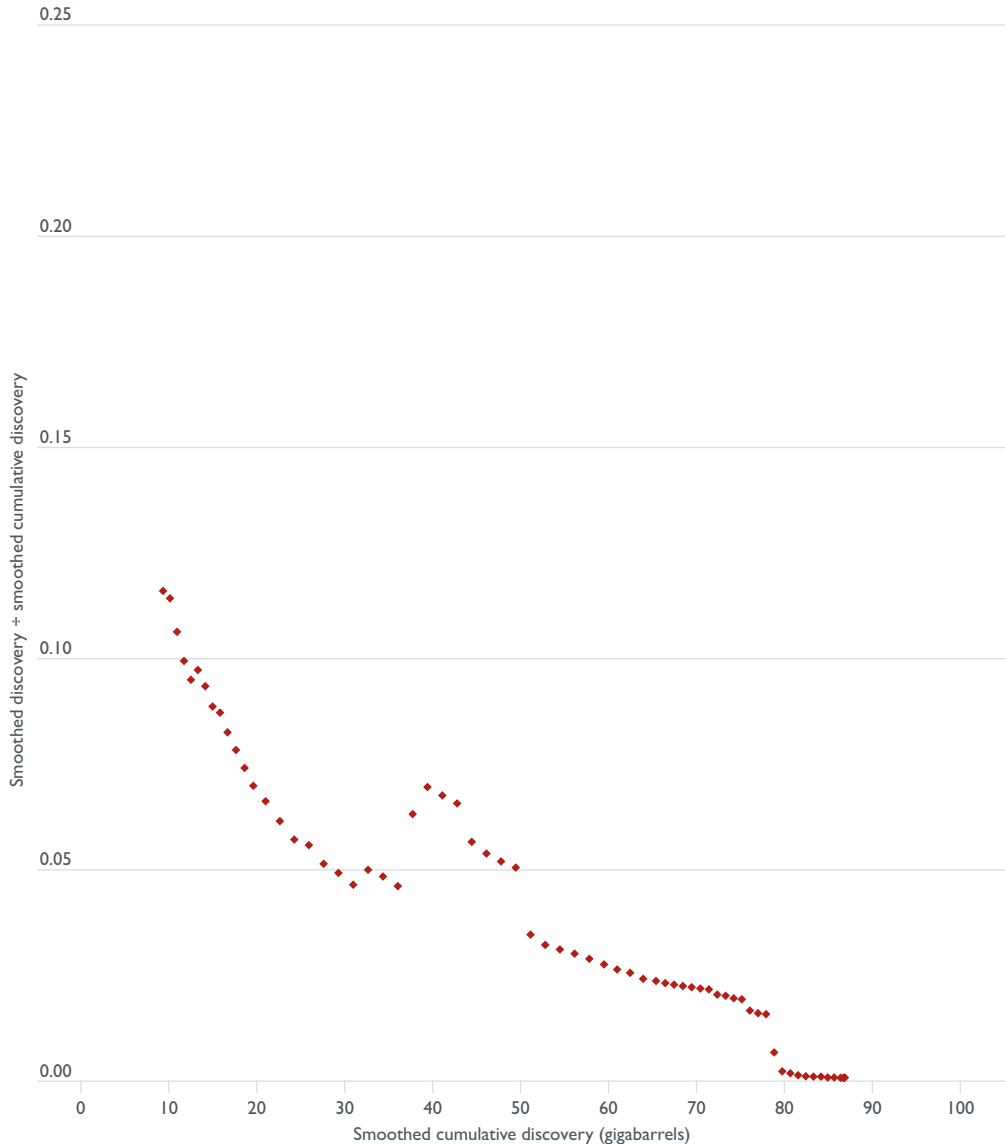
Figure 10.13 Iraqi cumulative production growth curve



- 3. The plot is then examined and a best guess at an ultimate cumulative production (U) is made. In this case, it is 110 gigabarrels.

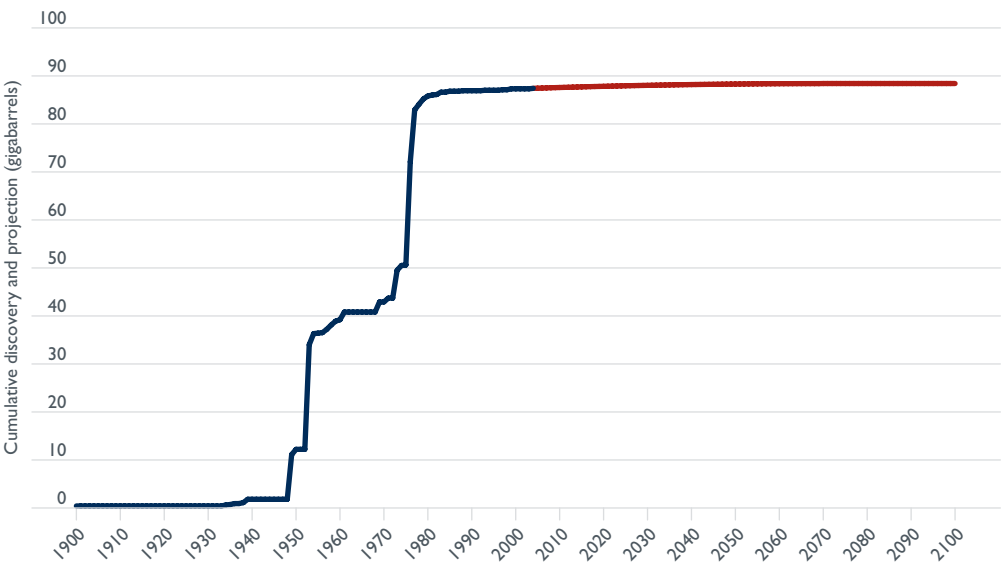
4. Discovery (D) is smoothed with a 31 year moving average and cumulative discovery (CD) is smoothed with a 51 year moving average.
5. The fractional growth in discovery (SD/SCD) is calculated and plotted against last year's smoothed cumulative discovery (Figure 10.14).

Figure 10.14 Iraqi cumulative discovery growth curve



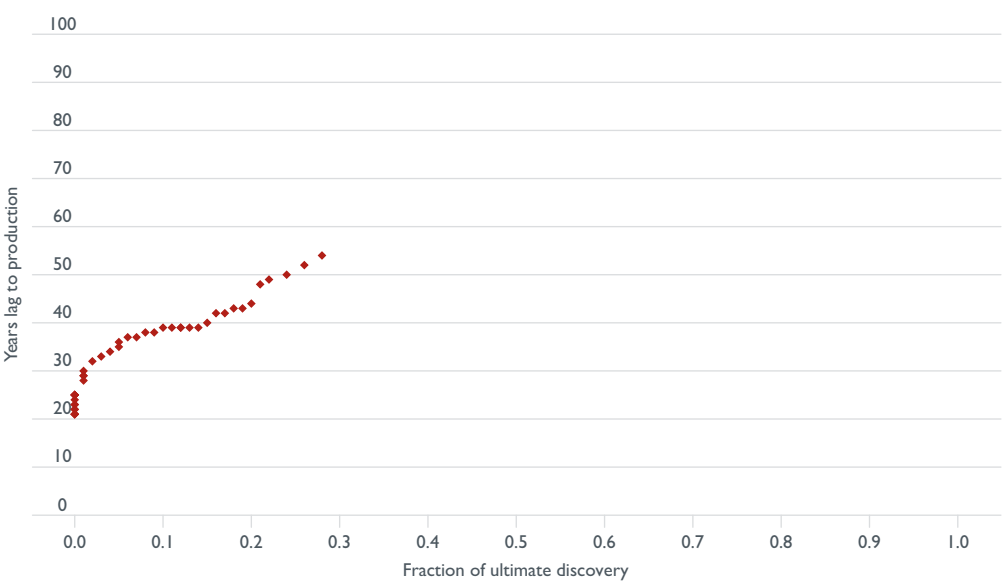
6. The plot is examined and a best guess at an ultimate discovery (UD) is made. In this case it is 88 gigabarrels.
7. Cumulative discovery in 2006 is then projected to UD by bringing SD estimated for 2006 to zero in 2070. For Iraqi oil, the projection of the cumulative discovery curve is shown in Figure 10.15.

Figure 10.15 Iraqi cumulative discovery projection



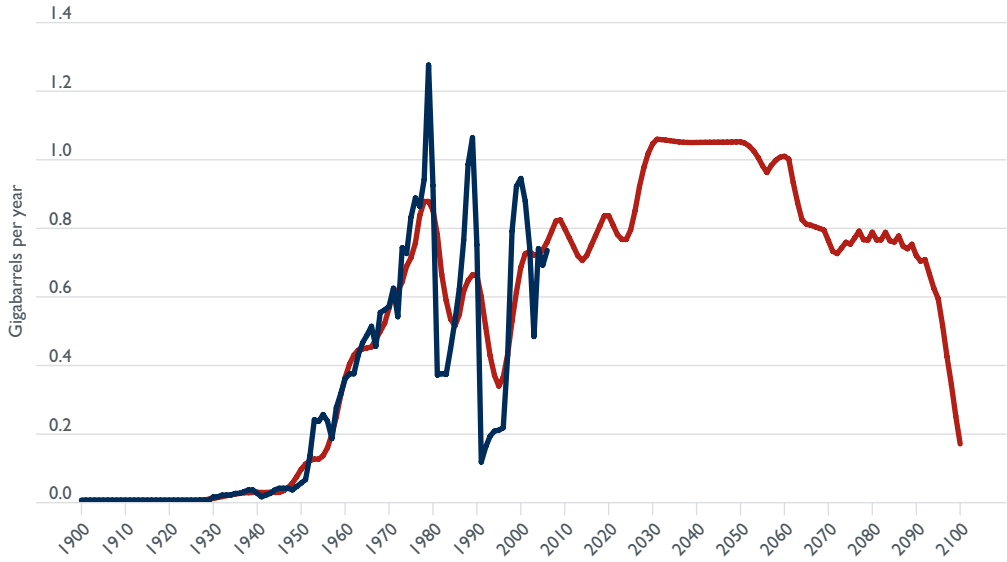
- 8. Next, the height of the cumulative discovery curve has to be adjusted to equal the more reliable cumulative production estimate. In this case, the adjustment is upward, amounting to multiplying by 110/88.
- 9. The historical stretch lag between the cumulative discovery and production curves is calculated, and plotted against the fraction of cumulative discovery. This plot for Iraq is shown in Figure 10.16. The stretch lag exhibits several waves of rises. Extrapolating the trend to 97 years at 1.0 allows the rest of the cumulative production curve to be forecast from the extrapolated discovery curve and the predicted lags.

Figure 10.16 Iraqi stretch lag curve



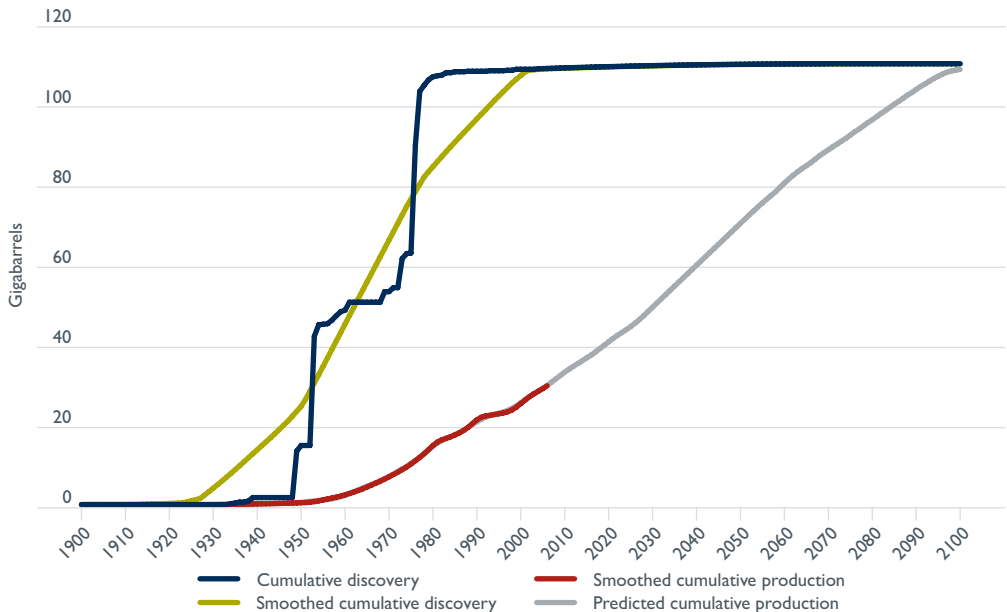
10. The predicted cumulative production curve is smoothed with a five year average and then differenced to give a raw predicted annual production. This is then averaged over five years to give a final annual production forecast. This is shown in Figure 10.17.

Figure 10.17 Actual and predicted Iraqi crude oil production



11. Finally the cumulative discovery and production curves (actual and forecast) are plotted in Figure 10.18. This allows a spatial understanding of the relationship between production and discovery.

Figure 10.18 Iraqi cumulative discovery and cumulative production curves

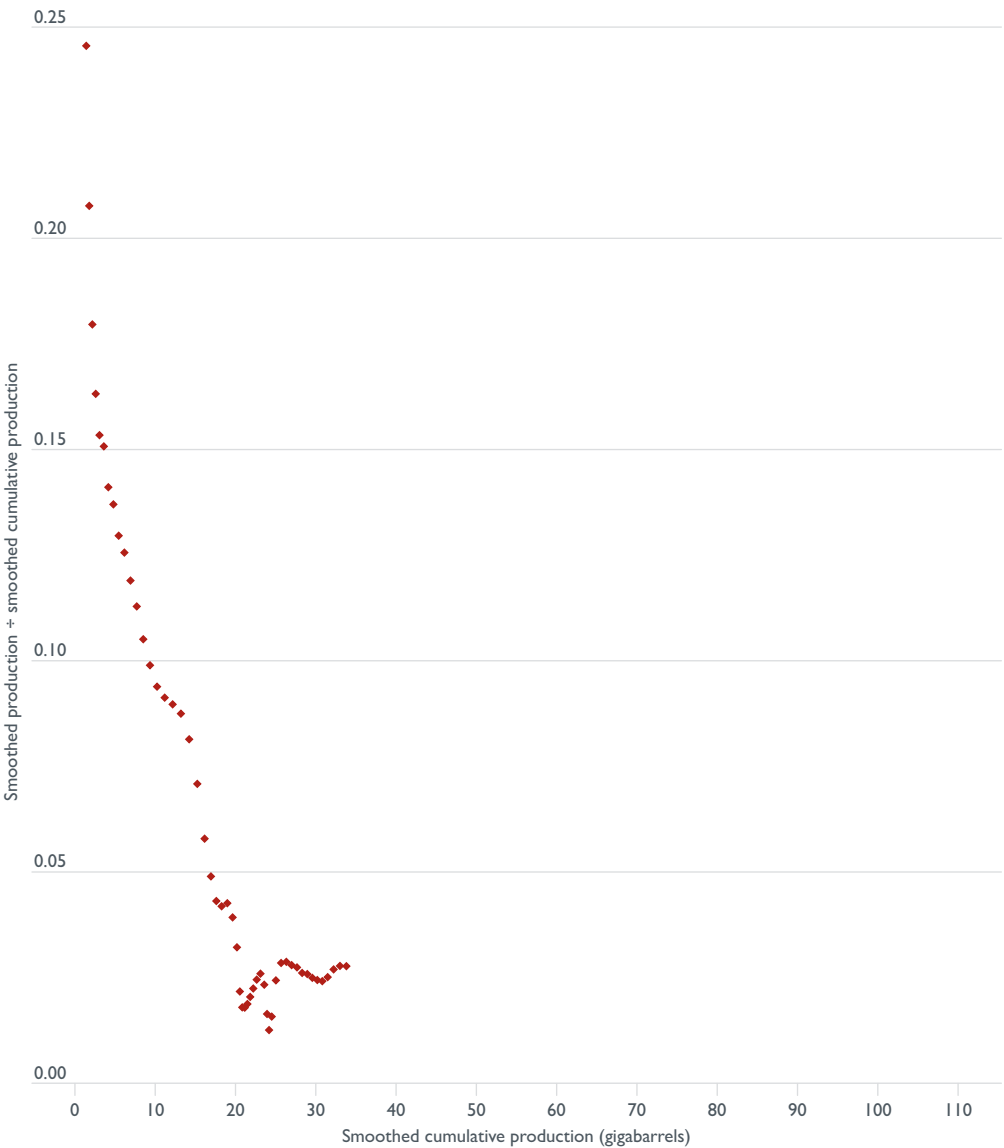


Kuwait

Table 10.4 sets out the calculations from the 11 steps to a forecast of production of Kuwaiti oil (not including Neutral Zone production).

1. First, annual production (P) and cumulative production (CP) are smoothed with three year averages, generating SP and SCP (see Table 10.4).
2. The fractional growth in production (SP/SCP) is calculated and plotted against last year's cumulative production, as shown in Figure 10.19.

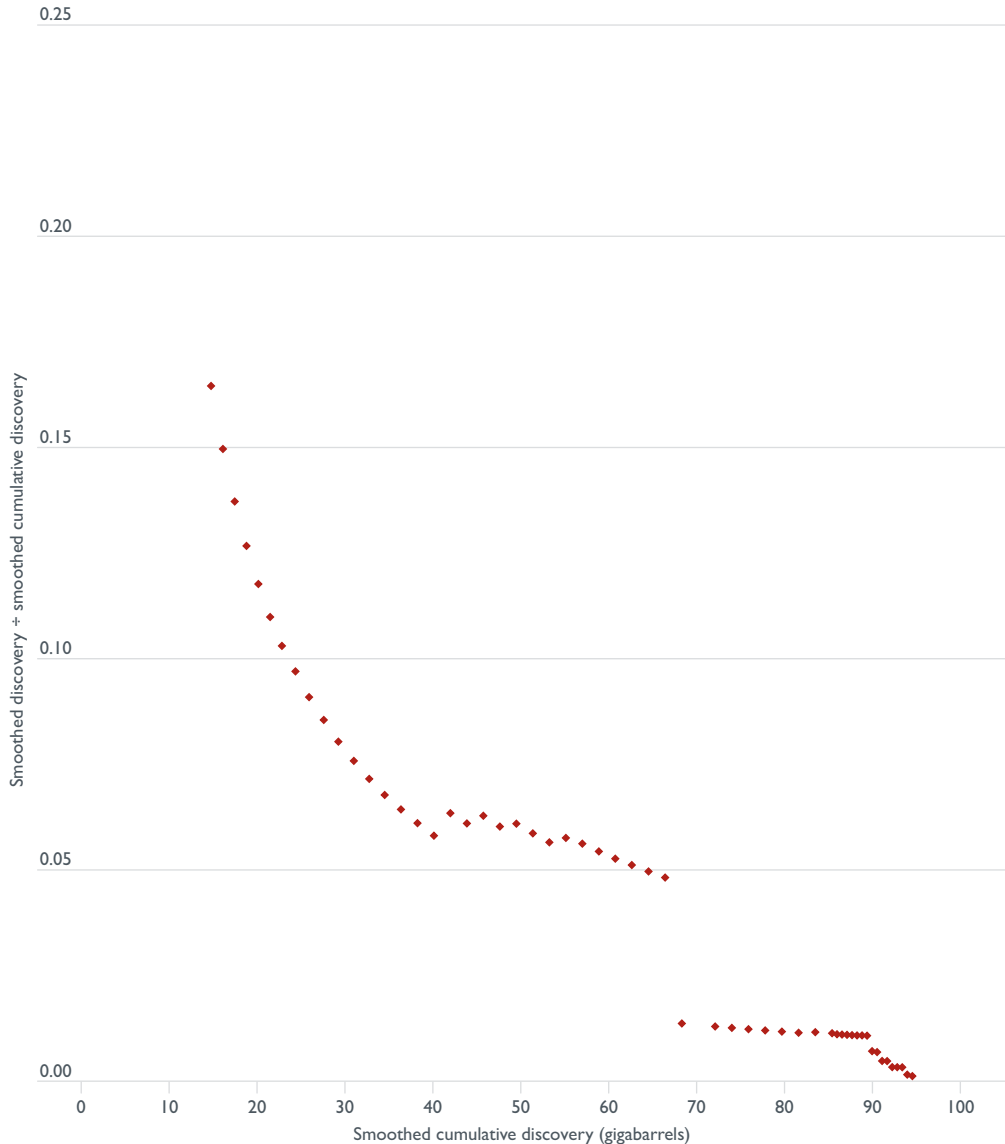
Figure 10.19 Kuwaiti cumulative production growth curve



3. The plot is then examined and a best guess at an ultimate cumulative production (U) is made. In this case, it is 100 gigabarrels.

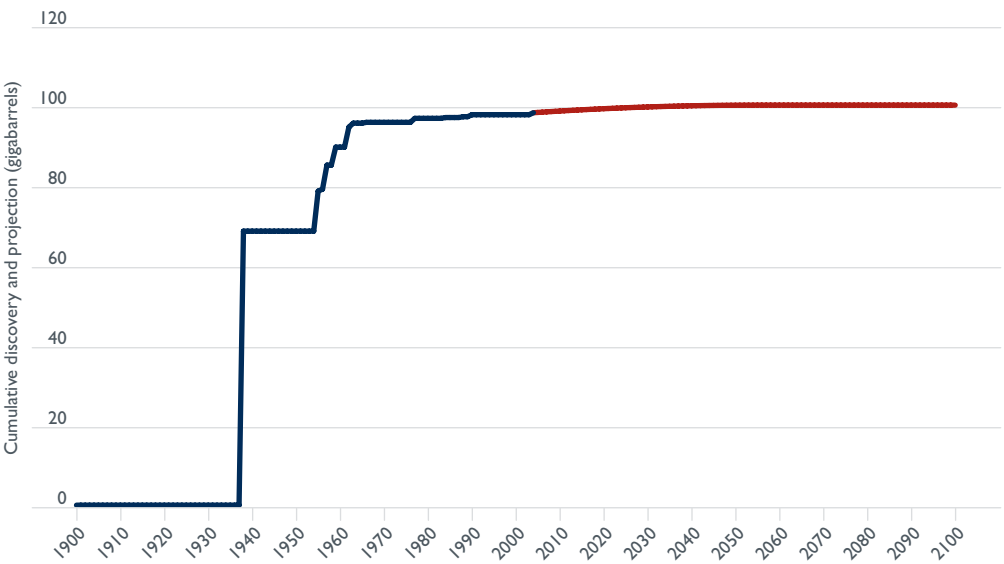
4. Discovery (D) is smoothed with a 31 year moving average and cumulative discovery (CD) is smoothed with a 21 year moving average.
5. The fractional growth in discovery (SD/SCD) is calculated and plotted against last year's smoothed cumulative discovery (Figure 10.20).

Figure 10.20 Kuwaiti cumulative discovery growth curve



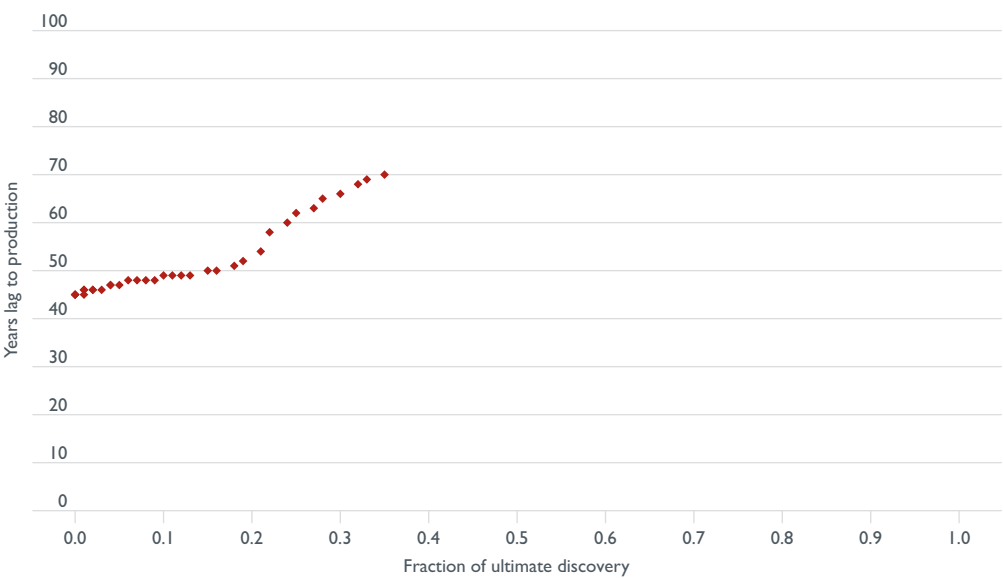
6. The plot is examined and a best guess at an ultimate discovery (UD) is made. In this case it is also 100 gigabarrels.
7. Cumulative discovery in 2006 is then projected to UD by bringing SD estimated for 2006 to zero in 2055. For Kuwait, the projection of the cumulative discovery curve is shown in Figure 10.21.

Figure 10.21 Kuwaiti cumulative discovery projection



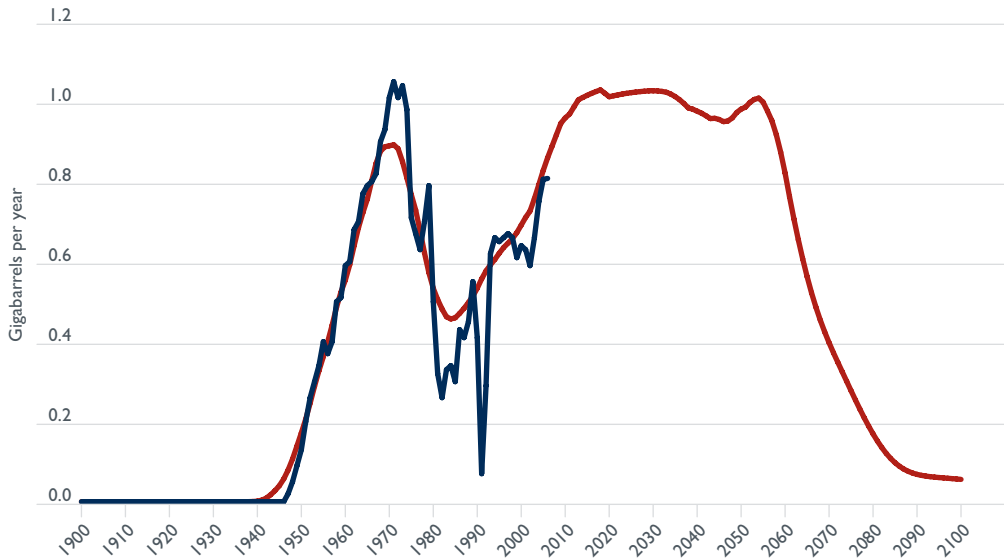
- 8. No adjustment to the cumulative discovery data is necessary.
- 9. Next, the historical stretch lag between the cumulative discovery and production curves is calculated, and plotted against the fraction of cumulative discovery. This plot for Kuwait is shown in Figure 10.22. The stretch lag rises slowly at first, and then with the OPEC slowdown, rises more quickly. Extrapolating the trend to 90 years at 1.0 allows the rest of the cumulative production curve to be forecast from the extrapolated discovery curve and the predicted lags.

Figure 10.22 Kuwaiti stretch lag curve



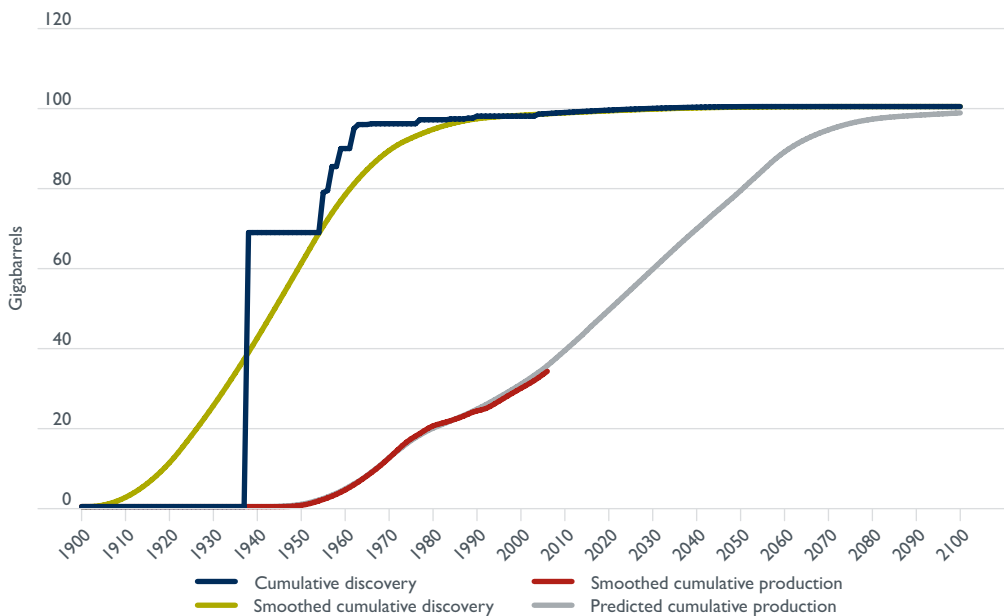
10. The predicted cumulative production curve is smoothed with an 11 year average and then differenced to give a raw predicted annual production. This is then averaged over seven years to give a final annual production forecast. This is shown in Figure 10.23.

Figure 10.23 Actual and predicted Kuwaiti crude oil production



11. Finally the cumulative discovery and production curves (actual and forecast) are plotted in Figure 10.24. This allows a spatial understanding of the relationship between production and discovery.

Figure 10.24 Kuwaiti cumulative discovery and cumulative production curves

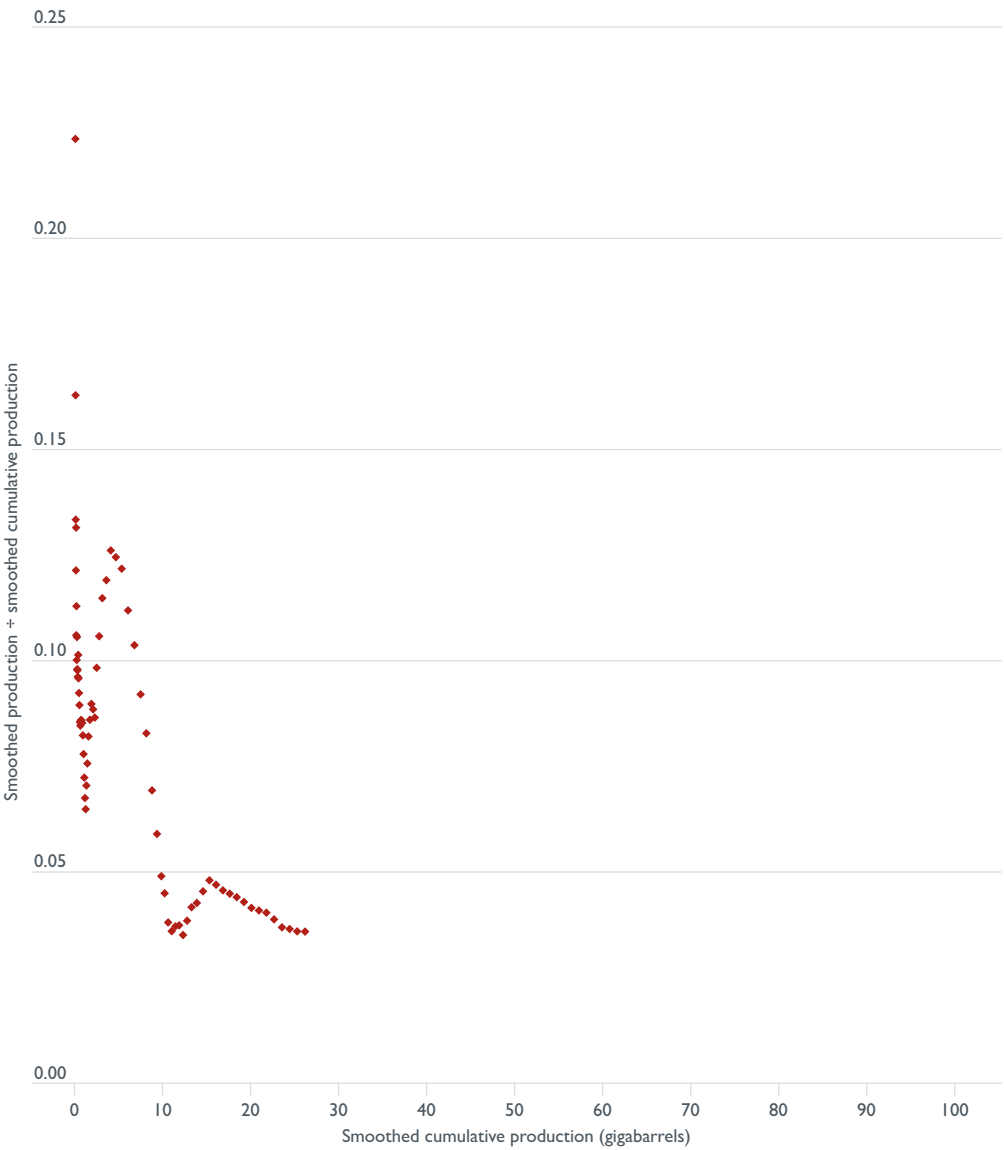


The Rest of the Middle East Gulf

Table 10.5 sets out the calculations from the 11 steps to a forecast of oil production from the Rest of the Middle East Gulf, including the Neutral Zone and Abu Dhabi.

1. First, annual production (P) and cumulative production (CP) are smoothed with five and three year averages, giving SP and SCP (Table 10.5).
2. The fractional growth in production (SP/SCP) is calculated and plotted against last year's cumulative production, as shown in Figure 10.25.

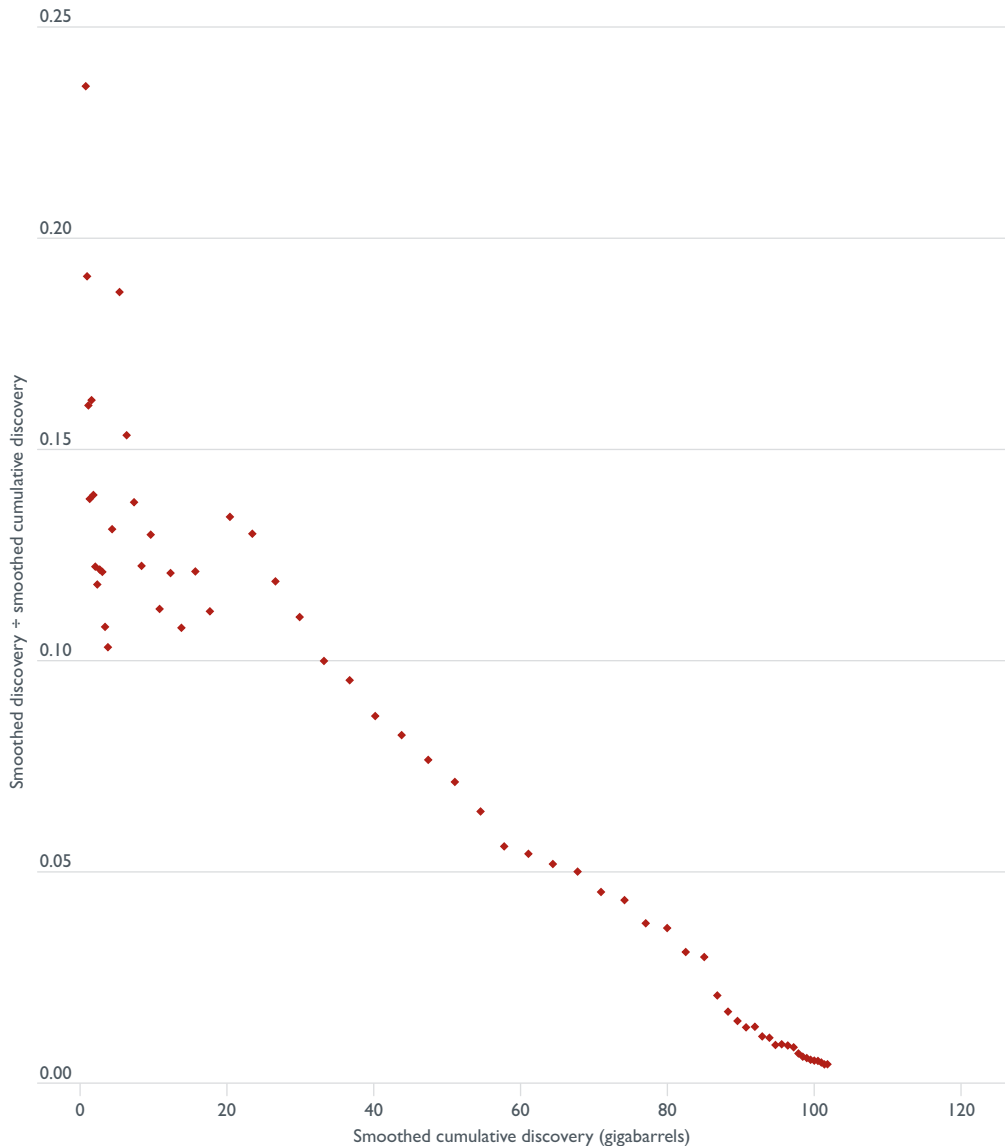
Figure 10.25 Cumulative production growth curve for the Rest of the Gulf



3. The plot is then examined and a best guess at an ultimate cumulative production (U) is made. In this case, it is 95 gigabarrels.

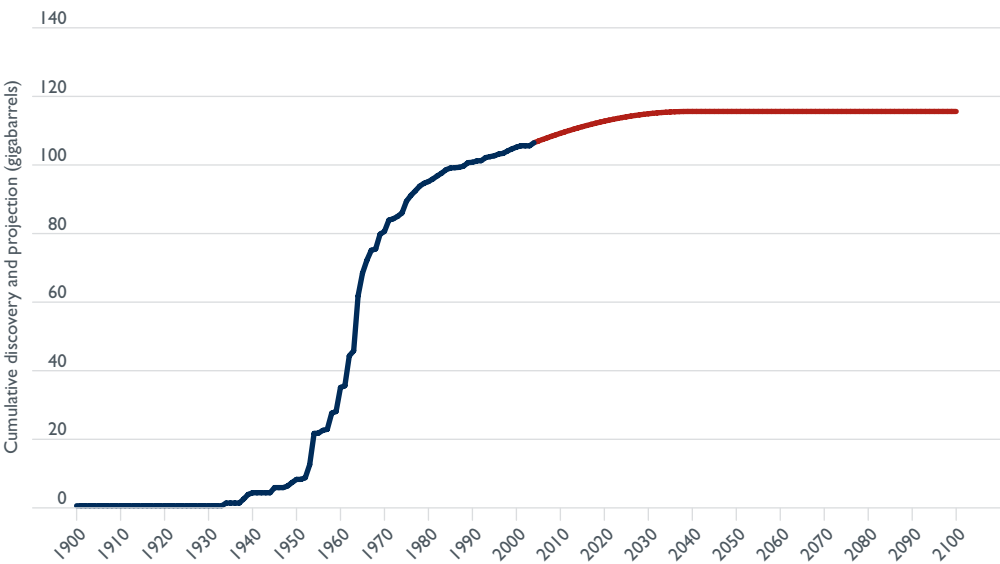
4. Discovery (D) and cumulative discovery (CD) are smoothed with 21 year moving averages.
5. The fractional growth in discovery (SD/SCD) is calculated and plotted against last year's smoothed cumulative discovery (Figure 10.26).

Figure 10.26 Cumulative discovery growth curve for the Rest of the Gulf



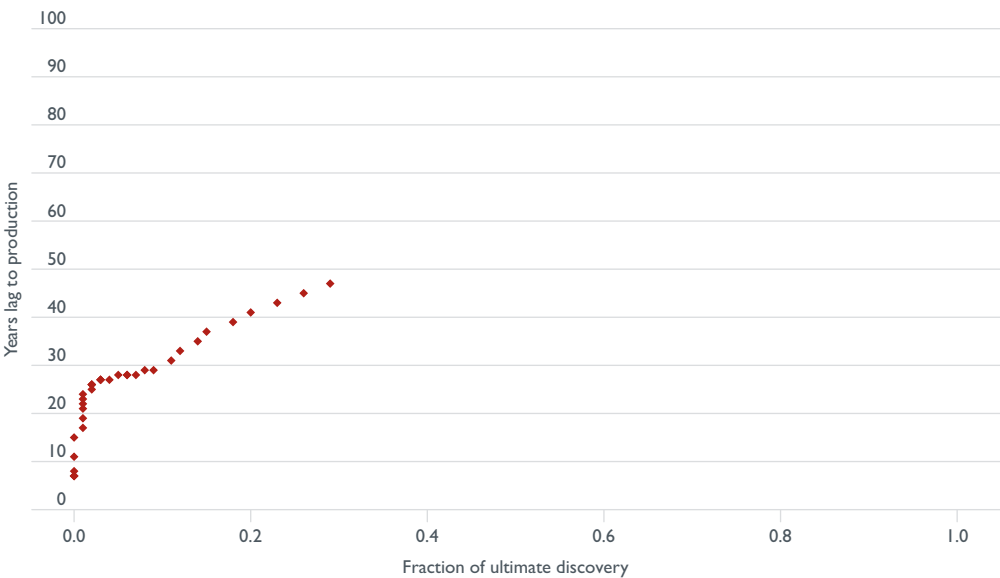
6. The plot is examined and a best guess at an ultimate discovery (UD) is made. In this case it is 115 gigabarrels.
7. Cumulative discovery in 2006 is then projected to UD by bringing SD estimated for 2006 to zero in 2040. The projection of the cumulative discovery curve for the Rest of the Gulf is shown in Figure 10.27.

Figure 10.27 Cumulative discovery projection for the Rest of the Gulf



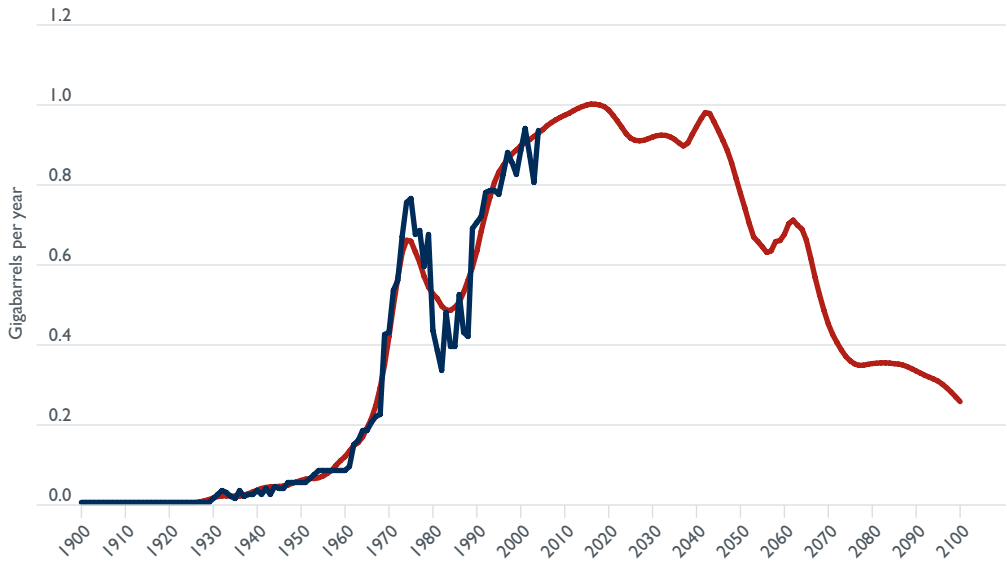
8. Next, the height of the cumulative discovery curve has to be adjusted to equal the more reliable cumulative production estimate. In this case, the adjustment is downward, amounting to multiplying by 95/115.
9. Next, the historical stretch lag between the cumulative discovery and production curves is calculated, and plotted against the fraction of cumulative discovery, as in Figure 10.28. It is apparent that there is a regular relationship. After some noise in the range of zero to 0.1, the stretch lag exhibits a progressive rise. Extrapolating the trend to 81 years at 1.0 allows the rest of the cumulative production lag curve to be forecast from the extrapolated discovery curve and the predicted lags.

Figure 10.28 Stretch lag curve for the Rest of the Gulf



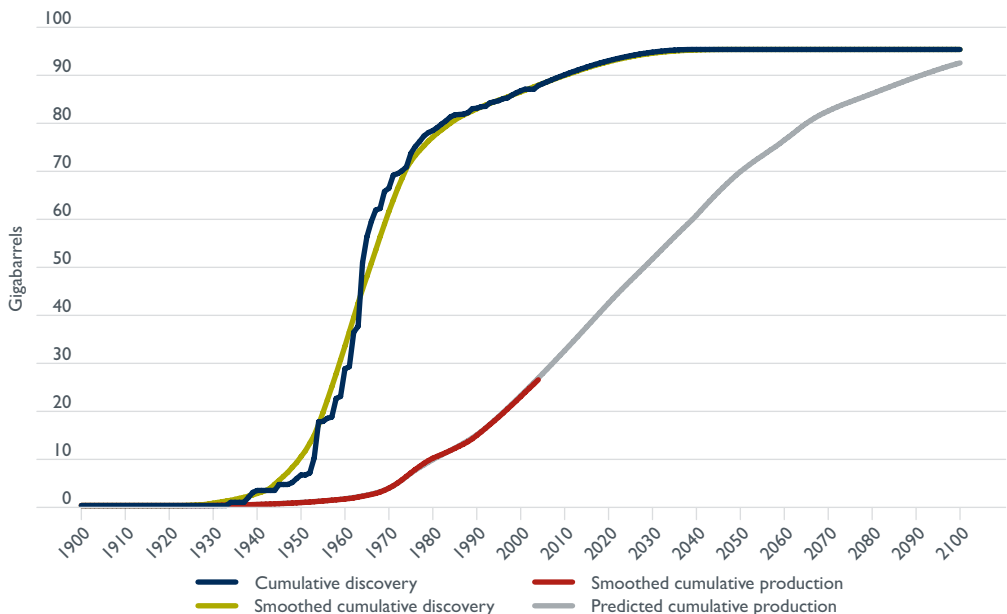
10. The predicted cumulative production curve is smoothed with a five year average and then differenced to give a raw predicted annual production. This is then averaged over five years to give a final annual production forecast. This is shown in Figure 10.29.

Figure 10.29 Actual and predicted crude oil production for the Rest of the Gulf



11. Finally the cumulative discovery and production curves (actual and forecast) are plotted in Figure 10.30. This allows a spatial understanding of the relationship between production and discovery.

Figure 10.30 Cumulative discovery and cumulative production curves for the Rest of the Gulf



Summary of the Middle East Gulf

Table 10.6 summarises the oil production data and forecasts for the Middle East Gulf region, the most important oil province in the world. As Figure 10.31 shows that under business-as-usual production (i.e. in the absence of a slacking of the rise in the stretch lags), production from the Gulf region is set to plateau in the period to 2040.

Figure 10.31 Actual and predicted Middle East Gulf crude oil production

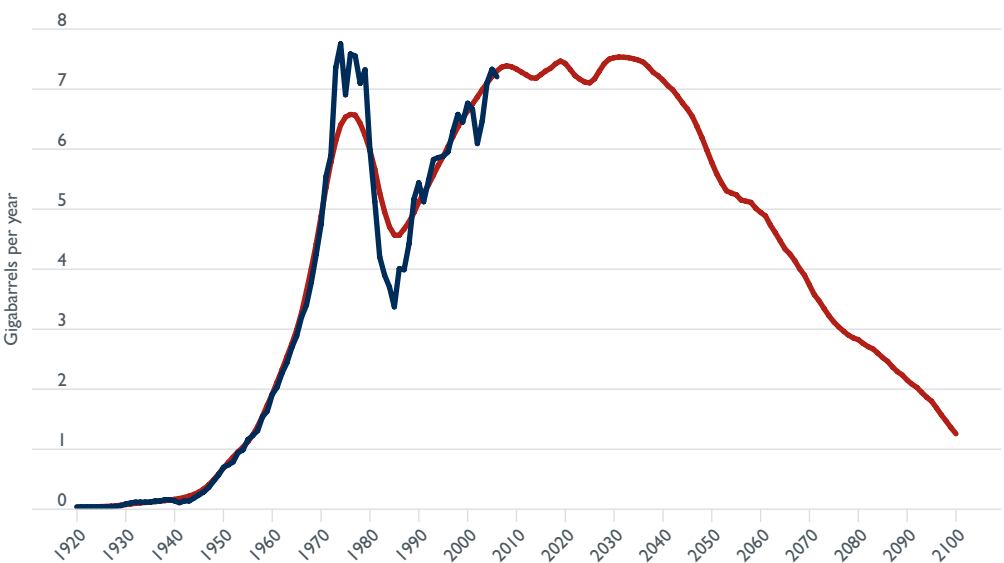


Figure 10.32 shows the dominance of Saudi Arabia in the region’s production, and that the patterns for the region as a whole are similar to Saudi patterns—i.e. a plateauing. Chapter 13 will present a scenario where the lag assumptions are varied and the effects on world production patterns are examined.

Figure 10.32 Components of predicted Middle East Gulf oil production

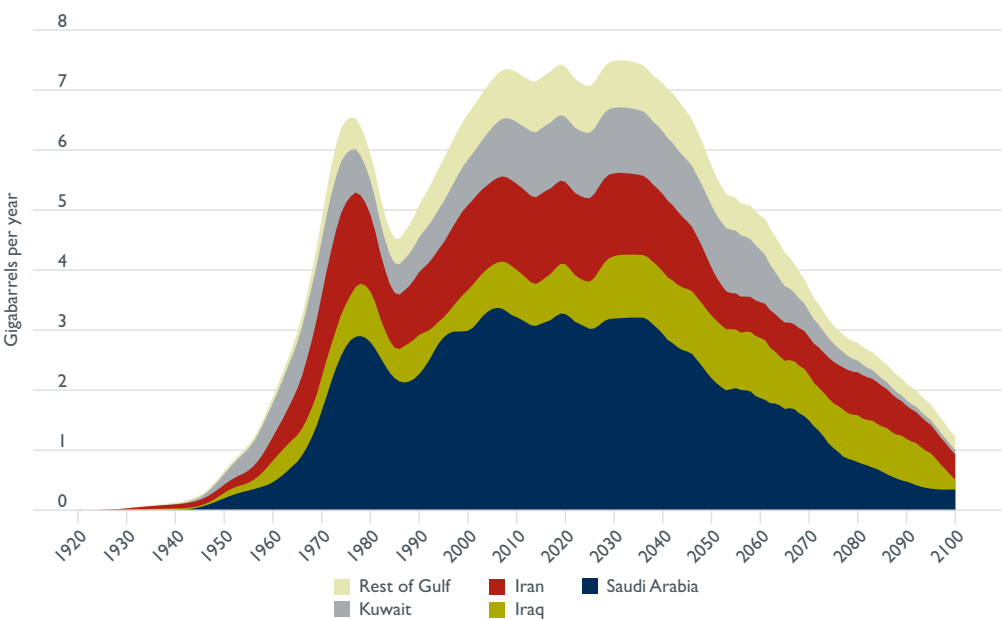


Table 10.1 Saudi Arabia, gigabarrels

Year	D	CD	3 Yr SCD	Adj SCD	Predlag	Raw pred CP	5yr smth pred SCP	SCP	Raw pred P	5yr smth pred SP	Actual P
1930	0.00	0.00	5.19	5.03	32	0.00	0.00	0.00	0.00	0.00	0.00
1931	0.00	0.00	6.27	6.07	33	0.00	0.00	0.00	0.00	0.00	0.00
1932	0.00	0.00	7.35	7.12	33	0.00	0.00	0.00	0.00	0.00	0.00
1933	0.00	0.00	12.39	11.99	37	0.00	0.00	0.00	0.00	0.00	0.00
1934	0.00	0.00	17.44	16.88	38	0.00	0.00	0.00	0.00	0.00	0.00
1935	0.00	0.00	22.50	21.77	39	0.00	0.00	0.00	0.00	0.00	0.00
1936	0.00	0.00	28.55	27.63	40	0.00	0.00	0.00	0.00	0.00	0.00
1937	0.00	0.00	34.61	33.49	41	0.00	0.00	0.00	0.00	0.00	0.00
1938	1.00	1.00	40.66	39.35	42	0.00	0.00	0.00	0.00	0.00	0.00
1939	0.00	1.00	46.72	45.21	43	0.00	0.00	0.00	0.00	0.00	0.00
1940	24.00	25.00	52.77	51.07	45	0.00	0.00	0.00	0.00	0.00	0.00
1941	0.00	25.00	58.95	57.05	47	0.00	0.00	0.00	0.00	0.00	0.00
1942	0.00	25.00	65.98	63.85	49	0.00	0.00	0.00	0.00	0.01	0.00
1943	0.00	25.00	73.00	70.65	51	0.00	0.01	0.00	0.01	0.02	0.00
1944	0.50	25.50	80.02	77.44	52	0.01	0.03	0.01	0.02	0.03	0.00
1945	8.00	33.50	87.05	84.24	53	0.04	0.06	0.04	0.03	0.05	0.03
1946	0.00	33.50	94.07	91.03	55	0.09	0.12	0.09	0.06	0.07	0.05
1947	0.00	33.50	101.09	97.83	56	0.17	0.21	0.17	0.09	0.10	0.08
1948	122.50	156.00	108.37	104.88	57	0.29	0.33	0.29	0.12	0.13	0.12
1949	0.70	156.70	116.04	112.30	58	0.45	0.49	0.45	0.16	0.16	0.15
1950	0.00	156.70	124.16	120.15	60	0.64	0.69	0.64	0.20	0.19	0.20
1951	31.00	187.70	132.28	128.01	61	0.89	0.92	0.89	0.23	0.23	0.24
1952	0.00	187.70	140.53	135.99	63	1.16	1.18	1.16	0.26	0.25	0.29
1953	0.00	187.70	149.29	144.47	65	1.46	1.47	1.46	0.29	0.28	0.30
1954	0.00	187.70	158.02	152.93	66	1.77	1.78	1.77	0.31	0.30	0.30
1955	0.00	187.70	166.75	161.38	68	2.09	2.11	2.09	0.32	0.32	0.33
1956	4.00	191.70	174.78	169.14	70	2.43	2.44	2.43	0.34	0.34	0.34
1957	26.00	217.70	182.80	176.90	71	2.78	2.80	2.78	0.35	0.37	0.35
1958	0.00	217.70	190.88	184.72	73	3.14	3.17	3.14	0.38	0.39	0.36
1959	0.00	217.70	198.99	192.57	74	3.53	3.58	3.53	0.41	0.42	0.36
1960	0.00	217.70	207.15	200.47	76	3.97	4.03	3.97	0.45	0.46	0.48
1961	0.00	217.70	215.24	208.29	77	4.48	4.51	4.48	0.48	0.51	0.54
1962	0.00	217.70	223.33	216.13	79	5.03	5.02	5.02	0.51	0.57	0.60
1963	8.00	225.70	231.53	224.06	81	5.55	5.65	5.60	0.63	0.64	0.65
1964	12.00	237.70	235.93	228.32	82	6.07	6.37	6.24	0.72	0.72	0.69
1965	14.00	251.70	240.33	232.57	82	7.12	7.18	6.97	0.81	0.79	0.81
1966	0.00	251.70	244.72	236.83	83	8.09	8.08	7.81	0.90	0.90	0.95
1967	4.00	255.70	248.15	240.15	84	9.07	9.07	8.76	0.99	1.03	1.03
1968	16.00	271.70	251.60	243.49	85	10.04	10.04	9.77	0.97	1.19	1.11
1969	0.00	271.70	255.06	246.84	85	11.01	11.31	10.91	1.27	1.39	1.18
1970	0.00	271.70	258.53	250.19	86	11.99	12.87	12.25	1.56	1.62	1.39
1971	2.00	273.70	261.99	253.54	87	14.43	14.73	13.88	1.86	1.86	1.74
1972	0.00	273.70	265.32	256.76	87	16.88	16.88	15.98	2.15	2.11	2.20
1973	1.80	275.50	267.81	259.17	88	19.33	19.42	18.56	2.54	2.33	2.77
1974	1.00	276.50	270.37	261.65	88	21.77	22.06	21.37	2.64	2.53	3.10
1975	2.00	278.50	272.97	264.17	89	24.70	24.80	24.33	2.74	2.68	2.58
1976	5.50	284.00	275.58	266.69	89	27.63	27.63	27.35	2.83	2.79	3.13
1977	0.50	284.50	278.18	269.21	90	30.56	30.56	30.48	2.93	2.85	3.37
1978	3.00	287.50	280.79	271.74	90	33.49	33.49	33.68	2.93	2.86	3.03
1979	5.00	292.50	283.16	274.02	91	36.42	36.42	36.95	2.93	2.83	3.48
1980	0.50	293.00	285.15	275.95	91	39.35	39.35	40.43	2.93	2.76	3.61
1981	0.00	293.00	286.70	277.45	91	42.28	42.08	43.57	2.73	2.65	3.58
1982	1.00	294.00	288.26	278.96	92	45.21	44.62	46.14	2.54	2.51	2.37
1983	0.70	294.70	289.70	280.35	92	47.16	46.97	48.11	2.34	2.38	1.86
1984	0.30	295.00	290.69	281.31	92	49.12	49.12	49.71	2.16	2.25	1.70
1985	0.00	295.00	291.70	282.29	92	51.07	51.09	51.26	1.97	2.16	1.24
1986	0.00	295.00	292.71	283.27	93	53.06	53.07	52.75	1.98	2.11	1.78
1987	0.00	295.00	293.65	284.18	93	55.06	55.11	54.39	2.04	2.09	1.56
1988	0.00	295.00	294.60	285.10	93	57.05	57.22	56.07	2.10	2.10	1.86
1989	2.00	297.00	295.51	285.98	93	59.32	59.37	58.05	2.16	2.15	1.85
1990	1.40	298.40	296.40	286.84	93	61.58	61.58	60.46	2.21	2.22	2.34
1991	0.00	298.40	297.23	287.65	94	63.85	63.85	63.25	2.27	2.32	2.96
1992	0.00	298.40	297.90	288.29	94	66.11	66.11	66.20	2.27	2.44	3.04
1993	0.30	298.70	298.56	288.93	94	68.38	68.61	69.11	2.49	2.58	2.99
1994	0.30	299.00	299.14	289.49	94	70.65	71.32	72.00	2.72	2.72	2.96
1995	0.30	299.30	299.56	289.90	94	74.04	74.27	74.88	2.94	2.82	3.00
1996	0.50	299.80	299.98	290.30	94	77.44	77.44	77.79	3.17	2.88	3.00
1997	0.30	300.10	300.41	290.71	94	80.84	80.61	80.71	3.17	2.91	3.05
1998	0.30	300.40	300.81	291.10	94	84.24	83.56	83.59	2.94	2.91	3.06
1999	2.00	302.40	301.20	291.48	94	86.50	86.28	86.46	2.72	2.92	2.86
2000	0.60	303.00	301.58	291.85	94	88.77	88.99	89.30	2.72	2.92	3.07
2001	0.00	303.00	301.98	292.23	94	91.03	91.71	92.08	2.72	2.97	2.93
2002	0.00	303.00	302.38	292.62	95	94.43	94.68	94.94	2.97	3.06	2.79
2003	0.00	303.00	302.79	293.02	95	97.83	97.90	97.91	3.22	3.16	3.20
2004	0.70	303.70	303.20	293.42	95	101.35	101.41	101.14	3.51	3.24	3.32
2005	0.35	304.05	303.56	293.77	95	104.88	104.99	104.40	3.57	3.28	3.49
2006	0.34	304.38	303.88	294.07	95	108.59	108.40	107.67	3.42	3.30	3.34
2007	0.33	304.71	304.20	294.39	95	112.30	111.64		3.24	3.29	
2008	0.32	305.03	304.53	294.71	95	114.91	114.70		3.06	3.24	
2009	0.31	305.33	304.86	295.02	95	117.53	117.80		3.10	3.18	

(continued)

Table 10.1 Saudi Arabia, gigabarrels (continued)

Year	D	CD	3 lyr SCD	Adj SCD	Predlag	Raw pred CP	Syr smth pred SCP	SCP	Raw pred P	Syr smth pred SP	Actual P
2010	0.30	305.63	305.18	295.33	95	120.15	120.94		3.14	3.14	
2011	0.29	305.92	305.49	295.64	95	124.08	124.09		3.15	3.10	
2012	0.28	306.20	305.80	295.93	95	128.01	127.25		3.16	3.06	
2013	0.27	306.47	306.09	296.22	95	130.67	130.42		3.17	3.01	
2014	0.26	306.73	306.38	296.50	95	133.33	133.37		2.95	3.00	
2015	0.25	306.98	306.61	296.72	95	135.99	136.09		2.73	3.03	
2016	0.24	307.22	306.83	296.93	95	138.82	138.85		2.76	3.06	
2017	0.23	307.45	307.05	297.14	95	141.65	141.93		3.07	3.09	
2018	0.22	307.67	307.26	297.35	95	144.47	145.31		3.39	3.16	
2019	0.21	307.88	307.48	297.57	96	148.70	148.70		3.38	3.20	
2020	0.20	308.08	307.68	297.76	96	152.93	152.08		3.38	3.20	
2021	0.19	308.27	307.87	297.94	96	155.74	155.46		3.38	3.14	
2022	0.18	308.45	308.05	298.12	96	158.56	158.51		3.05	3.07	
2023	0.17	308.62	308.22	298.28	96	161.38	161.24		2.73	3.03	
2024	0.16	308.78	308.38	298.44	96	163.96	163.92		2.68	2.99	
2025	0.15	308.93	308.53	298.58	96	166.55	166.81		2.89	2.95	
2026	0.14	309.07	308.68	298.72	96	169.14	169.92		3.11	2.96	
2027	0.13	309.20	308.81	298.85	96	173.02	173.03		3.11	3.02	
2028	0.12	309.33	308.93	298.96	96	176.90	176.14		3.11	3.09	
2029	0.11	309.44	309.04	299.07	96	179.51	179.25		3.12	3.12	
2030	0.10	309.54	309.15	299.18	96	182.12	182.38		3.13	3.13	
2031	0.09	309.63	309.25	299.27	96	184.72	185.51		3.13	3.13	
2032	0.08	309.71	309.34	299.36	96	188.65	188.65		3.14	3.14	
2033	0.07	309.78	309.42	299.44	96	192.57	191.80		3.14	3.14	
2034	0.06	309.84	309.49	299.51	96	195.21	194.95		3.15	3.14	
2035	0.05	309.89	309.56	299.58	96	197.84	198.10		3.15	3.14	
2036	0.04	309.93	309.62	299.64	96	200.47	201.24		3.14	3.14	
2037	0.03	309.96	309.68	299.69	96	204.38	204.38		3.14	3.10	
2038	0.02	309.98	309.73	299.74	96	208.29	207.51		3.14	3.03	
2039	0.01	309.99	309.77	299.78	96	210.90	210.64		3.13	2.95	
2040	0.01	310.00	309.81	299.82	96	213.52	213.52		2.88	2.87	
2041	0.00	310.00	309.85	299.85	96	216.13	216.15		2.62	2.77	
2042	0.00	310.00	309.88	299.88	96	218.77	218.78		2.63	2.71	
2043	0.00	310.00	309.90	299.91	96	221.41	221.31		2.53	2.65	
2044	0.00	310.00	309.93	299.93	96	224.06	223.75		2.44	2.60	
2045	0.00	310.00	309.94	299.95	96	226.19	226.51		2.76	2.58	
2046	0.00	310.00	309.96	299.96	96	228.32	229.17		2.66	2.54	
2047	0.00	310.00	309.97	299.97	96	232.57	231.72		2.55	2.44	
2048	0.00	310.00	309.98	299.98	96	234.70	234.18		2.46	2.34	
2049	0.00	310.00	309.99	299.99	96	236.83	236.55		2.37	2.23	
2050	0.00	310.00	309.99	299.99	96	238.49	238.40		1.85	2.14	
2051	0.00	310.00	310.00	300.00	96	240.15	240.15		1.76	2.06	
2052	0.00	310.00	310.00	300.00	96	241.82	242.15		2.00	2.00	
2053	0.00	310.00	310.00	300.00	96	243.49	244.16		2.01	1.95	
2054	0.00	310.00	310.00	300.00	96	246.84	246.17		2.01	1.97	
2055	0.00	310.00	310.00	300.00	96	248.51	248.18		2.01	1.99	
2056	0.00	310.00	310.00	300.00	96	250.19	250.19		2.01	1.96	
2057	0.00	310.00	310.00	300.00	96	251.86	252.17		1.98	1.95	
2058	0.00	310.00	310.00	300.00	96	253.54	254.06		1.89	1.93	
2059	0.00	310.00	310.00	300.00	96	256.76	255.86		1.80	1.86	
2060	0.00	310.00	310.00	300.00	96	257.97	257.82		1.96	1.82	
2061	0.00	310.00	310.00	300.00	96	259.17	259.69		1.87	1.79	
2062	0.00	310.00	310.00	300.00	96	261.65	261.17		1.48	1.73	
2063	0.00	310.00	310.00	300.00	96	262.91	262.92		1.74	1.73	
2064	0.00	310.00	310.00	300.00	96	264.17	264.67		1.75	1.70	
2065	0.00	310.00	310.00	300.00	96	266.69	266.18		1.51	1.64	
2066	0.00	310.00	310.00	300.00	96	267.95	267.95		1.77	1.66	
2067	0.00	310.00	310.00	300.00	96	269.21	269.69		1.74	1.64	
2068	0.00	310.00	310.00	300.00	96	271.74	271.16		1.47	1.58	
2069	0.00	310.00	310.00	300.00	96	272.88	272.76		1.60	1.53	
2070	0.00	310.00	310.00	300.00	96	274.02	274.41		1.65	1.46	
2071	0.00	310.00	310.00	300.00	96	275.95	275.70		1.29	1.37	
2072	0.00	310.00	310.00	300.00	96	277.45	276.92		1.22	1.30	
2073	0.00	310.00	310.00	300.00	96	278.20	278.18		1.27	1.20	
2074	0.00	310.00	310.00	300.00	96	278.96	279.26		1.07	1.08	
2075	0.00	310.00	310.00	300.00	96	280.35	280.22		0.97	1.01	
2076	0.00	310.00	310.00	300.00	96	281.31	281.14		0.91	0.94	
2077	0.00	310.00	310.00	300.00	96	282.29	282.00		0.86	0.87	
2078	0.00	310.00	310.00	300.00	96	282.78	282.77		0.77	0.83	
2079	0.00	310.00	310.00	300.00	96	283.27	283.52		0.76	0.81	
2080	0.00	310.00	310.00	300.00	96	284.18	284.26		0.74	0.77	
2081	0.00	310.00	310.00	300.00	96	285.10	285.07		0.81	0.74	
2082	0.00	310.00	310.00	300.00	96	285.98	285.87		0.79	0.72	
2083	0.00	310.00	310.00	300.00	96	286.84	286.56		0.69	0.69	
2084	0.00	310.00	310.00	300.00	96	287.24	287.20		0.64	0.66	
2085	0.00	310.00	310.00	300.00	96	287.65	287.79		0.59	0.62	
2086	0.00	310.00	310.00	300.00	96	288.29	288.32		0.53	0.57	
2087	0.00	310.00	310.00	300.00	96	288.93	288.85		0.53	0.53	
2088	0.00	310.00	310.00	300.00	96	289.49	289.38		0.53	0.50	
2089	0.00	310.00	310.00	300.00	96	289.90	289.87		0.48	0.47	

(continued)

Table 10.1 Saudi Arabia, gigabarrels (continued)

Year	D	CD	31yr SCD	Adj SCD	Predlag	Raw pred CP	5yr smth pred SCP	SCP	Raw pred P	5yr smth pred SP	Actual P
2090	0.00	310.00	310.00	300.00	96	290.30	290.30		0.43	0.45	
2091	0.00	310.00	310.00	300.00	96	290.71	290.70		0.40	0.42	
2092	0.00	310.00	310.00	300.00	96	291.10	291.09		0.39	0.39	
2093	0.00	310.00	310.00	300.00	96	291.48	291.48		0.39	0.37	
2094	0.00	310.00	310.00	300.00	96	291.85	291.82		0.34	0.35	
2095	0.00	310.00	310.00	300.00	96	292.23	292.12		0.30	0.34	
2096	0.00	310.00	310.00	300.00	96	292.43	292.43		0.31	0.33	
2097	0.00	310.00	310.00	300.00	96	292.62	292.75		0.31	0.32	
2098	0.00	310.00	310.00	300.00	96	293.02	293.05		0.31	0.32	
2099	0.00	310.00	310.00	300.00	96	293.42	293.38		0.33	0.32	
2100	0.00	310.00	310.00	300.00	96	293.77	293.73		0.35	0.32	

Notes: D—discovery; CD—cumulative discovery; SCD—smoothed cumulative discovery (years = number of years centred moving average); adj—adjusted (to match cumulative production maximum); predlag—predicted lag between cumulative discovery and cumulative production; raw Pred CP—prediction using direct lag of cumulative discovery by predicted lag years; Pred SCP—raw predicted CP smoothed (with years = number of years centred moving average); SCP—smoothed actual cumulative production (years = number of years centred moving average); raw Pred P—one year change in predicted smoothed cumulative production; Pred SP—smoothed raw Pred P (years = number of years centred moving average); Actual P—actual annual oil production. Shaded numbers are interpolations, extrapolations or forecasts.

Table 10.2 Iran, gigabarrels

Year	D	CD	2/yr SCD	Adj SCD	Predlag	Raw pred CP	1/yr smth pred SCP	SCP	Raw pred P	5yr smth pred SP	Actual P
1900	0.00	0.00	0.05	0.04	29		0.00	0.00	0.00	0.00	0.00
1901	0.00	0.00	0.15	0.12	31		0.00	0.00	0.00	0.00	0.00
1902	0.00	0.00	0.31	0.24	33		0.00	0.00	0.00	0.00	0.00
1903	0.00	0.00	0.53	0.41	35		0.00	0.00	0.00	0.00	0.00
1904	0.00	0.00	0.81	0.62	37		0.00	0.00	0.00	0.00	0.00
1905	0.00	0.00	1.14	0.87	39		0.00	0.00	0.00	0.00	0.00
1906	0.00	0.00	1.53	1.17	41		0.00	0.00	0.00	0.00	0.00
1907	0.00	0.00	1.98	1.51	43		0.00	0.00	0.00	0.00	0.00
1908	0.00	0.00	2.49	1.89	44		0.00	0.00	0.00	0.00	0.00
1909	0.00	0.00	3.05	2.32	46		0.00	0.00	0.00	0.00	0.00
1910	1.00	1.00	3.67	2.79	47		0.00	0.00	0.00	0.00	0.00
1911	1.20	2.20	4.34	3.31	48		0.00	0.00	0.00	0.00	0.00
1912	1.20	3.40	5.08	3.87	49		0.00	0.00	0.00	0.00	0.00
1913	1.20	4.60	5.87	4.47	49		0.00	0.00	0.00	0.00	0.00
1914	1.20	5.80	6.71	5.12	49		0.00	0.00	0.00	0.00	0.00
1915	1.20	7.00	7.62	5.80	49		0.00	0.00	0.00	0.00	0.00
1916	1.20	8.20	8.58	6.54	49		0.00	0.00	0.00	0.00	0.00
1917	1.20	9.40	9.60	7.31	49		0.00	0.00	0.00	0.00	0.00
1918	1.20	10.60	10.68	8.13	49		0.00	0.00	0.00	0.00	0.00
1919	1.20	11.80	11.81	9.00	49		0.00	0.00	0.00	0.00	0.00
1920	1.20	13.00	13.00	9.90	49		0.00	0.00	0.00	0.00	0.00
1921	1.20	14.20	14.33	10.92	48		0.00	0.00	0.00	0.00	0.00
1922	1.20	15.40	15.70	11.97	48		0.00	0.00	0.00	0.00	0.00
1923	1.20	16.60	17.11	13.04	48		0.00	0.00	0.00	0.00	0.00
1924	1.20	17.80	18.56	14.14	47		0.01	0.00	0.00	0.00	0.00
1925	1.20	19.00	20.10	15.31	47		0.01	0.00	0.01	0.01	0.00
1926	1.20	20.20	21.67	16.51	47		0.02	0.00	0.01	0.01	0.00
1927	1.20	21.40	23.18	17.66	46		0.03	0.00	0.01	0.01	0.00
1928	1.20	22.60	24.64	18.77	46	0.01	0.04	0.01	0.01	0.01	0.01
1929	1.20	23.80	26.04	19.84	45	0.04	0.06	0.03	0.02	0.02	0.02
1930	1.20	25.00	27.48	20.93	45	0.06	0.08	0.06	0.02	0.02	0.03
1931	4.00	29.00	28.86	21.99	44	0.09	0.11	0.10	0.03	0.03	0.04
1932	2.00	31.00	30.18	23.00	44	0.12	0.14	0.13	0.03	0.03	0.04
1933	2.00	33.00	31.45	23.96	43	0.16	0.18	0.17	0.04	0.04	0.04
1934	2.00	35.00	32.66	24.88	43	0.20	0.22	0.22	0.04	0.04	0.05
1935	3.00	38.00	33.81	25.76	42	0.24	0.27	0.27	0.05	0.05	0.05
1936	2.00	40.00	34.90	26.59	42	0.30	0.32	0.32	0.05	0.05	0.05
1937	0.00	40.00	35.94	27.39	41	0.35	0.37	0.38	0.06	0.06	0.06
1938	0.00	40.00	36.92	28.13	41	0.41	0.43	0.45	0.06	0.06	0.07
1939	0.00	40.00	37.85	28.84	40	0.48	0.50	0.51	0.06	0.07	0.07
1940	2.00	42.00	38.71	29.50	40	0.55	0.57	0.57	0.07	0.07	0.05
1941	0.00	42.00	39.52	30.11	40	0.62	0.64	0.61	0.08	0.07	0.04
1942	0.00	42.00	40.14	30.59	40	0.70	0.72	0.66	0.08	0.08	0.05
1943	0.00	42.00	40.67	30.98	39	0.79	0.81	0.73	0.08	0.08	0.06
1944	0.00	42.00	41.10	31.31	39	0.87	0.90	0.81	0.09	0.09	0.08
1945	0.00	42.00	41.43	31.56	38	0.97	0.99	0.91	0.09	0.10	0.10
1946	0.00	42.00	41.62	31.71	37	1.07	1.10	1.03	0.10	0.11	0.13
1947	0.00	42.00	41.71	31.78	37	1.17	1.21	1.18	0.12	0.11	0.14
1948	0.00	42.00	43.10	32.83	37	1.28	1.33	1.36	0.12	0.12	0.18
1949	0.00	42.00	44.52	33.92	37	1.40	1.46	1.56	0.13	0.13	0.20
1950	0.00	42.00	46.00	35.05	37	1.51	1.59	1.75	0.13	0.14	0.23
1951	0.00	42.00	47.93	36.52	38	1.70	1.74	1.88	0.14	0.15	0.15
1952	0.00	42.00	49.93	38.04	38	1.89	1.89	1.94	0.16	0.16	0.01
1953	0.00	42.00	52.60	40.07	39	2.04	2.07	1.94	0.17	0.17	0.00
1954	0.00	42.00	56.69	43.19	41	2.18	2.25	1.96	0.18	0.19	0.00
1955	0.00	42.00	61.12	46.57	42	2.32	2.45	2.04	0.20	0.20	0.06
1956	0.00	42.00	65.88	50.20	44	2.56	2.66	2.20	0.21	0.23	0.17
1957	0.00	42.00	70.79	53.93	45	2.79	2.92	2.44	0.25	0.26	0.26
1958	27.00	69.00	75.88	57.81	47	3.05	3.21	2.74	0.29	0.30	0.29
1959	1.00	70.00	81.02	61.73	49	3.31	3.55	3.08	0.34	0.35	0.34
1960	1.00	71.00	86.21	65.69	51	3.59	3.95	3.47	0.40	0.40	0.39
1961	11.50	82.50	91.40	69.64	52	3.87	4.40	3.90	0.45	0.45	0.44
1962	1.50	84.00	96.60	73.60	54	4.47	4.91	4.39	0.51	0.51	0.49
1963	14.00	98.00	101.88	77.62	56	5.12	5.47	4.94	0.56	0.59	0.54
1964	30.00	128.00	107.26	81.72	58	5.80	6.09	5.57	0.62	0.67	0.62
1965	7.00	135.00	112.74	85.90	60	6.54	6.88	6.27	0.79	0.77	0.70
1966	7.00	142.00	118.24	90.09	62	7.31	7.74	7.07	0.86	0.88	0.78
1967	3.00	145.00	123.86	94.37	64	8.13	8.78	7.99	1.04	1.00	0.95
1968	4.00	149.00	129.48	98.65	66	9.00	9.88	9.07	1.09	1.12	1.04
1969	1.00	150.00	133.81	101.95	68	9.90	11.12	10.29	1.24	1.25	1.23
1970	1.00	151.00	138.10	105.22	69	11.97	12.49	11.72	1.38	1.36	1.40
1971	0.00	151.00	142.38	108.48	71	13.04	13.99	13.35	1.50	1.48	1.66
1972	0.00	151.00	146.12	111.33	72	15.31	15.59	15.23	1.60	1.58	1.83
1973	2.00	153.00	149.79	114.12	73	16.51	17.26	17.28	1.68	1.66	2.14
1974	2.00	155.00	152.79	116.41	75	18.77	19.00	19.00	1.74	1.69	2.20
1975	2.00	157.00	154.36	117.61	75	20.93	20.78	21.48	1.78	1.69	1.95
1976	0.50	157.50	155.60	118.55	76	23.00	22.43	23.53	1.65	1.64	2.15
1977	2.50	160.00	156.50	119.24	76	24.88	24.03	25.58	1.60	1.57	2.07
1978	0.00	160.00	157.26	119.82	76	26.59	25.48	27.29	1.45	1.47	1.91
1979	0.00	160.00	157.83	120.25	76	28.13	26.87	28.51	1.39	1.38	1.16
1980	0.00	160.00	158.36	120.65	77	29.50	28.15	29.27	1.28	1.28	0.61

(continued)

Table 10.2 Iran, gigabarrels (continued)

Year	D	CD	2 Iyr SCD	Adj SCD	Predlag	Raw pred CP	1 Iyr smth pred SCP	SCP	Raw pred P	5yr smth pred SP	Actual P
1981	1.00	161.00	159.64	121.63	77	30.11	29.33	29.91	1.18	1.19	0.50
1982	0.00	161.00	160.98	122.65	77	30.59	30.43	30.64	1.10	1.09	0.81
1983	0.00	161.00	162.31	123.66	78	31.31	31.42	31.47	0.99	1.01	0.89
1984	0.00	161.00	163.60	124.64	78	31.78	32.32	32.31	0.90	0.95	0.79
1985	0.00	161.00	164.79	125.55	79	32.83	33.22	33.10	0.90	0.91	0.82
1986	0.00	161.00	165.88	126.39	79	33.92	34.09	33.90	0.87	0.91	0.74
1987	0.00	161.00	166.95	127.20	80	35.05	35.00	34.70	0.91	0.92	0.84
1988	0.00	161.00	167.90	127.93	80	35.78	35.95	35.59	0.96	0.95	0.82
1989	0.00	161.00	169.14	128.87	80	36.52	36.94	36.58	0.99	1.00	1.03
1990	0.00	161.00	170.38	129.81	81	38.04	37.98	37.70	1.04	1.04	1.13
1991	1.00	178.00	171.67	130.79	81	39.06	39.07	38.90	1.10	1.08	1.21
1992	1.00	179.00	173.00	131.81	82	40.07	40.22	40.15	1.15	1.13	1.25
1993	0.00	179.00	174.38	132.86	82	41.11	41.38	41.44	1.16	1.17	1.29
1994	1.00	180.00	175.76	133.91	83	42.15	42.58	42.75	1.20	1.21	1.32
1995	0.00	180.00	177.14	134.97	83	43.19	43.82	44.08	1.24	1.25	1.33
1996	0.00	180.00	178.56	136.04	84	44.88	45.10	45.42	1.27	1.29	1.35
1997	0.00	180.00	180.00	137.15	84	46.57	46.45	46.76	1.35	1.33	1.34
1998	0.00	180.00	181.48	138.27	85	47.78	47.83	48.08	1.38	1.37	1.33
1999	6.00	186.00	182.99	139.42	85	48.99	49.23	49.40	1.40	1.40	1.30
2000	0.00	186.00	184.53	140.60	86	50.20	50.65	50.74	1.42	1.41	1.35
2001	1.00	187.00	186.10	141.79	87	52.06	52.10	52.06	1.45	1.41	1.36
2002	2.00	189.00	186.89	142.40	87	53.93	53.51	53.39	1.41	1.41	1.26
2003	1.00	190.00	187.67	142.98	87	55.23	54.89	54.75	1.38	1.41	1.37
2004	0.00	190.00	188.47	143.60	87	56.52	56.28	56.19	1.39	1.40	1.46
2005	0.00	190.00	189.25	144.19	88	57.81	57.68	57.67	1.40	1.40	1.51
2006	0.69	190.69	190.06	144.81	88	59.12	59.09	59.16	1.41	1.41	1.47
2007	0.68	191.37	190.90	145.45	88	60.43	60.50		1.42	1.42	
2008	0.67	192.04	191.76	146.11	89	61.73	61.93		1.43	1.42	
2009	0.66	192.70	192.65	146.78	89	63.05	63.36		1.43	1.43	
2010	0.65	193.35	193.28	147.26	89	64.37	64.79		1.43	1.43	
2011	0.64	193.99	193.94	147.76	89	65.69	66.23		1.43	1.44	
2012	0.63	194.62	194.57	148.24	90	67.66	67.67		1.44	1.44	
2013	0.62	195.24	195.13	148.67	90	69.64	69.11		1.44	1.44	
2014	0.61	195.84	195.67	149.08	90	70.96	70.55		1.44	1.45	
2015	0.59	196.44	196.23	149.51	90	72.28	72.00		1.45	1.45	
2016	0.58	197.02	196.81	149.95	90	73.60	73.46		1.45	1.44	
2017	0.57	197.59	197.38	150.38	91	74.94	74.91		1.46	1.42	
2018	0.56	198.15	197.93	150.81	91	76.28	76.32		1.40	1.40	
2019	0.55	198.70	198.48	151.22	91	77.62	77.67		1.35	1.39	
2020	0.54	199.23	199.01	151.63	91	78.99	79.03		1.36	1.37	
2021	0.52	199.76	199.53	152.03	91	80.36	80.39		1.36	1.36	
2022	0.51	200.27	200.04	152.41	92	81.72	81.76		1.37	1.37	
2023	0.50	200.77	200.54	152.79	92	83.11	83.14		1.38	1.38	
2024	0.49	201.25	201.03	153.16	92	84.50	84.53		1.38	1.38	
2025	0.47	201.73	201.50	153.52	92	85.90	85.92		1.39	1.39	
2026	0.46	202.19	201.96	153.88	92	87.29	87.32		1.40	1.40	
2027	0.45	202.64	202.41	154.22	92	88.69	88.72		1.40	1.40	
2028	0.44	203.08	202.84	154.55	93	90.09	90.13		1.41	1.40	
2029	0.42	203.50	203.27	154.87	93	91.51	91.54		1.41	1.39	
2030	0.41	203.91	203.68	155.18	93	92.94	92.93		1.39	1.38	
2031	0.40	204.31	204.07	155.49	93	94.37	94.29		1.36	1.37	
2032	0.39	204.70	204.46	155.78	93	95.79	95.62		1.33	1.36	
2033	0.37	205.07	204.83	156.06	93	97.22	96.97		1.35	1.35	
2034	0.36	205.43	205.19	156.33	93	98.65	98.35		1.38	1.34	
2035	0.35	205.78	205.53	156.60	94	99.75	99.69		1.34	1.33	
2036	0.33	206.11	205.86	156.85	94	100.85	101.01		1.31	1.32	
2037	0.32	206.43	206.18	157.09	94	101.95	102.29		1.28	1.30	
2038	0.31	206.74	206.49	157.32	94	103.58	103.57		1.28	1.29	
2039	0.29	207.03	206.78	157.55	94	105.22	104.86		1.28	1.29	
2040	0.28	207.31	207.06	157.76	94	106.30	106.13		1.28	1.29	
2041	0.27	207.57	207.32	157.96	94	107.39	107.44		1.31	1.28	
2042	0.25	207.82	207.57	158.15	94	108.48	108.72		1.28	1.25	
2043	0.24	208.06	207.81	158.33	94	109.90	109.96		1.25	1.22	
2044	0.22	208.29	208.03	158.50	94	111.33	111.13		1.17	1.18	
2045	0.21	208.50	208.24	158.66	94	112.73	112.25		1.13	1.12	
2046	0.20	208.69	208.44	158.81	95	114.12	113.33		1.07	1.07	
2047	0.18	208.88	208.62	158.95	95	114.88	114.34		1.01	1.02	
2048	0.17	209.05	208.79	159.08	95	115.65	115.32		0.98	0.96	
2049	0.16	209.20	208.94	159.20	95	116.41	116.22		0.90	0.88	
2050	0.14	209.34	209.09	159.30	95	117.61	117.03		0.81	0.80	
2051	0.13	209.47	209.21	159.40	95	118.08	117.73		0.70	0.72	
2052	0.11	209.58	209.33	159.49	95	118.55	118.33		0.59	0.67	
2053	0.10	209.68	209.43	159.57	95	119.24	118.94		0.61	0.63	
2054	0.08	209.77	209.52	159.64	95	119.82	119.58		0.64	0.60	
2055	0.07	209.84	209.61	159.70	95	120.25	120.19		0.61	0.60	
2056	0.06	209.89	209.68	159.75	95	120.45	120.74		0.55	0.60	
2057	0.04	209.94	209.74	159.80	95	120.65	121.34		0.60	0.59	
2058	0.03	209.96	209.79	159.84	95	121.63	121.93		0.60	0.58	
2059	0.01	209.98	209.84	159.88	95	122.65	122.51		0.57	0.59	
2060	0.00	209.98	209.88	159.91	95	123.16	123.10		0.60	0.59	
2061	0.02	210.00	209.91	159.93	95	123.66	123.70		0.59	0.61	

(continued)

Table 10.2 Iran, gigabarrels (continued)

Year	D	CD	21yr SCD	Adj SCD	Predlag	Raw pred CP	11yr smth pred SCP	SCP	Raw pred P	5yr smth pred SP	Actual P
2062	0.00	210.00	209.93	159.95	95	124.64	124.31		0.61	0.62	
2063	0.00	210.00	209.95	159.96	95	125.10	124.97		0.66	0.63	
2064	0.00	210.00	209.97	159.98	95	125.55	125.63		0.66	0.63	
2065	0.00	210.00	209.98	159.98	95	126.39	126.24		0.61	0.64	
2066	0.00	210.00	209.99	159.99	95	126.79	126.84		0.61	0.63	
2067	0.00	210.00	209.99	159.99	95	127.20	127.49		0.65	0.62	
2068	0.00	210.00	210.00	160.00	95	127.93	128.10		0.61	0.63	
2069	0.00	210.00	210.00	160.00	95	128.87	128.71		0.61	0.63	
2070	0.00	210.00	210.00	160.00	95	129.34	129.37		0.66	0.63	
2071	0.00	210.00	210.00	160.00	95	129.81	130.01		0.64	0.65	
2072	0.00	210.00	210.00	160.00	95	130.79	130.66		0.65	0.67	
2073	0.00	210.00	210.00	160.00	95	131.30	131.36		0.71	0.67	
2074	0.00	210.00	210.00	160.00	95	131.81	132.05		0.69	0.68	
2075	0.00	210.00	210.00	160.00	95	132.86	132.70		0.65	0.69	
2076	0.00	210.00	210.00	160.00	95	133.39	133.41		0.71	0.69	
2077	0.00	210.00	210.00	160.00	95	133.91	134.13		0.72	0.70	
2078	0.00	210.00	210.00	160.00	95	134.97	134.81		0.68	0.72	
2079	0.00	210.00	210.00	160.00	95	135.50	135.55		0.74	0.72	
2080	0.00	210.00	210.00	160.00	95	136.04	136.29		0.75	0.72	
2081	0.00	210.00	210.00	160.00	95	137.15	137.00		0.70	0.72	
2082	0.00	210.00	210.00	160.00	95	137.71	137.71		0.71	0.71	
2083	0.00	210.00	210.00	160.00	95	138.27	138.42		0.72	0.70	
2084	0.00	210.00	210.00	160.00	95	139.42	139.10		0.68	0.69	
2085	0.00	210.00	210.00	160.00	95	140.01	139.78		0.68	0.67	
2086	0.00	210.00	210.00	160.00	95	140.60	140.46		0.69	0.65	
2087	0.00	210.00	210.00	160.00	95	141.19	141.08		0.61	0.63	
2088	0.00	210.00	210.00	160.00	95	141.79	141.67		0.59	0.61	
2089	0.00	210.00	210.00	160.00	95	142.40	142.26		0.59	0.57	
2090	0.00	210.00	210.00	160.00	95	142.98	142.81		0.55	0.55	
2091	0.00	210.00	210.00	160.00	95	143.60	143.33		0.52	0.54	
2092	0.00	210.00	210.00	160.00	95	143.89	143.84		0.50	0.52	
2093	0.00	210.00	210.00	160.00	95	144.19	144.34		0.51	0.50	
2094	0.00	210.00	210.00	160.00	95	144.81	144.84		0.50	0.49	
2095	0.00	210.00	210.00	160.00	95	145.45	145.33		0.49	0.47	
2096	0.00	210.00	210.00	160.00	95	145.78	145.79		0.46	0.46	
2097	0.00	210.00	210.00	160.00	95	146.11	146.21		0.42	0.45	
2098	0.00	210.00	210.00	160.00	95	146.78	146.64		0.43	0.44	
2099	0.00	210.00	210.00	160.00	95	147.26	147.09		0.44	0.43	
2100	0.00	210.00	210.00	160.00	95	147.76	147.51		0.43	0.42	

Notes: D—discovery; CD—cumulative discovery; SCD—smoothed cumulative discovery (years = number of years centred moving average); adj—adjusted (to match cumulative production maximum); predlag—predicted lag between cumulative discovery and cumulative production; raw Pred CP—prediction using direct lag of cumulative discovery by predicted lag years; Pred SCP—raw predicted CP smoothed (with years = number of years centred moving average); SCP—smoothed actual cumulative production (years = number of years centred moving average); raw Pred P—one year change in predicted smoothed cumulative production; Pred SP—smoothed raw Pred P (years = number of years centred moving average); Actual P—actual annual oil production. Shaded numbers are interpolations, extrapolations or forecasts.

Table 10.3 Iraq, gigabarrels

Year	D	CD	5 Yr SCD	Adj SCD	Predlag	Raw pred CP	5yr smth pred SCP	SCP	Raw pred P	5yr smth pred SP	Actual P
1900	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1901	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1902	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1903	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1904	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1905	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1906	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1907	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1908	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1909	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1910	0.00	0.00	0.01	0.01	21	0.00	0.00	0.00	0.00	0.00	0.00
1911	0.00	0.00	0.02	0.02	21	0.00	0.00	0.00	0.00	0.00	0.00
1912	0.00	0.00	0.03	0.04	21	0.00	0.00	0.00	0.00	0.00	0.00
1913	0.00	0.00	0.04	0.05	21	0.00	0.00	0.00	0.00	0.00	0.00
1914	0.00	0.00	0.07	0.09	22	0.00	0.00	0.00	0.00	0.00	0.00
1915	0.00	0.00	0.10	0.12	22	0.00	0.00	0.00	0.00	0.00	0.00
1916	0.00	0.00	0.13	0.16	23	0.00	0.00	0.00	0.00	0.00	0.00
1917	0.00	0.00	0.15	0.19	23	0.00	0.00	0.00	0.00	0.00	0.00
1918	0.00	0.00	0.18	0.23	24	0.00	0.00	0.00	0.00	0.00	0.00
1919	0.00	0.00	0.21	0.26	24	0.00	0.00	0.00	0.00	0.00	0.00
1920	0.00	0.00	0.24	0.29	25	0.00	0.00	0.00	0.00	0.00	0.00
1921	0.00	0.00	0.26	0.33	25	0.00	0.00	0.00	0.00	0.00	0.00
1922	0.00	0.00	0.29	0.36	26	0.00	0.00	0.00	0.00	0.00	0.00
1923	0.00	0.00	0.32	0.40	26	0.00	0.00	0.00	0.00	0.00	0.00
1924	0.00	0.00	0.53	0.66	27	0.00	0.00	0.00	0.00	0.00	0.00
1925	0.00	0.00	0.76	0.95	28	0.00	0.00	0.00	0.00	0.00	0.00
1926	0.00	0.00	0.99	1.24	30	0.00	0.00	0.00	0.00	0.00	0.00
1927	0.00	0.00	1.22	1.53	31	0.00	0.00	0.00	0.00	0.00	0.00
1928	0.00	0.00	1.88	2.35	32	0.00	0.00	0.00	0.00	0.00	0.00
1929	0.00	0.00	2.58	3.23	33	0.00	0.00	0.00	0.00	0.00	0.00
1930	0.00	0.00	3.29	4.11	34	0.00	0.01	0.00	0.01	0.01	0.01
1931	0.00	0.00	4.00	5.00	35	0.01	0.01	0.01	0.01	0.01	0.01
1932	0.00	0.00	4.72	5.90	36	0.02	0.03	0.02	0.01	0.01	0.02
1933	0.00	0.00	5.46	6.82	37	0.04	0.04	0.04	0.01	0.01	0.02
1934	0.20	0.20	6.21	7.77	37	0.05	0.05	0.05	0.02	0.02	0.02
1935	0.10	0.30	6.97	8.72	38	0.07	0.07	0.07	0.02	0.02	0.02
1936	0.20	0.50	7.77	9.71	38	0.09	0.10	0.09	0.02	0.02	0.02
1937	0.00	0.50	8.56	10.70	39	0.12	0.12	0.11	0.02	0.02	0.03
1938	0.20	0.70	9.35	11.69	39	0.14	0.14	0.13	0.02	0.02	0.03
1939	0.70	1.40	10.14	12.68	39	0.16	0.16	0.16	0.02	0.02	0.03
1940	0.00	1.40	10.94	13.67	39	0.19	0.18	0.19	0.02	0.02	0.02
1941	0.00	1.40	11.73	14.66	39	0.21	0.21	0.21	0.02	0.02	0.01
1942	0.00	1.40	12.52	15.65	39	0.23	0.23	0.22	0.02	0.02	0.02
1943	0.00	1.40	13.31	16.64	40	0.26	0.25	0.24	0.02	0.02	0.02
1944	0.00	1.40	14.15	17.68	42	0.28	0.28	0.26	0.02	0.02	0.03
1945	0.00	1.40	14.98	18.72	42	0.29	0.30	0.29	0.02	0.02	0.04
1946	0.00	1.40	15.83	19.78	43	0.33	0.32	0.32	0.02	0.03	0.04
1947	0.00	1.40	16.68	20.85	43	0.35	0.35	0.36	0.02	0.04	0.04
1948	0.00	1.40	17.64	22.05	44	0.36	0.39	0.39	0.05	0.05	0.03
1949	9.30	10.70	18.62	23.28	48	0.40	0.46	0.42	0.07	0.07	0.04
1950	1.10	11.80	19.61	24.51	49	0.53	0.55	0.46	0.09	0.09	0.05
1951	0.00	11.80	21.01	26.26	50	0.66	0.67	0.51	0.12	0.11	0.06
1952	0.00	11.80	22.63	28.29	52	0.80	0.80	0.59	0.13	0.12	0.13
1953	21.80	33.60	24.27	30.34	54	0.95	0.92	0.74	0.12	0.12	0.24
1954	2.30	35.90	25.93	32.42	55	1.04	1.04	0.93	0.12	0.12	0.23
1955	0.10	36.00	27.61	34.51	57	1.14	1.15	1.17	0.12	0.13	0.25
1956	0.10	36.10	29.29	36.61	59	1.24	1.27	1.41	0.12	0.15	0.23
1957	0.70	36.80	30.97	38.71	61	1.38	1.45	1.63	0.18	0.19	0.18
1958	0.90	37.70	32.66	40.82	62	1.53	1.69	1.86	0.24	0.24	0.27
1959	0.80	38.50	34.35	42.93	64	1.94	2.00	2.11	0.31	0.31	0.31
1960	0.30	38.80	36.04	45.05	66	2.35	2.37	2.42	0.37	0.36	0.35
1961	1.60	40.40	37.73	47.16	67	2.79	2.80	2.76	0.43	0.40	0.37
1962	0.00	40.40	39.41	49.26	68	3.23	3.23	3.13	0.43	0.42	0.37
1963	0.00	40.40	41.10	51.37	69	3.67	3.67	3.51	0.44	0.44	0.42
1964	0.00	40.40	42.78	53.47	70	4.11	4.11	3.93	0.44	0.44	0.46
1965	0.00	40.40	44.45	55.56	71	4.56	4.56	4.39	0.44	0.44	0.48
1966	0.00	40.40	46.12	57.64	72	5.00	5.00	4.87	0.45	0.45	0.51
1967	0.00	40.40	47.78	59.73	73	5.45	5.45	5.35	0.45	0.47	0.45
1968	0.00	40.40	49.45	61.82	74	5.90	5.91	5.85	0.45	0.49	0.55
1969	2.10	42.50	51.13	63.91	75	6.36	6.46	6.37	0.55	0.52	0.55
1970	0.00	42.50	52.80	66.00	76	6.82	7.02	6.92	0.56	0.56	0.57
1971	0.80	43.30	54.47	68.08	77	7.77	7.58	7.50	0.56	0.60	0.62
1972	0.00	43.30	56.14	70.17	78	8.24	8.25	8.08	0.67	0.61	0.54
1973	5.80	49.10	57.81	72.26	79	8.72	8.93	8.71	0.68	0.64	0.74
1974	1.00	50.10	59.49	74.36	80	9.71	9.51	9.37	0.59	0.68	0.72
1975	0.10	50.20	60.98	76.23	81	10.20	10.20	10.13	0.69	0.71	0.83
1976	21.50	71.70	62.45	78.07	82	10.70	11.00	10.94	0.79	0.75	0.88
1977	10.80	82.50	63.93	79.91	83	11.69	11.79	11.79	0.79	0.83	0.86
1978	1.20	83.70	65.40	81.75	83	12.68	12.68	12.69	0.89	0.87	0.94
1979	1.10	84.80	66.45	83.06	84	13.67	13.67	13.71	0.99	0.87	1.27
1980	0.60	85.40	67.45	84.31	85	14.66	14.56	14.75	0.89	0.85	0.92

(continued)

Table 10.3 Iraq, gigabarrels (continued)

Year	D	CD	5 Yr SCD	Adj SCD	Predlag	Raw pred CP	Syr smth pred SCP	SCP	Raw pred P	Syr smth pred SP	Actual P
1981	0.20	85.60	68.45	85.56	85	15.65	15.35	15.60	0.79	0.77	0.37
1982	0.10	85.70	69.45	86.81	86	16.14	16.02	16.15	0.66	0.66	0.37
1983	0.50	86.20	70.44	88.05	86	16.64	16.55	16.51	0.53	0.58	0.37
1984	0.00	86.20	71.41	89.26	87	16.99	16.96	16.91	0.41	0.53	0.44
1985	0.20	86.40	72.36	90.45	88	17.33	17.47	17.35	0.52	0.51	0.52
1986	0.00	86.40	73.31	91.64	88	17.68	18.00	17.88	0.52	0.54	0.62
1987	0.00	86.40	74.23	92.78	89	18.72	18.56	18.51	0.56	0.61	0.76
1988	0.10	86.50	75.15	93.93	89	19.25	19.26	19.30	0.70	0.64	0.98
1989	0.00	86.50	76.07	95.08	90	19.78	20.01	20.23	0.75	0.66	1.06
1990	0.00	86.50	76.99	96.23	90	20.85	20.68	21.16	0.67	0.66	0.74
1991	0.00	86.50	77.91	97.38	91	21.45	21.28	21.79	0.61	0.59	0.11
1992	0.00	86.50	78.83	98.53	91	22.05	21.84	22.13	0.55	0.51	0.16
1993	0.10	86.60	79.75	99.68	92	22.29	22.22	22.28	0.39	0.42	0.19
1994	0.00	86.60	80.67	100.84	92	22.54	22.54	22.46	0.32	0.36	0.20
1995	0.00	86.60	81.55	101.94	93	22.79	22.79	22.66	0.25	0.33	0.20
1996	0.00	86.60	82.43	103.04	93	23.03	23.11	22.87	0.32	0.36	0.21
1997	0.10	86.70	83.30	104.12	94	23.28	23.50	23.15	0.39	0.43	0.42
1998	0.00	86.70	84.16	105.20	94	23.89	24.02	23.62	0.52	0.52	0.78
1999	0.20	86.90	84.92	106.14	95	24.51	24.67	24.33	0.65	0.61	0.92
2000	0.00	86.90	85.65	107.06	95	25.39	25.40	25.20	0.73	0.68	0.94
2001	0.00	86.90	86.38	107.98	96	26.26	26.14	26.11	0.74	0.72	0.87
2002	0.00	86.90	86.69	108.37	96	26.94	26.90	26.96	0.76	0.73	0.74
2003	0.00	86.90	86.79	108.49	96	27.61	27.61	27.66	0.72	0.71	0.48
2004	0.10	87.00	86.87	108.59	96	28.29	28.29	28.31	0.68	0.72	0.73
2005	0.03	87.03	86.92	108.66	96	28.97	28.97	28.94	0.68	0.73	0.69
2006	0.03	87.06	86.97	108.71	96	29.65	29.73	29.64	0.75	0.75	0.73
2007	0.03	87.09	87.01	108.76	96	30.34	30.55		0.83	0.78	
2008	0.03	87.12	87.05	108.81	96	31.38	31.38		0.83	0.81	
2009	0.03	87.14	87.08	108.85	96	32.42	32.21		0.83	0.82	
2010	0.03	87.17	87.11	108.88	96	33.11	33.05		0.83	0.79	
2011	0.03	87.20	87.13	108.92	96	33.81	33.81		0.77	0.77	
2012	0.03	87.22	87.16	108.95	96	34.51	34.51		0.70	0.74	
2013	0.03	87.25	87.19	108.98	96	35.21	35.21		0.70	0.71	
2014	0.03	87.28	87.21	109.01	96	35.91	35.91		0.70	0.70	
2015	0.03	87.30	87.24	109.04	96	36.61	36.61		0.70	0.71	
2016	0.02	87.33	87.26	109.08	96	37.31	37.31		0.70	0.74	
2017	0.02	87.35	87.29	109.11	96	38.01	38.08		0.77	0.77	
2018	0.02	87.37	87.31	109.14	96	38.71	38.92		0.84	0.80	
2019	0.02	87.40	87.34	109.17	96	39.76	39.77		0.84	0.83	
2020	0.02	87.42	87.36	109.20	96	40.82	40.61		0.84	0.83	
2021	0.02	87.44	87.39	109.23	96	41.53	41.45		0.85	0.80	
2022	0.02	87.46	87.41	109.26	96	42.23	42.23		0.77	0.77	
2023	0.02	87.49	87.43	109.29	96	42.93	42.93		0.70	0.76	
2024	0.02	87.51	87.46	109.32	96	43.64	43.64		0.70	0.76	
2025	0.02	87.53	87.48	109.34	96	44.34	44.41		0.77	0.79	
2026	0.02	87.55	87.50	109.37	96	45.05	45.26		0.84	0.84	
2027	0.02	87.57	87.52	109.39	96	46.10	46.17		0.91	0.91	
2028	0.02	87.59	87.54	109.42	96	47.16	47.16		0.98	0.97	
2029	0.02	87.60	87.56	109.44	96	48.21	48.21		1.05	1.01	
2030	0.02	87.62	87.57	109.47	96	49.26	49.26		1.05	1.04	
2031	0.02	87.64	87.59	109.49	96	50.32	50.32		1.05	1.05	
2032	0.02	87.66	87.61	109.51	96	51.37	51.37		1.05	1.05	
2033	0.02	87.68	87.63	109.53	96	52.42	52.42		1.05	1.05	
2034	0.02	87.69	87.64	109.55	96	53.47	53.47		1.05	1.05	
2035	0.02	87.71	87.66	109.57	96	54.52	54.51		1.05	1.05	
2036	0.02	87.72	87.67	109.59	96	55.56	55.56		1.04	1.05	
2037	0.02	87.74	87.69	109.61	96	56.60	56.60		1.04	1.04	
2038	0.01	87.75	87.70	109.63	96	57.64	57.64		1.04	1.04	
2039	0.01	87.77	87.72	109.65	96	58.69	58.69		1.04	1.04	
2040	0.01	87.78	87.73	109.66	96	59.73	59.73		1.04	1.04	
2041	0.01	87.79	87.74	109.68	96	60.77	60.77		1.04	1.04	
2042	0.01	87.81	87.76	109.70	96	61.82	61.82		1.04	1.04	
2043	0.01	87.82	87.77	109.71	96	62.86	62.86		1.04	1.04	
2044	0.01	87.83	87.78	109.73	96	63.91	63.91		1.04	1.04	
2045	0.01	87.84	87.79	109.74	96	64.95	64.95		1.04	1.04	
2046	0.01	87.85	87.81	109.76	96	66.00	66.00		1.04	1.04	
2047	0.01	87.86	87.82	109.77	96	67.04	67.04		1.04	1.04	
2048	0.01	87.87	87.83	109.78	96	68.08	68.08		1.04	1.04	
2049	0.01	87.88	87.84	109.80	96	69.13	69.13		1.04	1.04	
2050	0.01	87.89	87.85	109.81	96	70.17	70.17		1.05	1.05	
2051	0.01	87.90	87.86	109.82	96	71.22	71.22		1.05	1.04	
2052	0.01	87.91	87.86	109.83	96	72.26	72.27		1.05	1.03	
2053	0.01	87.92	87.87	109.84	96	73.31	73.29		1.02	1.02	
2054	0.01	87.93	87.88	109.85	96	74.36	74.29		1.00	1.00	
2055	0.01	87.93	87.89	109.86	96	75.29	75.27		0.98	0.98	
2056	0.01	87.94	87.90	109.87	96	76.23	76.22		0.95	0.96	
2057	0.01	87.95	87.90	109.88	96	77.15	77.15		0.93	0.98	
2058	0.01	87.95	87.91	109.89	96	78.07	78.07		0.92	0.99	
2059	0.01	87.96	87.92	109.90	97	78.99	79.17		1.10	1.00	
2060	0.01	87.96	87.92	109.90	97	79.91	80.22		1.05	1.00	
2061	0.00	87.96	87.93	109.91	97	81.75	81.22		1.00	0.99	

(continued)

Table 10.3 Iraq, gigabarrels (continued)

Year	D	CD	5 Iyr SCD	Adj SCD	Predlag	Raw pred CP	5yr smth pred SCP	SCP	Raw pred P	5yr smth pred SP	Actual P
2062	0.00	87.97	87.93	109.92	97	82.40	82.16		0.94	0.93	
2063	0.00	87.97	87.94	109.92	97	83.06	83.04		0.88	0.87	
2064	0.00	87.97	87.94	109.93	97	83.69	83.80		0.76	0.82	
2065	0.00	87.98	87.95	109.94	97	84.31	84.56		0.76	0.80	
2066	0.00	87.98	87.95	109.94	97	85.56	85.31		0.75	0.80	
2067	0.00	87.98	87.96	109.95	97	86.19	86.18		0.87	0.80	
2068	0.00	87.98	87.96	109.95	97	86.81	87.05		0.87	0.79	
2069	0.00	87.98	87.96	109.95	97	88.05	87.79		0.74	0.79	
2070	0.02	88.00	87.97	109.96	97	88.65	88.52		0.73	0.76	
2071	0.00	88.00	87.97	109.96	97	89.26	89.25		0.73	0.73	
2072	0.00	88.00	87.97	109.97	97	89.85	89.97		0.72	0.72	
2073	0.00	88.00	87.98	109.97	97	90.45	90.68		0.71	0.74	
2074	0.00	88.00	87.98	109.97	97	91.64	91.39		0.71	0.75	
2075	0.00	88.00	87.98	109.98	97	92.21	92.20		0.82	0.75	
2076	0.00	88.00	87.98	109.98	97	92.78	93.01		0.81	0.77	
2077	0.00	88.00	87.98	109.98	97	93.93	93.70		0.69	0.78	
2078	0.00	88.00	87.99	109.98	97	94.51	94.51		0.80	0.76	
2079	0.00	88.00	87.99	109.98	97	95.08	95.31		0.80	0.76	
2080	0.00	88.00	87.99	109.99	97	96.23	96.00		0.69	0.78	
2081	0.00	88.00	87.99	109.99	97	96.81	96.81		0.80	0.76	
2082	0.00	88.00	87.99	109.99	97	97.38	97.61		0.81	0.76	
2083	0.00	88.00	87.99	109.99	97	98.53	98.30		0.69	0.78	
2084	0.00	88.00	87.99	109.99	97	99.11	99.11		0.81	0.76	
2085	0.00	88.00	87.99	109.99	97	99.68	99.91		0.80	0.75	
2086	0.00	88.00	88.00	109.99	97	100.84	100.59		0.68	0.77	
2087	0.00	88.00	88.00	110.00	97	101.39	101.38		0.79	0.74	
2088	0.00	88.00	88.00	110.00	97	101.94	102.16		0.78	0.73	
2089	0.00	88.00	88.00	110.00	97	103.04	102.81		0.66	0.75	
2090	0.00	88.00	88.00	110.00	97	103.58	103.58		0.76	0.71	
2091	0.00	88.00	88.00	110.00	97	104.12	104.32		0.75	0.70	
2092	0.00	88.00	88.00	110.00	97	105.20	104.94		0.62	0.70	
2093	0.00	88.00	88.00	110.00	97	105.67	105.64		0.70	0.66	
2094	0.00	88.00	88.00	110.00	97	106.14	106.32		0.68	0.62	
2095	0.00	88.00	88.00	110.00	97	107.06	106.88		0.55	0.59	
2096	0.00	88.00	88.00	110.00	97	107.52	107.41		0.54	0.51	
2097	0.00	88.00	88.00	110.00	97	107.98	107.88		0.47	0.42	
2098	0.00	88.00	88.00	110.00	97	108.37	108.19		0.30	0.34	
2099	0.00	88.00	88.00	110.00	97	108.49	108.42		0.23	0.25	
2100	0.00	88.00	88.00	110.00	97	108.59	108.56		0.15	0.16	

Notes: D—discovery; CD—cumulative discovery; SCD—smoothed cumulative discovery (years = number of years centred moving average); adj—adjusted (to match cumulative production maximum); predlag—predicted lag between cumulative discovery and cumulative production; raw Pred CP—prediction using direct lag of cumulative discovery by predicted lag years; Pred SCP—raw predicted CP smoothed (with years = number of years centred moving average); SCP—smoothed actual cumulative production (years = number of years centred moving average); raw Pred P—one year change in predicted smoothed cumulative production; Pred SP—smoothed raw Pred P (years = number of years centred moving average); Actual P—actual annual oil production. Shaded numbers are interpolations, extrapolations or forecasts.

Table 10.4 Kuwait, gigabarrels

Year	D	CD	21yr SCD	Adj SCD	Predlag	Raw pred CP	11yr smth pred SCP	SCP	Raw pred P	7yr smth pred SP	Actual P
1900	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1901	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1902	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1903	0.00	0.00	0.06	0.06	45		0.00	0.00	0.00	0.00	0.00
1904	0.00	0.00	0.19	0.19	45		0.00	0.00	0.00	0.00	0.00
1905	0.00	0.00	0.38	0.38	45		0.00	0.00	0.00	0.00	0.00
1906	0.00	0.00	0.64	0.64	45		0.00	0.00	0.00	0.00	0.00
1907	0.00	0.00	0.96	0.96	46		0.00	0.00	0.00	0.00	0.00
1908	0.00	0.00	1.34	1.34	46		0.00	0.00	0.00	0.00	0.00
1909	0.00	0.00	1.79	1.79	46		0.00	0.00	0.00	0.00	0.00
1910	0.00	0.00	2.30	2.30	46		0.00	0.00	0.00	0.00	0.00
1911	0.00	0.00	2.88	2.88	46		0.00	0.00	0.00	0.00	0.00
1912	0.00	0.00	3.52	3.52	47		0.00	0.00	0.00	0.00	0.00
1913	0.00	0.00	4.22	4.22	47		0.00	0.00	0.00	0.00	0.00
1914	0.00	0.00	4.99	4.99	47		0.00	0.00	0.00	0.00	0.00
1915	0.00	0.00	5.82	5.82	48		0.00	0.00	0.00	0.00	0.00
1916	0.00	0.00	6.72	6.72	48		0.00	0.00	0.00	0.00	0.00
1917	0.00	0.00	7.68	7.68	48		0.00	0.00	0.00	0.00	0.00
1918	0.00	0.00	8.70	8.70	48		0.00	0.00	0.00	0.00	0.00
1919	0.00	0.00	9.79	9.79	49		0.00	0.00	0.00	0.00	0.00
1920	0.00	0.00	10.95	10.95	49		0.00	0.00	0.00	0.00	0.00
1921	0.00	0.00	12.18	12.18	49		0.00	0.00	0.00	0.00	0.00
1922	0.00	0.00	13.49	13.49	49		0.00	0.00	0.00	0.00	0.00
1923	0.00	0.00	14.89	14.89	50		0.00	0.00	0.00	0.00	0.00
1924	0.00	0.00	16.30	16.30	50		0.00	0.00	0.00	0.00	0.00
1925	0.00	0.00	17.73	17.73	51		0.00	0.00	0.00	0.00	0.00
1926	0.00	0.00	19.18	19.18	53		0.00	0.00	0.00	0.00	0.00
1927	0.00	0.00	20.66	20.66	55		0.00	0.00	0.00	0.00	0.00
1928	0.00	0.00	22.16	22.16	57		0.00	0.00	0.00	0.00	0.00
1929	0.00	0.00	23.69	23.69	59		0.00	0.00	0.00	0.00	0.00
1930	0.00	0.00	25.24	25.24	62		0.00	0.00	0.00	0.00	0.00
1931	0.00	0.00	26.82	26.82	63		0.00	0.00	0.00	0.00	0.00
1932	0.00	0.00	28.42	28.42	65		0.00	0.00	0.00	0.00	0.00
1933	0.00	0.00	30.05	30.05	66		0.00	0.00	0.00	0.00	0.00
1934	0.00	0.00	31.70	31.70	68		0.00	0.00	0.00	0.00	0.00
1935	0.00	0.00	33.38	33.38	69		0.00	0.00	0.00	0.00	0.00
1936	0.00	0.00	35.08	35.08	70		0.00	0.00	0.00	0.00	0.00
1937	0.00	0.00	36.81	36.81	71		0.00	0.00	0.00	0.00	0.00
1938	68.50	68.50	38.57	38.57	72		0.00	0.00	0.00	0.00	0.00
1939	0.00	68.50	40.35	40.35	72		0.00	0.00	0.00	0.00	0.00
1940	0.00	68.50	42.16	42.16	73		0.00	0.00	0.00	0.00	0.00
1941	0.00	68.50	43.98	43.98	74		0.00	0.00	0.00	0.00	0.00
1942	0.00	68.50	45.82	45.82	75		0.00	0.00	0.00	0.01	0.00
1943	0.00	68.50	47.66	47.66	76		0.01	0.00	0.01	0.02	0.00
1944	0.00	68.50	49.53	49.53	76		0.03	0.00	0.02	0.03	0.00
1945	0.00	68.50	51.39	51.39	77		0.06	0.00	0.03	0.04	0.00
1946	0.00	68.50	53.27	53.27	78	0.01	0.12	0.01	0.06	0.06	0.00
1947	0.00	68.50	55.15	55.15	79	0.03	0.19	0.03	0.07	0.08	0.02
1948	0.00	68.50	57.03	57.03	80	0.06	0.28	0.08	0.09	0.11	0.05
1949	0.00	68.50	58.91	58.91	81	0.19	0.40	0.17	0.12	0.14	0.09
1950	0.00	68.50	60.80	60.80	81	0.38	0.56	0.31	0.16	0.17	0.13
1951	0.00	68.50	62.68	62.68	82	0.64	0.77	0.51	0.21	0.21	0.20
1952	0.00	68.50	64.57	64.57	83	0.80	1.03	0.76	0.26	0.25	0.26
1953	0.00	68.50	66.46	66.46	84	0.96	1.32	1.06	0.29	0.29	0.30
1954	0.00	68.50	68.29	68.29	85	1.34	1.64	1.41	0.31	0.33	0.34
1955	10.00	78.50	70.05	70.05	86	1.79	2.00	1.78	0.37	0.36	0.40
1956	0.50	79.00	71.75	71.75	86	2.30	2.42	2.17	0.42	0.40	0.37
1957	6.00	85.00	73.39	73.39	87	2.88	2.85	2.59	0.43	0.44	0.40
1958	0.00	85.00	74.97	74.97	88	3.20	3.31	3.06	0.46	0.49	0.50
1959	4.50	89.50	76.48	76.48	88	3.52	3.83	3.60	0.52	0.52	0.51
1960	0.00	89.50	77.94	77.94	89	4.22	4.41	4.16	0.58	0.55	0.59
1961	0.00	89.50	79.33	79.33	90	4.99	5.04	4.79	0.63	0.59	0.60
1962	5.00	94.50	80.66	80.66	90	5.40	5.67	5.45	0.63	0.64	0.68
1963	1.00	95.50	81.92	81.92	90	5.82	6.30	6.16	0.63	0.69	0.70
1964	0.00	95.50	83.12	83.12	90	6.72	7.00	6.92	0.70	0.72	0.77
1965	0.00	95.50	84.26	84.26	90	7.68	7.79	7.70	0.79	0.76	0.79
1966	0.20	95.70	85.34	85.34	90	8.70	8.63	8.51	0.84	0.80	0.80
1967	0.00	95.70	86.35	86.35	90	9.24	9.47	9.35	0.84	0.85	0.82
1968	0.00	95.70	87.30	87.30	90	9.79	10.33	10.23	0.86	0.88	0.90
1969	0.00	95.70	88.19	88.19	90	10.95	11.28	11.18	0.95	0.89	0.93
1970	0.00	95.70	89.02	89.02	90	12.18	12.22	12.17	0.94	0.89	1.01
1971	0.00	95.70	89.77	89.77	90	13.49	13.13	13.20	0.91	0.89	1.05
1972	0.00	95.70	90.45	90.45	90	14.19	14.00	14.23	0.87	0.88	1.01
1973	0.00	95.70	91.05	91.05	90	14.89	14.86	15.24	0.86	0.85	1.04
1974	0.00	95.70	91.57	91.57	90	16.30	15.71	16.15	0.85	0.81	0.98
1975	0.00	95.70	92.08	92.08	90	17.02	16.51	16.94	0.79	0.77	0.71
1976	0.00	95.70	92.57	92.57	90	17.73	17.23	17.61	0.73	0.73	0.67
1977	1.00	96.70	93.03	93.03	90	18.22	17.88	18.27	0.65	0.68	0.63
1978	0.00	96.70	93.48	93.48	90	18.70	18.51	18.98	0.62	0.62	0.70
1979	0.00	96.70	93.90	93.90	90	19.18	19.10	19.64	0.59	0.57	0.79
1980	0.00	96.70	94.30	94.30	90	19.68	19.60	20.18	0.50	0.53	0.50

(continued)

Table 10.4 Kuwait, gigabarrels (continued)

Year	D	CD	2 lyr SCD	Adj SCD	Predlag	Raw pred CP	1 lyr smth pred SCP	SCP	Raw pred P	7yr smth pred SP	Actual P
1981	0.00	96.70	94.67	94.67	90	20.17	20.07	20.54	0.47	0.51	0.32
1982	0.00	96.70	95.02	95.02	90	20.66	20.52	20.84	0.45	0.48	0.26
1983	0.00	96.70	95.34	95.34	90	21.04	20.97	21.15	0.45	0.46	0.33
1984	0.20	96.90	95.65	95.65	90	21.41	21.42	21.48	0.45	0.46	0.34
1985	0.00	96.90	95.92	95.92	90	21.79	21.88	21.83	0.46	0.46	0.30
1986	0.00	96.90	96.17	96.17	90	22.16	22.34	22.21	0.46	0.47	0.43
1987	0.00	96.90	96.40	96.40	90	22.67	22.80	22.64	0.46	0.48	0.41
1988	0.20	97.10	96.61	96.61	90	23.18	23.28	23.11	0.49	0.50	0.45
1989	0.00	97.10	96.79	96.79	90	23.69	23.81	23.64	0.53	0.51	0.55
1990	0.50	97.60	96.95	96.95	90	24.21	24.35	24.20	0.54	0.53	0.41
1991	0.00	97.60	97.08	97.08	90	24.72	24.91	24.79	0.55	0.56	0.07
1992	0.00	97.60	97.20	97.20	90	25.24	25.47	25.39	0.57	0.58	0.29
1993	0.00	97.60	97.30	97.30	90	26.03	26.07	26.02	0.60	0.59	0.62
1994	0.00	97.60	97.39	97.39	90	26.82	26.70	26.66	0.62	0.61	0.66
1995	0.00	97.60	97.47	97.47	90	27.35	27.32	27.32	0.63	0.62	0.65
1996	0.00	97.60	97.55	97.55	90	27.89	27.95	27.98	0.63	0.64	0.66
1997	0.00	97.60	97.62	97.62	90	28.42	28.59	28.64	0.63	0.65	0.67
1998	0.00	97.60	97.69	97.69	90	29.23	29.25	29.29	0.66	0.66	0.66
1999	0.00	97.60	97.75	97.75	90	30.05	29.92	29.93	0.67	0.67	0.61
2000	0.00	97.60	97.81	97.81	90	30.60	30.60	30.55	0.67	0.69	0.64
2001	0.00	97.60	97.88	97.88	90	31.15	31.30	31.17	0.70	0.71	0.63
2002	0.00	97.60	97.94	97.94	90	31.70	32.03	31.80	0.73	0.73	0.59
2003	0.00	97.60	98.00	98.00	90	32.54	32.79	32.47	0.76	0.76	0.66
2004	0.50	98.10	98.06	98.06	90	33.38	33.56	33.20	0.77	0.79	0.75
2005	0.07	98.17	98.13	98.13	90	34.23	34.34	33.99	0.77	0.83	0.81
2006	0.07	98.25	98.19	98.19	90	35.08	35.22	34.80	0.89	0.86	0.81
2007	0.07	98.32	98.25	98.25	90	35.95	36.14		0.92	0.89	
2008	0.07	98.39	98.30	98.30	90	36.81	37.09		0.95	0.92	
2009	0.07	98.45	98.36	98.36	90	37.69	38.05		0.96	0.95	
2010	0.07	98.52	98.42	98.42	90	38.57	39.01		0.96	0.96	
2011	0.07	98.59	98.47	98.47	90	40.35	39.98		0.97	0.97	
2012	0.06	98.65	98.52	98.52	90	41.25	40.96		0.98	0.99	
2013	0.06	98.71	98.57	98.57	90	42.16	41.94		0.98	1.01	
2014	0.06	98.77	98.63	98.63	90	43.07	42.93		0.99	1.01	
2015	0.06	98.83	98.68	98.68	90	43.98	44.00		1.08	1.02	
2016	0.06	98.89	98.73	98.73	90	44.90	45.08		1.08	1.02	
2017	0.06	98.95	98.78	98.78	90	45.82	46.09		1.00	1.03	
2018	0.05	99.00	98.83	98.83	90	46.74	47.09		1.01	1.03	
2019	0.05	99.05	98.88	98.88	90	47.66	48.10		1.01	1.02	
2020	0.05	99.11	98.93	98.93	90	49.53	49.12		1.01	1.01	
2021	0.05	99.16	98.97	98.97	90	50.46	50.13		1.02	1.01	
2022	0.05	99.21	99.02	99.02	90	51.39	51.15		1.02	1.02	
2023	0.05	99.25	99.06	99.06	90	52.33	52.17		1.02	1.02	
2024	0.05	99.30	99.11	99.11	90	53.27	53.19		1.02	1.02	
2025	0.04	99.34	99.15	99.15	90	54.21	54.21		1.02	1.02	
2026	0.04	99.39	99.19	99.19	90	55.15	55.24		1.02	1.02	
2027	0.04	99.43	99.23	99.23	90	56.09	56.26		1.03	1.03	
2028	0.04	99.47	99.27	99.27	90	57.03	57.29		1.03	1.03	
2029	0.04	99.51	99.31	99.31	90	57.97	58.32		1.03	1.03	
2030	0.04	99.54	99.35	99.35	90	58.91	59.34		1.03	1.03	
2031	0.04	99.58	99.39	99.39	90	60.80	60.37		1.03	1.03	
2032	0.03	99.62	99.42	99.42	90	61.74	61.40		1.03	1.03	
2033	0.03	99.65	99.46	99.46	90	62.68	62.43		1.03	1.02	
2034	0.03	99.68	99.49	99.49	90	63.63	63.45		1.02	1.02	
2035	0.03	99.71	99.52	99.52	90	64.57	64.47		1.02	1.01	
2036	0.03	99.74	99.55	99.55	90	65.52	65.48		1.01	1.01	
2037	0.03	99.76	99.58	99.58	90	66.46	66.48		1.00	1.00	
2038	0.03	99.79	99.61	99.61	90	67.37	67.46		0.98	0.98	
2039	0.02	99.81	99.64	99.64	90	68.29	68.43		0.97	0.98	
2040	0.02	99.84	99.66	99.66	90	69.17	69.39		0.96	0.98	
2041	0.02	99.86	99.68	99.68	90	70.05	70.34		0.95	0.97	
2042	0.02	99.88	99.71	99.71	90	71.75	71.34		1.00	0.96	
2043	0.02	99.89	99.73	99.73	90	72.57	72.31		0.98	0.96	
2044	0.02	99.91	99.75	99.75	90	73.39	73.27		0.96	0.96	
2045	0.01	99.93	99.77	99.77	90	74.18	74.21		0.94	0.96	
2046	0.01	99.94	99.79	99.79	90	74.97	75.14		0.92	0.95	
2047	0.01	99.95	99.80	99.80	90	76.48	76.10		0.96	0.95	
2048	0.01	99.96	99.82	99.82	90	77.21	77.03		0.92	0.96	
2049	0.01	99.97	99.83	99.83	90	77.94	77.99		0.96	0.97	
2050	0.01	99.98	99.85	99.85	90	78.63	78.97		0.99	0.98	
2051	0.01	99.98	99.86	99.86	90	79.33	79.99		1.01	0.99	
2052	0.00	99.99	99.87	99.87	90	80.66	81.02		1.03	1.00	
2053	0.00	99.99	99.89	99.89	90	81.92	82.01		0.98	1.01	
2054	0.00	99.99	99.90	99.90	90	83.12	83.01		1.00	1.01	
2055	0.01	100.00	99.91	99.91	90	84.26	84.01		1.01	1.00	
2056	0.00	100.00	99.92	99.92	90	85.34	85.02		1.01	0.98	
2057	0.00	100.00	99.93	99.93	90	86.35	86.04		1.01	0.95	
2058	0.00	100.00	99.93	99.93	90	87.30	86.98		0.94	0.92	
2059	0.00	100.00	99.94	99.94	90	88.19	87.86		0.88	0.87	
2060	0.00	100.00	99.95	99.95	90	89.02	88.67		0.81	0.82	
2061	0.00	100.00	99.95	99.95	90	89.77	89.43		0.75	0.76	

(continued)

Table 10.4 Kuwait (continued)

Year	D	CD	2 lyr SCD	Adj SCD	Predlag	Raw pred CP	1 lyr smth pred SCP	SCP	Raw pred P	7yr smth pred SP	Actual P
2062	0.00	100.00	99.96	99.96	90	90.45	90.13		0.70	0.71	
2063	0.00	100.00	99.96	99.96	90	91.05	90.77		0.65	0.66	
2064	0.00	100.00	99.97	99.97	90	91.57	91.37		0.60	0.61	
2065	0.00	100.00	99.97	99.97	90	92.08	91.93		0.56	0.56	
2066	0.00	100.00	99.98	99.98	90	92.57	92.44		0.51	0.52	
2067	0.00	100.00	99.98	99.98	90	93.03	92.92		0.48	0.49	
2068	0.00	100.00	99.98	99.98	90	93.48	93.37		0.45	0.45	
2069	0.00	100.00	99.99	99.99	90	93.90	93.78		0.42	0.42	
2070	0.00	100.00	99.99	99.99	90	94.30	94.18		0.40	0.40	
2071	0.00	100.00	99.99	99.99	90	94.67	94.55		0.37	0.37	
2072	0.00	100.00	99.99	99.99	90	95.02	94.90		0.35	0.35	
2073	0.00	100.00	99.99	99.99	90	95.34	95.22		0.32	0.32	
2074	0.00	100.00	99.99	99.99	90	95.65	95.53		0.30	0.30	
2075	0.00	100.00	100.00	100.00	90	95.92	95.80		0.28	0.28	
2076	0.00	100.00	100.00	100.00	90	96.17	96.05		0.25	0.25	
2077	0.00	100.00	100.00	100.00	90	96.40	96.28		0.23	0.23	
2078	0.00	100.00	100.00	100.00	90	96.61	96.49		0.21	0.21	
2079	0.00	100.00	100.00	100.00	90	96.79	96.68		0.19	0.19	
2080	0.00	100.00	100.00	100.00	90	96.95	96.84		0.17	0.17	
2081	0.00	100.00	100.00	100.00	90	97.08	96.99		0.15	0.15	
2082	0.00	100.00	100.00	100.00	90	97.20	97.12		0.13	0.14	
2083	0.00	100.00	100.00	100.00	90	97.30	97.24		0.12	0.12	
2084	0.00	100.00	100.00	100.00	90	97.39	97.34		0.10	0.11	
2085	0.00	100.00	100.00	100.00	90	97.47	97.44		0.09	0.10	
2086	0.00	100.00	100.00	100.00	90	97.55	97.52		0.08	0.09	
2087	0.00	100.00	100.00	100.00	90	97.62	97.60		0.08	0.08	
2088	0.00	100.00	100.00	100.00	90	97.69	97.67		0.07	0.08	
2089	0.00	100.00	100.00	100.00	90	97.75	97.74		0.07	0.07	
2090	0.00	100.00	100.00	100.00	90	97.81	97.81		0.07	0.07	
2091	0.00	100.00	100.00	100.00	90	97.88	97.87		0.06	0.07	
2092	0.00	100.00	100.00	100.00	90	97.94	97.94		0.06	0.06	
2093	0.00	100.00	100.00	100.00	90	98.00	98.00		0.06	0.06	
2094	0.00	100.00	100.00	100.00	90	98.06	98.06		0.06	0.06	
2095	0.00	100.00	100.00	100.00	90	98.13	98.12		0.06	0.06	
2096	0.00	100.00	100.00	100.00	90	98.19	98.18		0.06	0.06	
2097	0.00	100.00	100.00	100.00	90	98.25	98.24		0.06	0.06	
2098	0.00	100.00	100.00	100.00	90	98.30	98.30		0.06	0.06	
2099	0.00	100.00	100.00	100.00	90	98.36	98.35		0.06	0.06	
2100	0.00	100.00	100.00	100.00	90	98.42	98.41		0.06	0.06	

Notes: D—discovery; CD—cumulative discovery; SCD—smoothed cumulative discovery (years = number of years centred moving average); adj—adjusted (to match cumulative production maximum); predlag—predicted lag between cumulative discovery and cumulative production; raw Pred CP—prediction using direct lag of cumulative discovery by predicted lag years; Pred SCP—raw predicted CP smoothed (with years = number of years centred moving average); SCP—smoothed actual cumulative production (years = number of years centred moving average); raw Pred P—one year change in predicted smoothed cumulative production; Pred SP—smoothed raw Pred P (years = number of years centred moving average); Actual P—actual annual oil production. Shaded numbers are interpolations, extrapolations or forecasts.

Table 10.5 Rest of the Middle East Gulf, gigabarrels

Year	D	CD	2/yr SCD	Adj SCD	Predlag	Raw pred CP	5yr smth pred SCP	SCP	Raw pred P	5yr smth pred SP	Actual P
1900	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1901	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1902	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1903	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1904	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1905	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1906	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1907	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1908	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1909	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1910	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1911	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1912	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1913	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1914	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1915	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1916	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1917	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1918	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1919	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1920	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1921	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1922	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1923	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1924	0.00	0.00	0.04	0.03	7		0.00	0.00	0.00	0.00	0.00
1925	0.00	0.00	0.08	0.06	7		0.00	0.00	0.00	0.00	0.00
1926	0.00	0.00	0.11	0.09	8		0.00	0.00	0.00	0.00	0.00
1927	0.00	0.00	0.15	0.13	10		0.00	0.00	0.00	0.00	0.00
1928	0.00	0.00	0.25	0.20	12		0.00	0.00	0.00	0.00	0.00
1929	0.00	0.00	0.40	0.33	14		0.01	0.00	0.01	0.01	0.00
1930	0.00	0.00	0.59	0.48	17	0.01	0.02	0.01	0.01	0.01	0.01
1931	0.00	0.00	0.77	0.63	19	0.03	0.04	0.03	0.02	0.01	0.02
1932	0.00	0.00	0.95	0.78	20	0.06	0.06	0.06	0.02	0.02	0.03
1933	0.00	0.00	1.13	0.93	22	0.08	0.07	0.08	0.02	0.02	0.03
1934	0.80	0.80	1.31	1.08	23	0.09	0.09	0.10	0.02	0.02	0.02
1935	0.00	0.80	1.56	1.29	24	0.10	0.10	0.12	0.01	0.02	0.01
1936	0.00	0.80	1.81	1.50	25	0.12	0.12	0.14	0.01	0.02	0.03
1937	0.00	0.80	2.07	1.71	25	0.13	0.14	0.16	0.02	0.02	0.02
1938	1.20	2.00	2.34	1.94	26	0.15	0.16	0.18	0.02	0.02	0.02
1939	1.30	3.30	2.67	2.20	26	0.18	0.18	0.20	0.03	0.03	0.02
1940	0.50	3.80	3.03	2.51	27	0.20	0.21	0.22	0.03	0.03	0.03
1941	0.00	3.80	3.40	2.81	27	0.25	0.25	0.25	0.04	0.04	0.02
1942	0.00	3.80	3.79	3.13	27	0.29	0.29	0.28	0.04	0.04	0.04
1943	0.00	3.80	4.36	3.60	27	0.33	0.33	0.31	0.04	0.04	0.02
1944	0.00	3.80	5.37	4.43	28	0.37	0.37	0.34	0.04	0.04	0.04
1945	1.50	5.30	6.34	5.24	28	0.41	0.41	0.38	0.04	0.04	0.04
1946	0.00	5.30	7.35	6.07	28	0.45	0.45	0.42	0.04	0.04	0.04
1947	0.00	5.30	8.37	6.92	28	0.48	0.49	0.46	0.04	0.04	0.05
1948	0.50	5.80	9.62	7.95	29	0.53	0.54	0.51	0.04	0.05	0.05
1949	1.00	6.80	10.83	8.95	30	0.58	0.59	0.56	0.05	0.05	0.05
1950	0.90	7.70	12.32	10.18	31	0.63	0.65	0.61	0.06	0.06	0.05
1951	0.00	7.70	13.80	11.40	33	0.71	0.71	0.66	0.06	0.06	0.05
1952	0.50	8.20	15.70	12.97	35	0.78	0.77	0.72	0.06	0.06	0.06
1953	3.80	12.00	17.68	14.60	37	0.83	0.83	0.79	0.06	0.06	0.07
1954	9.10	21.10	20.41	16.86	39	0.88	0.89	0.87	0.06	0.06	0.08
1955	0.10	21.20	23.46	19.38	41	0.93	0.95	0.95	0.06	0.07	0.08
1956	0.80	22.00	26.61	21.99	43	1.01	1.02	1.03	0.07	0.07	0.08
1957	0.30	22.30	29.91	24.71	45	1.08	1.10	1.11	0.08	0.08	0.08
1958	4.70	27.00	33.22	27.45	47	1.19	1.19	1.19	0.09	0.09	0.08
1959	0.50	27.50	36.72	30.33	49	1.29	1.29	1.27	0.10	0.10	0.08
1960	7.00	34.50	40.20	33.21	51	1.39	1.42	1.35	0.13	0.11	0.08
1961	0.50	35.00	43.80	36.19	53	1.50	1.54	1.46	0.13	0.13	0.09
1962	8.70	43.70	47.42	39.18	55	1.71	1.67	1.59	0.13	0.14	0.15
1963	1.50	45.20	51.05	42.17	57	1.82	1.83	1.75	0.16	0.15	0.16
1964	16.00	61.20	54.55	45.06	59	1.94	2.00	1.92	0.17	0.16	0.18
1965	6.60	67.80	57.77	47.72	61	2.20	2.16	2.11	0.16	0.19	0.18
1966	3.80	71.60	61.07	50.45	63	2.35	2.36	2.31	0.20	0.21	0.20
1967	2.90	74.50	64.40	53.20	65	2.51	2.60	2.52	0.24	0.24	0.22
1968	0.40	74.90	67.77	55.99	67	2.81	2.88	2.80	0.28	0.29	0.22
1969	4.30	79.20	70.96	58.62	69	3.13	3.21	3.16	0.33	0.34	0.42
1970	0.80	80.00	74.16	61.26	71	3.60	3.60	3.62	0.39	0.41	0.43
1971	3.30	83.30	77.05	63.65	72	4.02	4.08	4.12	0.49	0.49	0.53
1972	0.40	83.70	79.97	66.06	74	4.43	4.67	4.70	0.59	0.56	0.56
1973	0.70	84.40	82.50	68.16	75	5.24	5.33	5.36	0.66	0.62	0.67
1974	1.00	85.40	85.02	70.23	77	6.07	6.02	6.08	0.68	0.66	0.75
1975	3.40	88.80	86.80	71.70	78	6.92	6.72	6.81	0.70	0.65	0.76
1976	1.70	90.50	88.26	72.91	79	7.43	7.36	7.51	0.64	0.63	0.67
1977	1.30	91.80	89.55	73.98	80	7.95	7.94	8.16	0.58	0.60	0.68
1978	1.40	93.20	90.72	74.94	80	8.45	8.47	8.81	0.53	0.56	0.59
1979	0.85	94.05	91.92	75.93	81	8.95	9.02	9.37	0.55	0.54	0.67
1980	0.50	94.55	92.92	76.76	81	9.56	9.54	9.86	0.53	0.52	0.43

(continued)

Table 10.5 Rest of the Middle East Gulf, gigabarrels (continued)

Year	D	CD	21yr SCD	Adj SCD	Predlag	Raw pred CP	5yr smth pred SCP	SCP	Raw pred P	5yr smth pred SP	Actual P
1981	0.75	95.30	93.90	77.57	81	10.18	10.05	10.24	0.51	0.51	0.38
1982	0.90	96.20	94.72	78.25	81	10.59	10.54	10.64	0.49	0.49	0.33
1983	0.80	97.00	95.57	78.95	81	10.99	11.02	11.04	0.47	0.48	0.48
1984	1.00	98.00	96.40	79.64	81	11.40	11.47	11.46	0.45	0.48	0.39
1985	0.50	98.50	97.20	80.29	81	11.93	11.95	11.89	0.48	0.49	0.39
1986	0.10	98.60	97.85	80.84	81	12.45	12.45	12.33	0.50	0.50	0.52
1987	0.10	98.70	98.44	81.32	81	12.97	12.99	12.79	0.53	0.53	0.43
1988	0.37	99.07	98.99	81.78	81	13.52	13.52	13.30	0.53	0.56	0.42
1989	1.00	100.07	99.51	82.21	81	14.06	14.10	13.90	0.58	0.59	0.69
1990	0.10	100.17	100.01	82.62	81	14.60	14.73	14.60	0.63	0.63	0.70
1991	0.40	100.57	100.51	83.03	81	15.35	15.40	15.33	0.67	0.68	0.71
1992	0.07	100.64	100.97	83.41	81	16.11	16.12	16.08	0.73	0.72	0.78
1993	0.90	101.54	101.39	83.76	81	16.86	16.91	16.86	0.79	0.76	0.78
1994	0.27	101.81	101.81	84.11	81	17.70	17.72	17.64	0.80	0.80	0.78
1995	0.27	102.08	102.21	84.44	81	18.54	18.54	18.43	0.83	0.83	0.77
1996	0.50	102.58	102.61	84.76	81	19.38	19.40	19.25	0.85	0.84	0.82
1997	0.20	102.78	103.02	85.11	81	20.25	20.25	20.10	0.86	0.86	0.88
1998	0.70	103.48	103.45	85.46	81	21.12	21.12	20.95	0.87	0.87	0.85
1999	0.60	104.08	103.89	85.82	81	21.99	22.01	21.80	0.88	0.88	0.82
2000	0.50	104.58	104.30	86.16	81	22.89	22.90	22.67	0.89	0.89	0.88
2001	0.40	104.98	104.72	86.51	81	23.80	23.80	23.57	0.90	0.90	0.94
2002	0.00	104.98	105.14	86.85	81	24.71	24.71	24.44	0.91	0.91	0.87
2003	0.00	104.98	105.58	87.22	81	25.62	25.62	25.30	0.91	0.91	0.80
2004	0.90	105.88	105.99	87.56	81	26.53	26.54	26.19	0.92	0.92	0.93
2005	0.49	106.37	106.41	87.90	81	27.45	27.48		0.93	0.93	
2006	0.47	106.84	106.83	88.25	81	28.41	28.42		0.94	0.94	
2007	0.46	107.30	107.24	88.59	81	29.37	29.37		0.95	0.95	
2008	0.45	107.76	107.66	88.93	81	30.33	30.33		0.96	0.96	
2009	0.44	108.19	108.06	89.26	81	31.29	31.29		0.96	0.96	
2010	0.43	108.62	108.44	89.58	81	32.25	32.26		0.97	0.97	
2011	0.41	109.03	108.82	89.89	81	33.21	33.23		0.97	0.97	
2012	0.40	109.44	109.19	90.20	81	34.20	34.21		0.98	0.98	
2013	0.39	109.82	109.57	90.51	81	35.20	35.20		0.99	0.99	
2014	0.38	110.20	109.96	90.83	81	36.19	36.19		0.99	0.99	
2015	0.36	110.56	110.32	91.13	81	37.18	37.18		0.99	0.99	
2016	0.35	110.91	110.66	91.42	81	38.18	38.18		1.00	1.00	
2017	0.34	111.24	110.99	91.69	81	39.18	39.18		1.00	1.00	
2018	0.32	111.57	111.31	91.96	81	40.18	40.18		1.00	0.99	
2019	0.31	111.87	111.62	92.21	81	41.17	41.17		0.99	0.99	
2020	0.29	112.17	111.91	92.45	81	42.17	42.15		0.98	0.98	
2021	0.28	112.45	112.19	92.68	81	43.14	43.13		0.98	0.97	
2022	0.27	112.71	112.45	92.90	81	44.10	44.08		0.95	0.95	
2023	0.25	112.96	112.70	93.10	81	45.06	45.02		0.93	0.94	
2024	0.24	113.20	112.94	93.30	81	45.95	45.93		0.92	0.92	
2025	0.22	113.42	113.16	93.48	81	46.84	46.84		0.91	0.91	
2026	0.21	113.63	113.37	93.65	81	47.72	47.74		0.90	0.91	
2027	0.19	113.83	113.56	93.81	81	48.63	48.64		0.90	0.90	
2028	0.18	114.01	113.74	93.96	81	49.54	49.54		0.91	0.91	
2029	0.16	114.17	113.90	94.09	81	50.45	50.45		0.91	0.91	
2030	0.15	114.32	114.05	94.22	81	51.37	51.37		0.91	0.91	
2031	0.14	114.46	114.18	94.33	81	52.28	52.28		0.92	0.92	
2032	0.12	114.58	114.31	94.43	81	53.20	53.20		0.92	0.92	
2033	0.11	114.68	114.42	94.52	81	54.13	54.13		0.92	0.92	
2034	0.09	114.77	114.51	94.60	81	55.06	55.05		0.92	0.91	
2035	0.08	114.85	114.60	94.67	81	55.99	55.95		0.91	0.91	
2036	0.06	114.91	114.67	94.73	81	56.86	56.85		0.90	0.90	
2037	0.05	114.95	114.74	94.78	81	57.74	57.74		0.89	0.89	
2038	0.03	114.98	114.79	94.83	81	58.62	58.62		0.88	0.90	
2039	0.02	115.00	114.84	94.87	81	59.50	59.50		0.88	0.92	
2040	0.00	115.00	114.88	94.90	81	60.38	60.44		0.94	0.94	
2041	0.00	115.00	114.91	94.93	81	61.26	61.45		1.01	0.96	
2042	0.00	115.00	114.94	94.95	81	62.46	62.44		0.99	0.97	
2043	0.00	115.00	114.96	94.97	81	63.65	63.42		0.98	0.97	
2044	0.00	115.00	114.97	94.98	81	64.45	64.38		0.96	0.95	
2045	0.00	115.00	114.98	94.99	81	65.26	65.31		0.93	0.93	
2046	0.00	115.00	114.99	94.99	81	66.06	66.21		0.90	0.91	
2047	0.00	115.00	115.00	95.00	81	67.11	67.09		0.88	0.88	
2048	0.00	115.00	115.00	95.00	81	68.16	67.94		0.86	0.85	
2049	0.00	115.00	115.00	95.00	81	68.85	68.78		0.83	0.81	
2050	0.00	115.00	115.00	95.00	81	69.54	69.55		0.77	0.77	
2051	0.00	115.00	115.00	95.00	81	70.23	70.26		0.71	0.74	
2052	0.00	115.00	115.00	95.00	81	70.97	70.95		0.69	0.70	
2053	0.00	115.00	115.00	95.00	81	71.70	71.62		0.67	0.66	
2054	0.00	115.00	115.00	95.00	81	72.31	72.27		0.64	0.65	
2055	0.00	115.00	115.00	95.00	81	72.91	72.87		0.60	0.64	
2056	0.00	115.00	115.00	95.00	81	73.45	73.52		0.65	0.62	
2057	0.00	115.00	115.00	95.00	81	73.98	74.14		0.63	0.63	
2058	0.00	115.00	115.00	95.00	81	74.94	74.75		0.60	0.65	
2059	0.00	115.00	115.00	95.00	81	75.44	75.41		0.66	0.65	
2060	0.00	115.00	115.00	95.00	81	75.93	76.13		0.72	0.67	
2061	0.00	115.00	115.00	95.00	81	76.76	76.79		0.66	0.70	

(continued)

Table 10.5 Rest of the Middle East Gulf, gigabarrels (continued)

Year	D	CD	2/yr SCD	Adj SCD	Predlag	Raw pred CP	5yr smth pred SCP	SCP	Raw pred P	5yr smth pred SP	Actual P
2062	0.00	115.00	115.00	95.00	81	77.57	77.49		0.70	0.71	
2063	0.00	115.00	115.00	95.00	81	78.25	78.23		0.74	0.69	
2064	0.00	115.00	115.00	95.00	81	78.95	78.94		0.71	0.68	
2065	0.00	115.00	115.00	95.00	81	79.64	79.59		0.65	0.66	
2066	0.00	115.00	115.00	95.00	81	80.29	80.21		0.61	0.61	
2067	0.00	115.00	115.00	95.00	81	80.84	80.77		0.57	0.56	
2068	0.00	115.00	115.00	95.00	81	81.32	81.29		0.51	0.52	
2069	0.00	115.00	115.00	95.00	81	81.78	81.75		0.47	0.48	
2070	0.00	115.00	115.00	95.00	81	82.21	82.19		0.44	0.45	
2071	0.00	115.00	115.00	95.00	81	82.62	82.61		0.42	0.42	
2072	0.00	115.00	115.00	95.00	81	83.03	83.01		0.40	0.40	
2073	0.00	115.00	115.00	95.00	81	83.41	83.39		0.38	0.38	
2074	0.00	115.00	115.00	95.00	81	83.76	83.75		0.36	0.36	
2075	0.00	115.00	115.00	95.00	81	84.11	84.09		0.35	0.35	
2076	0.00	115.00	115.00	95.00	81	84.44	84.43		0.34	0.35	
2077	0.00	115.00	115.00	95.00	81	84.76	84.77		0.34	0.34	
2078	0.00	115.00	115.00	95.00	81	85.11	85.12		0.34	0.34	
2079	0.00	115.00	115.00	95.00	81	85.46	85.46		0.34	0.35	
2080	0.00	115.00	115.00	95.00	81	85.82	85.81		0.35	0.35	
2081	0.00	115.00	115.00	95.00	81	86.16	86.16		0.35	0.35	
2082	0.00	115.00	115.00	95.00	81	86.51	86.51		0.35	0.35	
2083	0.00	115.00	115.00	95.00	81	86.85	86.86		0.35	0.35	
2084	0.00	115.00	115.00	95.00	81	87.22	87.21		0.35	0.35	
2085	0.00	115.00	115.00	95.00	81	87.56	87.56		0.35	0.35	
2086	0.00	115.00	115.00	95.00	81	87.90	87.90		0.35	0.35	
2087	0.00	115.00	115.00	95.00	81	88.25	88.25		0.34	0.34	
2088	0.00	115.00	115.00	95.00	81	88.59	88.59		0.34	0.34	
2089	0.00	115.00	115.00	95.00	81	88.93	88.92		0.34	0.33	
2090	0.00	115.00	115.00	95.00	81	89.26	89.25		0.33	0.33	
2091	0.00	115.00	115.00	95.00	81	89.58	89.57		0.32	0.32	
2092	0.00	115.00	115.00	95.00	81	89.89	89.89		0.32	0.32	
2093	0.00	115.00	115.00	95.00	81	90.20	90.20		0.31	0.31	
2094	0.00	115.00	115.00	95.00	81	90.51	90.51		0.31	0.31	
2095	0.00	115.00	115.00	95.00	81	90.83	90.82		0.30	0.30	
2096	0.00	115.00	115.00	95.00	81	91.13	91.12		0.30	0.30	
2097	0.00	115.00	115.00	95.00	81	91.42	91.41		0.29	0.29	
2098	0.00	115.00	115.00	95.00	81	91.69	91.68		0.27	0.28	
2099	0.00	115.00	115.00	95.00	81	91.96	91.94		0.26	0.26	
2100	0.00	115.00	115.00	95.00	81	92.21	92.20		0.25	0.25	

Notes: D—discovery; CD—cumulative discovery; SCD—smoothed cumulative discovery (years = number of years centred moving average); adj—adjusted (to match cumulative production maximum); predlag—predicted lag between cumulative discovery and cumulative production; raw Pred CP—prediction using direct lag of cumulative discovery by predicted lag years; Pred SCP—raw predicted CP smoothed (with years = number of years centred moving average); SCP—smoothed actual cumulative production (years = number of years centred moving average); raw Pred P—one year change in predicted smoothed cumulative production; Pred SP—smoothed raw Pred P (years = number of years centred moving average); Actual P—actual annual oil production. Shaded numbers are interpolations, extrapolations or forecasts.

Table 10.6 Middle East Gulf actual production, gigabarrels

Year	Saudi	SA NZ	Total SA	Iraq	Iran	Kuwait	Kuwait NZ	Total Kuwait	Rest+ NZ	NZ	Rest- NZ	Total ME Gulf
<i>(actual production)</i>												
1920	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1921	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1922	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1923	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1924	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1925	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1926	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1927	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1928	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01
1929	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02
1930	0.00	0.00	0.00	0.01	0.03	0.00	0.00	0.00	0.01	0.00	0.01	0.05
1931	0.00	0.00	0.00	0.01	0.04	0.00	0.00	0.00	0.02	0.00	0.02	0.07
1932	0.00	0.00	0.00	0.02	0.04	0.00	0.00	0.00	0.03	0.00	0.03	0.08
1933	0.00	0.00	0.00	0.02	0.04	0.00	0.00	0.00	0.03	0.00	0.02	0.08
1934	0.00	0.00	0.00	0.02	0.05	0.00	0.00	0.00	0.02	0.00	0.01	0.08
1935	0.00	0.00	0.00	0.02	0.05	0.00	0.00	0.00	0.01	0.00	0.01	0.08
1936	0.00	0.00	0.00	0.02	0.05	0.00	0.00	0.00	0.03	0.00	0.03	0.10
1937	0.00	0.00	0.00	0.03	0.06	0.00	0.00	0.00	0.02	0.00	0.01	0.10
1938	0.00	0.00	0.00	0.03	0.07	0.00	0.00	0.00	0.02	0.00	0.02	0.12
1939	0.00	0.00	0.00	0.03	0.07	0.00	0.00	0.00	0.02	0.00	0.02	0.12
1940	0.00	0.00	0.00	0.02	0.05	0.00	0.00	0.00	0.03	0.00	0.03	0.10
1941	0.00	0.00	0.00	0.01	0.04	0.00	0.00	0.00	0.02	0.00	0.02	0.07
1942	0.00	0.00	0.00	0.02	0.05	0.00	0.00	0.00	0.04	0.01	0.03	0.10
1943	0.00	0.00	0.00	0.02	0.06	0.00	0.00	0.00	0.02	0.00	0.02	0.10
1944	0.00	0.00	0.00	0.03	0.08	0.00	0.00	0.00	0.04	0.01	0.03	0.15
1945	0.03	0.00	0.03	0.04	0.10	0.00	0.00	0.00	0.04	0.01	0.03	0.20
1946	0.05	0.00	0.05	0.04	0.13	0.00	0.00	0.00	0.04	0.01	0.03	0.25
1947	0.08	0.00	0.08	0.04	0.14	0.02	0.00	0.02	0.05	0.01	0.04	0.33
1948	0.12	0.00	0.12	0.03	0.18	0.05	0.00	0.05	0.05	0.01	0.04	0.43
1949	0.15	0.00	0.15	0.04	0.20	0.09	0.00	0.09	0.05	0.01	0.04	0.53
1950	0.20	0.00	0.20	0.05	0.23	0.13	0.00	0.13	0.05	0.01	0.04	0.66
1951	0.24	0.00	0.24	0.06	0.15	0.20	0.00	0.20	0.05	0.01	0.04	0.70
1952	0.29	0.00	0.29	0.13	0.01	0.26	0.00	0.26	0.06	0.01	0.05	0.75
1953	0.30	0.01	0.31	0.24	0.00	0.30	0.01	0.31	0.07	0.01	0.06	0.91
1954	0.30	0.01	0.31	0.23	0.00	0.34	0.01	0.35	0.08	0.01	0.07	0.95
1955	0.33	0.01	0.34	0.25	0.06	0.40	0.01	0.41	0.08	0.01	0.07	1.12
1956	0.34	0.01	0.35	0.23	0.17	0.37	0.01	0.38	0.08	0.01	0.07	1.19
1957	0.35	0.01	0.36	0.18	0.26	0.40	0.01	0.41	0.08	0.01	0.07	1.27
1958	0.36	0.01	0.37	0.27	0.29	0.50	0.01	0.51	0.08	0.01	0.07	1.50
1959	0.36	0.01	0.37	0.31	0.34	0.51	0.01	0.52	0.08	0.01	0.07	1.60
1960	0.46	0.01	0.47	0.35	0.39	0.59	0.01	0.60	0.08	0.01	0.07	1.87
1961	0.50	0.01	0.51	0.37	0.44	0.60	0.01	0.61	0.09	0.01	0.08	2.00
1962	0.55	0.01	0.56	0.37	0.49	0.68	0.01	0.69	0.15	0.02	0.12	2.23
1963	0.58	0.01	0.59	0.42	0.54	0.70	0.01	0.71	0.16	0.02	0.13	2.40
1964	0.62	0.01	0.63	0.46	0.62	0.77	0.01	0.78	0.18	0.03	0.15	2.65
1965	0.70	0.01	0.71	0.48	0.70	0.79	0.01	0.80	0.18	0.03	0.15	2.85
1966	0.88	0.01	0.89	0.51	0.78	0.80	0.01	0.81	0.20	0.03	0.17	3.16
1967	0.93	0.02	0.95	0.45	0.95	0.82	0.02	0.84	0.22	0.03	0.18	3.36
1968	1.04	0.02	1.06	0.55	1.04	0.90	0.02	0.92	0.22	0.03	0.19	3.74
1969	1.07	0.03	1.10	0.55	1.23	0.93	0.03	0.96	0.42	0.06	0.36	4.21
1970	1.31	0.03	1.34	0.57	1.40	1.01	0.03	1.04	0.43	0.06	0.36	4.71
1971	1.65	0.04	1.69	0.62	1.66	1.05	0.04	1.09	0.53	0.08	0.45	5.51
1972	1.92	0.04	1.96	0.54	1.83	1.01	0.04	1.05	0.56	0.08	0.47	5.85
1973	2.74	0.05	2.79	0.74	2.14	1.04	0.05	1.09	0.67	0.10	0.57	7.32
1974	3.07	0.05	3.12	0.72	2.20	0.98	0.05	1.03	0.75	0.11	0.64	7.72
1975	2.62	0.06	2.68	0.83	1.95	0.71	0.06	0.77	0.76	0.11	0.65	6.87
1976	3.18	0.05	3.23	0.88	2.15	0.67	0.05	0.72	0.67	0.10	0.57	7.55
1977	3.28	0.05	3.33	0.86	2.07	0.63	0.05	0.68	0.68	0.10	0.58	7.51
1978	2.92	0.04	2.96	0.94	1.91	0.70	0.04	0.74	0.59	0.09	0.50	7.06
1979	3.40	0.05	3.45	1.27	1.16	0.79	0.05	0.84	0.67	0.10	0.57	7.29
1980	3.50	0.03	3.53	0.92	0.61	0.50	0.03	0.53	0.43	0.06	0.37	5.95
1981	3.52	0.03	3.55	0.37	0.50	0.32	0.03	0.35	0.38	0.06	0.32	5.09
1982	2.40	0.02	2.42	0.37	0.81	0.26	0.02	0.28	0.33	0.05	0.28	4.17
1983	1.80	0.03	1.83	0.37	0.89	0.33	0.03	0.36	0.48	0.07	0.41	3.86
1984	1.70	0.03	1.73	0.44	0.79	0.34	0.03	0.37	0.39	0.06	0.33	3.66
1985	1.30	0.03	1.33	0.52	0.82	0.30	0.03	0.33	0.39	0.06	0.33	3.33
1986	1.66	0.04	1.70	0.62	0.74	0.43	0.04	0.47	0.52	0.08	0.44	3.97
1987	1.52	0.03	1.55	0.76	0.84	0.41	0.03	0.44	0.43	0.06	0.36	3.95
1988	1.72	0.03	1.75	0.98	0.82	0.45	0.03	0.48	0.42	0.06	0.35	4.38
1989	1.81	0.05	1.86	1.06	1.03	0.55	0.05	0.60	0.69	0.10	0.59	5.13
1990	2.42	0.05	2.47	0.74	1.13	0.41	0.05	0.46	0.70	0.10	0.60	5.40
1991	2.98	0.05	3.03	0.11	1.21	0.07	0.05	0.12	0.71	0.10	0.61	5.09
1992	2.97	0.06	3.03	0.16	1.25	0.29	0.06	0.35	0.78	0.11	0.66	5.44
1993	2.91	0.06	2.97	0.19	1.29	0.62	0.06	0.68	0.78	0.11	0.67	5.79
1994	2.86	0.06	2.92	0.20	1.32	0.66	0.06	0.72	0.78	0.11	0.67	5.82
1995	2.89	0.06	2.95	0.20	1.33	0.65	0.06	0.71	0.77	0.11	0.66	5.84
1996	2.88	0.06	2.94	0.21	1.35	0.66	0.06	0.72	0.82	0.12	0.70	5.92
1997	2.96	0.06	3.02	0.42	1.34	0.67	0.06	0.73	0.88	0.13	0.75	6.26
1998	2.92	0.06	2.98	0.78	1.33	0.66	0.06	0.72	0.85	0.12	0.73	6.54

(continued)

Table 10.6 Middle East Gulf actual production, gigabarrels (continued)

Year	Saudi	SA NZ	Total SA	Iraq	Iran	Kuwait	Kuwait NZ	Total Kuwait	Rest+ NZ	NZ	Rest- NZ	Total ME Gulf
<i>(actual production)</i>												
1999	2.77	0.06	2.83	0.92	1.30	0.61	0.06	0.67	0.82	0.12	0.70	6.41
2000	2.92	0.06	2.98	0.94	1.35	0.64	0.06	0.70	0.88	0.13	0.75	6.73
2001	2.83	0.07	2.90	0.87	1.36	0.63	0.07	0.70	0.94	0.14	0.80	6.63
2002	2.60	0.06	2.66	0.74	1.26	0.59	0.06	0.65	0.87	0.13	0.74	6.06
2003	3.13	0.06	3.19	0.48	1.37	0.66	0.06	0.72	0.80	0.12	0.68	6.43
2004	3.20	0.07	3.27	0.73	1.46	0.75	0.07	0.82	0.93	0.13	0.80	7.07
2005	3.36	0.07	3.43	0.69	1.51	0.81	0.07	0.87	0.93	0.14	0.80	7.29
2006	3.22	0.07	3.29	0.73	1.47	0.81	0.07	0.88	0.94	0.14	0.81	7.17

Notes: Saudi, SA—Saudi Arabia; NZ—Neutral Zone, a territory shared by Saudi Arabia and Kuwait; SA NZ—Saudi Arabia's share of the Neutral Zone production; Kuwait NZ—Kuwait's share of the Neutral Zone production; Tot—total; ME—Middle East.

Table 10.6 Middle East Gulf predicted production, gigabarrels

Year	Saudi	SA NZ	Total SA	Iraq	Iran	Kuwait	Kuwait NZ	Total Kuwait	Rest+ NZ	NZ	Rest- NZ	Total ME Gulf
<i>(predicted production)</i>												
1920	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1921	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1922	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1923	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1924	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1925	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01
1926	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01
1927	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01
1928	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.02
1929	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.01	0.03
1930	0.00	0.00	0.00	0.01	0.02	0.00	0.00	0.00	0.01	0.00	0.01	0.04
1931	0.00	0.00	0.00	0.01	0.03	0.00	0.00	0.00	0.01	0.00	0.01	0.05
1932	0.00	0.00	0.00	0.01	0.03	0.00	0.00	0.00	0.02	0.00	0.01	0.06
1933	0.00	0.00	0.00	0.01	0.04	0.00	0.00	0.00	0.02	0.00	0.01	0.07
1934	0.00	0.00	0.00	0.02	0.04	0.00	0.00	0.00	0.02	0.00	0.01	0.07
1935	0.00	0.00	0.00	0.02	0.05	0.00	0.00	0.00	0.02	0.00	0.01	0.08
1936	0.00	0.00	0.00	0.02	0.05	0.00	0.00	0.00	0.02	0.00	0.01	0.09
1937	0.00	0.00	0.00	0.02	0.06	0.00	0.00	0.00	0.02	0.00	0.02	0.10
1938	0.00	0.00	0.00	0.02	0.06	0.00	0.00	0.00	0.02	0.00	0.02	0.10
1939	0.00	0.00	0.00	0.02	0.07	0.00	0.00	0.00	0.03	0.00	0.02	0.12
1940	0.00	0.00	0.00	0.02	0.07	0.00	0.00	0.00	0.03	0.00	0.03	0.13
1941	0.00	0.00	0.01	0.02	0.07	0.00	0.00	0.01	0.04	0.01	0.03	0.14
1942	0.01	0.00	0.01	0.02	0.08	0.01	0.00	0.01	0.04	0.01	0.03	0.16
1943	0.02	0.00	0.02	0.02	0.08	0.02	0.00	0.02	0.04	0.01	0.03	0.18
1944	0.03	0.00	0.03	0.02	0.09	0.03	0.00	0.03	0.04	0.01	0.03	0.21
1945	0.05	0.00	0.05	0.02	0.10	0.04	0.00	0.04	0.04	0.01	0.03	0.25
1946	0.07	0.00	0.07	0.03	0.11	0.06	0.00	0.06	0.04	0.01	0.04	0.30
1947	0.10	0.00	0.10	0.04	0.11	0.08	0.00	0.08	0.04	0.01	0.04	0.37
1948	0.13	0.00	0.13	0.05	0.12	0.11	0.00	0.11	0.05	0.01	0.04	0.45
1949	0.16	0.00	0.16	0.07	0.13	0.14	0.00	0.14	0.05	0.01	0.04	0.55
1950	0.19	0.00	0.20	0.09	0.14	0.17	0.00	0.18	0.06	0.01	0.05	0.65
1951	0.23	0.00	0.23	0.11	0.15	0.21	0.00	0.21	0.06	0.01	0.05	0.74
1952	0.25	0.00	0.26	0.12	0.16	0.25	0.00	0.25	0.06	0.01	0.05	0.83
1953	0.28	0.00	0.28	0.12	0.17	0.29	0.00	0.29	0.06	0.01	0.05	0.92
1954	0.30	0.00	0.31	0.12	0.19	0.33	0.00	0.33	0.06	0.01	0.05	1.00
1955	0.32	0.01	0.33	0.13	0.20	0.36	0.01	0.37	0.07	0.01	0.06	1.08
1956	0.34	0.01	0.35	0.15	0.23	0.40	0.01	0.41	0.07	0.01	0.06	1.20
1957	0.37	0.01	0.37	0.19	0.26	0.44	0.01	0.45	0.08	0.01	0.07	1.34
1958	0.39	0.01	0.40	0.24	0.30	0.49	0.01	0.49	0.09	0.01	0.08	1.51
1959	0.42	0.01	0.42	0.31	0.35	0.52	0.01	0.53	0.10	0.02	0.09	1.70
1960	0.46	0.01	0.47	0.36	0.40	0.55	0.01	0.56	0.11	0.02	0.10	1.88
1961	0.51	0.01	0.52	0.40	0.45	0.59	0.01	0.60	0.13	0.02	0.11	2.08
1962	0.57	0.01	0.58	0.42	0.51	0.64	0.01	0.65	0.14	0.02	0.12	2.29
1963	0.64	0.01	0.65	0.44	0.59	0.69	0.01	0.70	0.15	0.02	0.13	2.50
1964	0.72	0.01	0.73	0.44	0.67	0.72	0.01	0.73	0.16	0.02	0.14	2.72
1965	0.79	0.01	0.80	0.44	0.77	0.76	0.01	0.77	0.19	0.03	0.16	2.95
1966	0.90	0.02	0.91	0.45	0.88	0.80	0.02	0.82	0.21	0.03	0.18	3.24
1967	1.03	0.02	1.05	0.47	1.00	0.85	0.02	0.86	0.24	0.04	0.21	3.59
1968	1.19	0.02	1.21	0.49	1.12	0.88	0.02	0.90	0.29	0.04	0.25	3.97
1969	1.39	0.02	1.41	0.52	1.25	0.89	0.02	0.91	0.34	0.05	0.29	4.38
1970	1.62	0.03	1.65	0.56	1.36	0.89	0.03	0.92	0.41	0.06	0.35	4.85
1971	1.86	0.04	1.89	0.60	1.48	0.89	0.04	0.93	0.49	0.07	0.42	5.32
1972	2.11	0.04	2.15	0.61	1.58	0.88	0.04	0.92	0.56	0.08	0.48	5.74
1973	2.33	0.05	2.38	0.64	1.66	0.85	0.05	0.90	0.62	0.09	0.53	6.10
1974	2.53	0.05	2.57	0.68	1.69	0.81	0.05	0.86	0.66	0.10	0.56	6.36
1975	2.68	0.05	2.73	0.71	1.69	0.77	0.05	0.81	0.65	0.09	0.56	6.50
1976	2.79	0.05	2.84	0.75	1.64	0.73	0.05	0.77	0.63	0.09	0.54	6.54
1977	2.85	0.04	2.89	0.83	1.57	0.68	0.04	0.72	0.60	0.09	0.51	6.53
1978	2.86	0.04	2.90	0.87	1.47	0.62	0.04	0.66	0.56	0.08	0.48	6.39
1979	2.83	0.04	2.87	0.87	1.38	0.57	0.04	0.61	0.54	0.08	0.46	6.19
1980	2.76	0.04	2.80	0.85	1.28	0.53	0.04	0.57	0.52	0.08	0.45	5.94
1981	2.65	0.04	2.69	0.77	1.19	0.51	0.04	0.54	0.51	0.07	0.44	5.63
1982	2.51	0.04	2.55	0.66	1.09	0.48	0.04	0.52	0.49	0.07	0.42	5.23
1983	2.38	0.03	2.41	0.58	1.01	0.46	0.03	0.50	0.48	0.07	0.41	4.92
1984	2.25	0.03	2.29	0.53	0.95	0.46	0.03	0.49	0.48	0.07	0.41	4.67
1985	2.16	0.04	2.20	0.51	0.91	0.46	0.04	0.50	0.49	0.07	0.42	4.53
1986	2.11	0.04	2.14	0.54	0.91	0.47	0.04	0.51	0.50	0.07	0.43	4.53
1987	2.09	0.04	2.13	0.61	0.92	0.48	0.04	0.52	0.53	0.08	0.45	4.63
1988	2.10	0.04	2.14	0.64	0.95	0.50	0.04	0.54	0.56	0.08	0.48	4.75
1989	2.15	0.04	2.19	0.66	1.00	0.51	0.04	0.56	0.59	0.09	0.50	4.90
1990	2.22	0.05	2.26	0.66	1.04	0.53	0.05	0.58	0.63	0.09	0.54	5.08
1991	2.32	0.05	2.37	0.59	1.08	0.56	0.05	0.61	0.68	0.10	0.58	5.23
1992	2.44	0.05	2.49	0.51	1.13	0.58	0.05	0.63	0.72	0.10	0.62	5.37
1993	2.58	0.06	2.64	0.42	1.17	0.59	0.06	0.65	0.76	0.11	0.65	5.53
1994	2.72	0.06	2.78	0.36	1.21	0.61	0.06	0.66	0.80	0.12	0.68	5.69
1995	2.82	0.06	2.88	0.33	1.25	0.62	0.06	0.68	0.83	0.12	0.71	5.84
1996	2.88	0.06	2.94	0.36	1.29	0.64	0.06	0.70	0.84	0.12	0.72	6.01
1997	2.91	0.06	2.97	0.43	1.33	0.65	0.06	0.71	0.86	0.12	0.73	6.17
1998	2.91	0.06	2.98	0.52	1.37	0.66	0.06	0.72	0.87	0.13	0.74	6.33

(continued)

Table 10.6 Middle East Gulf predicted production, gigabarrels (continued)

Year	Saudi	SA NZ	Total SA	Iraq	Iran	Kuwait	Kuwait NZ	Total Kuwait	Rest+ NZ	NZ	Rest- NZ	Total ME Gulf
(predicted production)												
1999	2.92	0.06	2.98	0.61	1.40	0.67	0.06	0.74	0.88	0.13	0.75	6.48
2000	2.92	0.06	2.99	0.68	1.41	0.69	0.06	0.76	0.89	0.13	0.76	6.60
2001	2.97	0.07	3.04	0.72	1.41	0.71	0.07	0.78	0.90	0.13	0.77	6.71
2002	3.06	0.07	3.13	0.73	1.41	0.73	0.07	0.79	0.91	0.13	0.78	6.83
2003	3.16	0.07	3.23	0.71	1.41	0.76	0.07	0.82	0.91	0.13	0.78	6.95
2004	3.24	0.07	3.30	0.72	1.40	0.79	0.07	0.86	0.92	0.13	0.79	7.07
2005	3.28	0.07	3.35	0.73	1.40	0.83	0.07	0.90	0.93	0.14	0.80	7.17
2006	3.30	0.07	3.37	0.75	1.41	0.86	0.07	0.93	0.94	0.14	0.81	7.27
2007	3.29	0.07	3.36	0.78	1.42	0.89	0.07	0.96	0.95	0.14	0.81	7.33
2008	3.24	0.07	3.31	0.81	1.42	0.92	0.07	0.99	0.96	0.14	0.82	7.35
2009	3.18	0.07	3.25	0.82	1.43	0.95	0.07	1.02	0.96	0.14	0.82	7.33
2010	3.14	0.07	3.21	0.79	1.43	0.96	0.07	1.03	0.97	0.14	0.83	7.30
2011	3.10	0.07	3.17	0.77	1.44	0.97	0.07	1.04	0.97	0.14	0.83	7.25
2012	3.06	0.07	3.13	0.74	1.44	0.99	0.07	1.06	0.98	0.14	0.84	7.20
2013	3.01	0.07	3.08	0.71	1.44	1.01	0.07	1.08	0.99	0.14	0.84	7.15
2014	3.00	0.07	3.07	0.70	1.45	1.01	0.07	1.08	0.99	0.14	0.85	7.14
2015	3.03	0.07	3.10	0.71	1.45	1.02	0.07	1.09	0.99	0.14	0.85	7.20
2016	3.06	0.07	3.14	0.74	1.44	1.02	0.07	1.09	1.00	0.14	0.85	7.27
2017	3.09	0.07	3.17	0.77	1.42	1.03	0.07	1.10	1.00	0.14	0.85	7.31
2018	3.16	0.07	3.23	0.80	1.40	1.03	0.07	1.10	0.99	0.14	0.85	7.38
2019	3.20	0.07	3.27	0.83	1.39	1.02	0.07	1.09	0.99	0.14	0.85	7.43
2020	3.20	0.07	3.27	0.83	1.37	1.01	0.07	1.08	0.98	0.14	0.84	7.39
2021	3.14	0.07	3.21	0.80	1.36	1.01	0.07	1.08	0.97	0.14	0.83	7.29
2022	3.07	0.07	3.14	0.77	1.37	1.02	0.07	1.09	0.95	0.14	0.82	7.19
2023	3.03	0.07	3.10	0.76	1.38	1.02	0.07	1.09	0.94	0.14	0.80	7.13
2024	2.99	0.07	3.06	0.76	1.38	1.02	0.07	1.09	0.92	0.13	0.79	7.08
2025	2.95	0.07	3.02	0.79	1.39	1.02	0.07	1.09	0.91	0.13	0.78	7.07
2026	2.96	0.07	3.03	0.84	1.40	1.02	0.07	1.09	0.91	0.13	0.77	7.13
2027	3.02	0.07	3.09	0.91	1.40	1.03	0.07	1.09	0.90	0.13	0.77	7.27
2028	3.09	0.07	3.15	0.97	1.40	1.03	0.07	1.09	0.91	0.13	0.77	7.39
2029	3.12	0.07	3.19	1.01	1.39	1.03	0.07	1.09	0.91	0.13	0.78	7.46
2030	3.13	0.07	3.19	1.04	1.38	1.03	0.07	1.09	0.91	0.13	0.78	7.49
2031	3.13	0.07	3.20	1.05	1.37	1.03	0.07	1.09	0.92	0.13	0.78	7.50
2032	3.14	0.07	3.20	1.05	1.36	1.03	0.07	1.09	0.92	0.13	0.79	7.49
2033	3.14	0.07	3.21	1.05	1.35	1.02	0.07	1.09	0.92	0.13	0.78	7.49
2034	3.14	0.07	3.21	1.05	1.34	1.02	0.07	1.09	0.91	0.13	0.78	7.47
2035	3.14	0.07	3.21	1.05	1.33	1.01	0.07	1.08	0.91	0.13	0.78	7.44
2036	3.14	0.07	3.21	1.05	1.32	1.01	0.07	1.07	0.90	0.13	0.77	7.41
2037	3.10	0.06	3.17	1.04	1.30	1.00	0.06	1.06	0.89	0.13	0.76	7.34
2038	3.03	0.07	3.09	1.04	1.29	0.98	0.07	1.05	0.90	0.13	0.77	7.24
2039	2.95	0.07	3.02	1.04	1.29	0.98	0.07	1.05	0.92	0.13	0.79	7.19
2040	2.87	0.07	2.94	1.04	1.29	0.98	0.07	1.04	0.94	0.14	0.80	7.11
2041	2.77	0.07	2.84	1.04	1.28	0.97	0.07	1.04	0.96	0.14	0.82	7.02
2042	2.71	0.07	2.78	1.04	1.25	0.96	0.07	1.04	0.97	0.14	0.83	6.95
2043	2.65	0.07	2.72	1.04	1.22	0.96	0.07	1.03	0.97	0.14	0.83	6.84
2044	2.60	0.07	2.67	1.04	1.18	0.96	0.07	1.03	0.95	0.14	0.81	6.73
2045	2.58	0.07	2.64	1.04	1.12	0.96	0.07	1.02	0.93	0.13	0.79	6.63
2046	2.54	0.07	2.60	1.04	1.07	0.95	0.07	1.02	0.91	0.13	0.77	6.51
2047	2.44	0.06	2.50	1.04	1.02	0.95	0.06	1.02	0.88	0.13	0.75	6.33
2048	2.34	0.06	2.40	1.04	0.96	0.96	0.06	1.02	0.85	0.12	0.73	6.15
2049	2.23	0.06	2.29	1.04	0.88	0.97	0.06	1.03	0.81	0.12	0.69	5.94
2050	2.14	0.06	2.20	1.05	0.80	0.98	0.06	1.04	0.77	0.11	0.66	5.74
2051	2.06	0.05	2.12	1.04	0.72	0.99	0.05	1.04	0.74	0.11	0.63	5.55
2052	2.00	0.05	2.05	1.03	0.67	1.00	0.05	1.05	0.70	0.10	0.60	5.40
2053	1.95	0.05	2.00	1.02	0.63	1.01	0.05	1.05	0.66	0.10	0.57	5.27
2054	1.97	0.05	2.02	1.00	0.60	1.01	0.05	1.06	0.65	0.09	0.56	5.23
2055	1.99	0.05	2.03	0.98	0.60	1.00	0.05	1.05	0.64	0.09	0.55	5.20
2056	1.96	0.05	2.00	0.96	0.60	0.98	0.05	1.02	0.62	0.09	0.53	5.11
2057	1.95	0.05	2.00	0.98	0.59	0.95	0.05	1.00	0.63	0.09	0.54	5.09
2058	1.93	0.05	1.98	0.99	0.58	0.92	0.05	0.96	0.63	0.09	0.56	5.08
2059	1.86	0.05	1.90	1.00	0.59	0.87	0.05	0.92	0.65	0.09	0.56	4.98
2060	1.82	0.05	1.87	1.00	0.59	0.82	0.05	0.87	0.67	0.10	0.57	4.91
2061	1.79	0.05	1.84	0.99	0.61	0.76	0.05	0.81	0.70	0.10	0.60	4.85
2062	1.73	0.05	1.78	0.93	0.62	0.71	0.05	0.76	0.71	0.10	0.60	4.70
2063	1.73	0.05	1.78	0.87	0.63	0.66	0.05	0.71	0.69	0.10	0.59	4.57
2064	1.70	0.05	1.75	0.82	0.63	0.61	0.05	0.66	0.68	0.10	0.58	4.43
2065	1.64	0.05	1.69	0.80	0.64	0.56	0.05	0.61	0.66	0.10	0.56	4.30
2066	1.66	0.04	1.70	0.80	0.63	0.52	0.04	0.57	0.61	0.09	0.52	4.22
2067	1.64	0.04	1.68	0.80	0.62	0.49	0.04	0.53	0.56	0.08	0.48	4.10
2068	1.58	0.04	1.61	0.79	0.63	0.45	0.04	0.49	0.52	0.08	0.44	3.97
2069	1.53	0.03	1.57	0.79	0.63	0.42	0.03	0.46	0.48	0.07	0.41	3.86
2070	1.46	0.03	1.49	0.76	0.63	0.40	0.03	0.43	0.45	0.06	0.38	3.70
2071	1.37	0.03	1.40	0.73	0.65	0.37	0.03	0.40	0.42	0.06	0.36	3.54
2072	1.30	0.03	1.32	0.72	0.67	0.35	0.03	0.38	0.40	0.06	0.34	3.43
2073	1.20	0.03	1.22	0.74	0.67	0.32	0.03	0.35	0.38	0.06	0.33	3.30
2074	1.08	0.03	1.11	0.75	0.68	0.30	0.03	0.33	0.36	0.05	0.31	3.18
2075	1.01	0.03	1.04	0.75	0.69	0.28	0.03	0.30	0.35	0.05	0.30	3.08
2076	0.94	0.03	0.97	0.77	0.69	0.25	0.03	0.28	0.35	0.05	0.30	3.00
2077	0.87	0.02	0.89	0.78	0.70	0.23	0.02	0.26	0.34	0.05	0.29	2.93

(continued)

Table 10.6 Middle East Gulf predicted production, gigabarrels

Year	Saudi	SA NZ	Total SA	Iraq	Iran	Kuwait	Kuwait NZ	Total Kuwait	Rest+ NZ	NZ	Rest- NZ	Total ME Gulf
<i>(predicted production)</i>												
2078	0.83	0.02	0.86	0.76	0.72	0.21	0.02	0.23	0.34	0.05	0.29	2.86
2079	0.81	0.03	0.83	0.76	0.72	0.19	0.03	0.21	0.35	0.05	0.30	2.82
2080	0.77	0.03	0.80	0.78	0.72	0.17	0.03	0.19	0.35	0.05	0.30	2.79
2081	0.74	0.03	0.77	0.76	0.72	0.15	0.03	0.18	0.35	0.05	0.30	2.72
2082	0.72	0.03	0.74	0.76	0.71	0.14	0.03	0.16	0.35	0.05	0.30	2.67
2083	0.69	0.03	0.71	0.78	0.70	0.12	0.03	0.15	0.35	0.05	0.30	2.63
2084	0.66	0.03	0.68	0.76	0.69	0.11	0.03	0.13	0.35	0.05	0.30	2.56
2085	0.62	0.03	0.64	0.75	0.67	0.10	0.03	0.12	0.35	0.05	0.30	2.49
2086	0.57	0.03	0.60	0.77	0.65	0.09	0.03	0.11	0.35	0.05	0.30	2.43
2087	0.53	0.02	0.56	0.74	0.63	0.08	0.02	0.11	0.34	0.05	0.29	2.33
2088	0.50	0.02	0.52	0.73	0.61	0.08	0.02	0.10	0.34	0.05	0.29	2.26
2089	0.47	0.02	0.50	0.75	0.57	0.07	0.02	0.10	0.33	0.05	0.29	2.20
2090	0.45	0.02	0.47	0.71	0.55	0.07	0.02	0.09	0.33	0.05	0.28	2.11
2091	0.42	0.02	0.45	0.70	0.54	0.07	0.02	0.09	0.32	0.05	0.28	2.05
2092	0.39	0.02	0.41	0.70	0.52	0.06	0.02	0.09	0.32	0.05	0.27	1.99
2093	0.37	0.02	0.39	0.66	0.50	0.06	0.02	0.09	0.31	0.05	0.27	1.91
2094	0.35	0.02	0.37	0.62	0.49	0.06	0.02	0.08	0.31	0.04	0.26	1.83
2095	0.34	0.02	0.36	0.59	0.47	0.06	0.02	0.08	0.30	0.04	0.26	1.76
2096	0.33	0.02	0.35	0.51	0.46	0.06	0.02	0.08	0.30	0.04	0.25	1.65
2097	0.32	0.02	0.34	0.42	0.45	0.06	0.02	0.08	0.29	0.04	0.24	1.54
2098	0.32	0.02	0.34	0.34	0.44	0.06	0.02	0.08	0.28	0.04	0.24	1.43
2099	0.32	0.02	0.34	0.25	0.43	0.06	0.02	0.08	0.26	0.04	0.23	1.32
2100	0.32	0.02	0.34	0.16	0.42	0.06	0.02	0.07	0.25	0.04	0.22	1.22

Notes: Saudi, SA—Saudi Arabia; NZ—Neutral Zone, a territory shared by Saudi Arabia and Kuwait; SA NZ—Saudi Arabia's share of the Neutral Zone production; Kuwait NZ—Kuwait's share of the Neutral Zone production; Tot—total; ME—Middle East.

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Chapter 11

Deep water oil

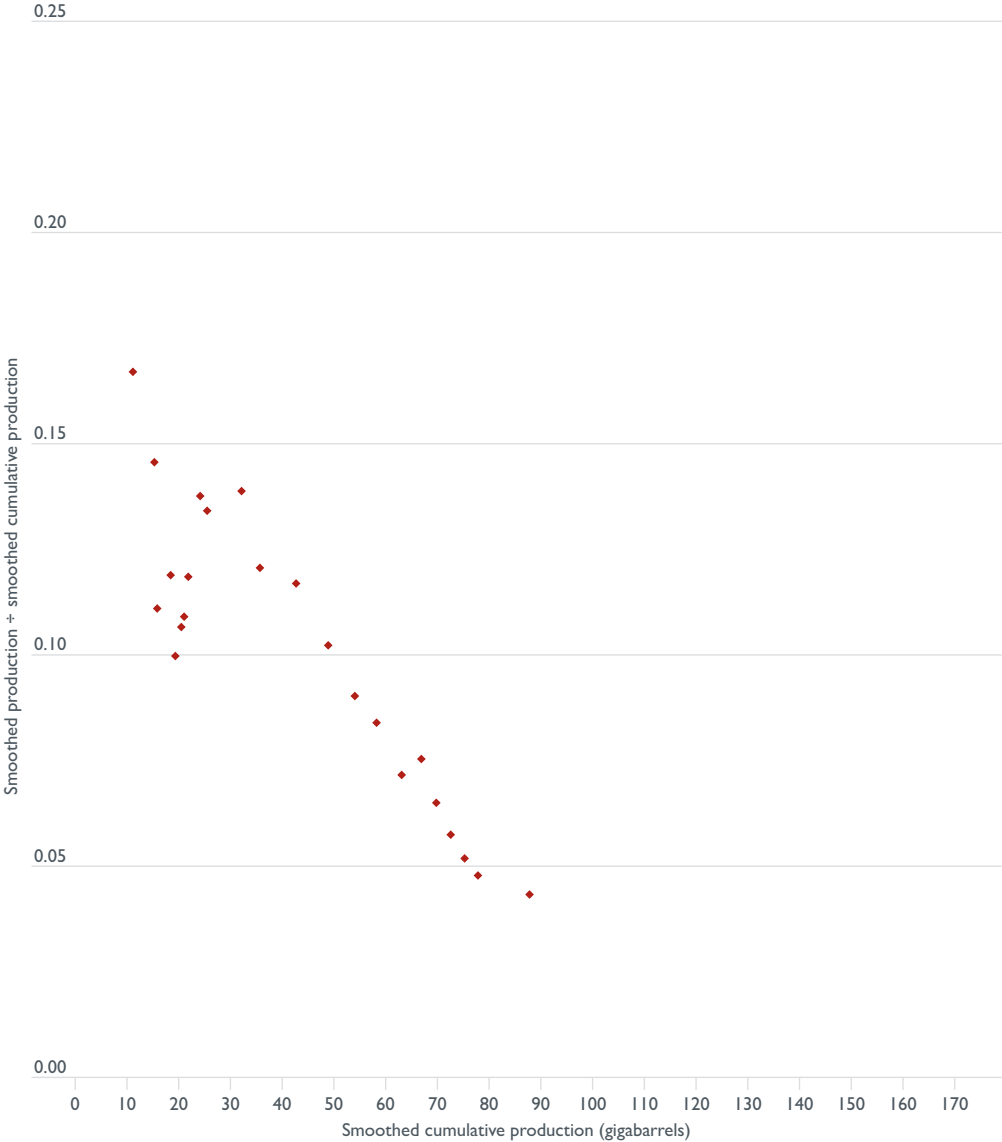


Chapter 11 Deep water oil

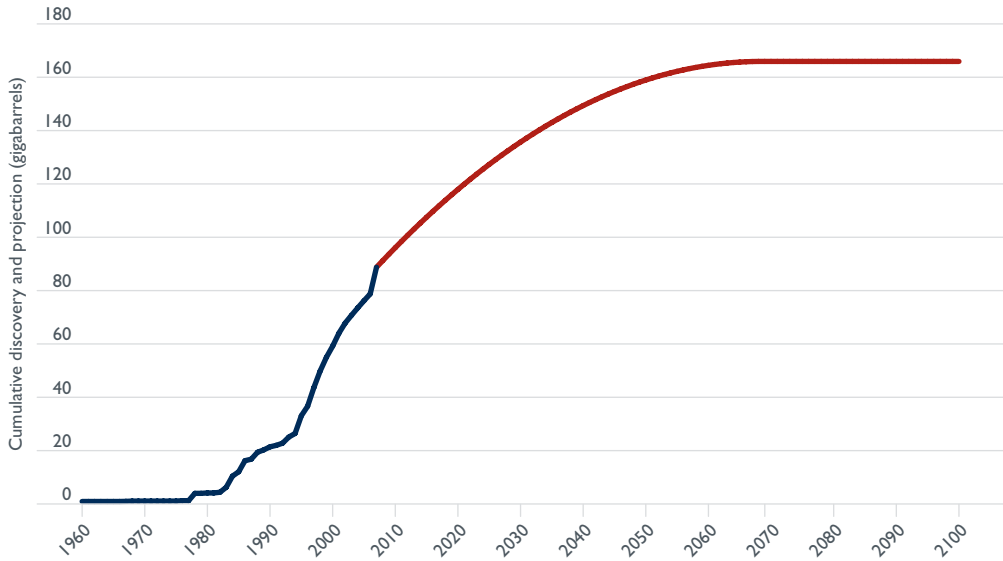
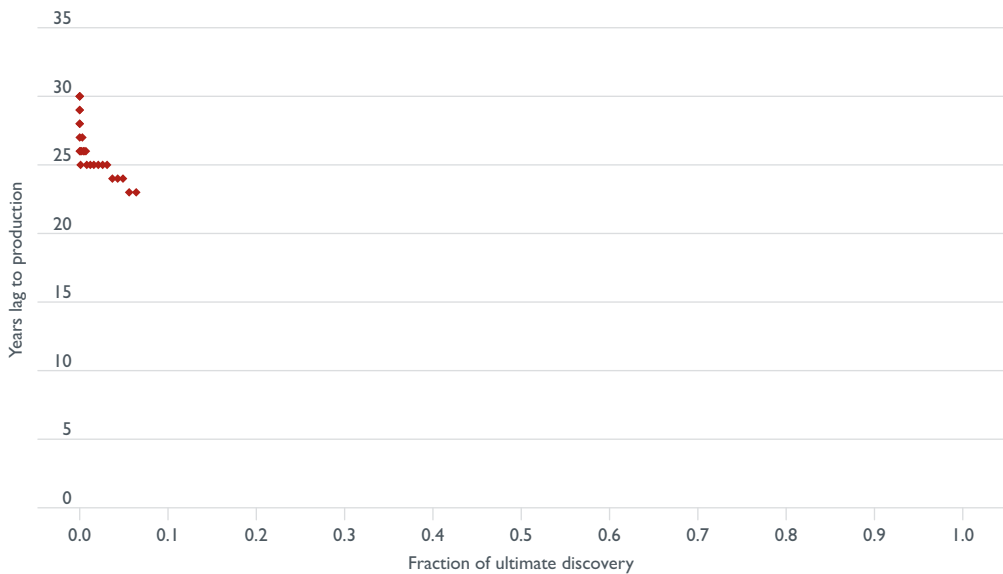
The technology to enable the discovery, drilling and production of oil from depths greater than 500 metres below the sea's surface only became a reality late in the last century. Moving into this century and production is starting to flow from deep sea areas. Deep sea oil will first be analysed as a single major oil-producing province, and then also separately by the major subregions. Table 11.1 sets out the calculations from the seven steps to a forecast of aggregate production of deep water oil.

1. Discovery (D) is smoothed with a three year moving average and cumulative discovery (CD) is smoothed with a 21 year moving average.
2. The fractional growth in discovery (SD/SCD) is calculated and plotted against last year's smoothed cumulative discovery (shown in Figure 11.1).
3. The plot is examined and a best guess at an ultimate discovery (UD) is made. In this case it is 165 gigabarrels.
4. Cumulative discovery in 2006 is then projected to UD by bringing SD estimated for 2007 to zero in 2075. For deep water oil, the projection of the cumulative discovery curve is shown in Figure 11.2.

Figure 11.1 World deep water cumulative discovery growth curve



5. Next, the historical stretch lag between the cumulative discovery and production curves is calculated, and plotted against the fraction of cumulative discovery. This plot for deep water oil is shown in Figure 11.3. It is apparent that this is a very young oil province, with the lag yet to fully emerge from the usual noise in the range of zero to 0.1. However, extrapolating the trend at the current 23 years at 1.0 allows the rest of the cumulative production curve to be forecast from the extrapolated discovery curve and the predicted lags.

Figure 11.2 World deep water cumulative discovery projection**Figure 11.3** Deep water stretch lag curve

6. The predicted cumulative production curve is smoothed with a five year average and then differenced to give a raw predicted annual production. This is then averaged over five years to give a final forecast for world deep water annual production. This is shown in Figure 11.4.
7. Finally the cumulative discovery and production curves (actual and forecast) are plotted in Figure 11.5. This allows a spatial understanding of the relationship between production and discovery.

Figure 11.4 Actual and predicted deep water crude oil production

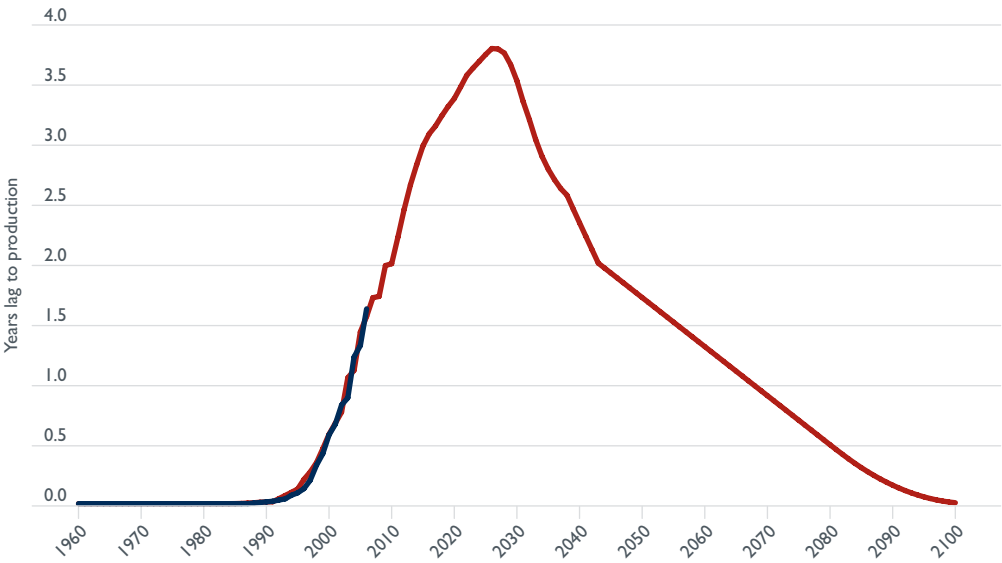
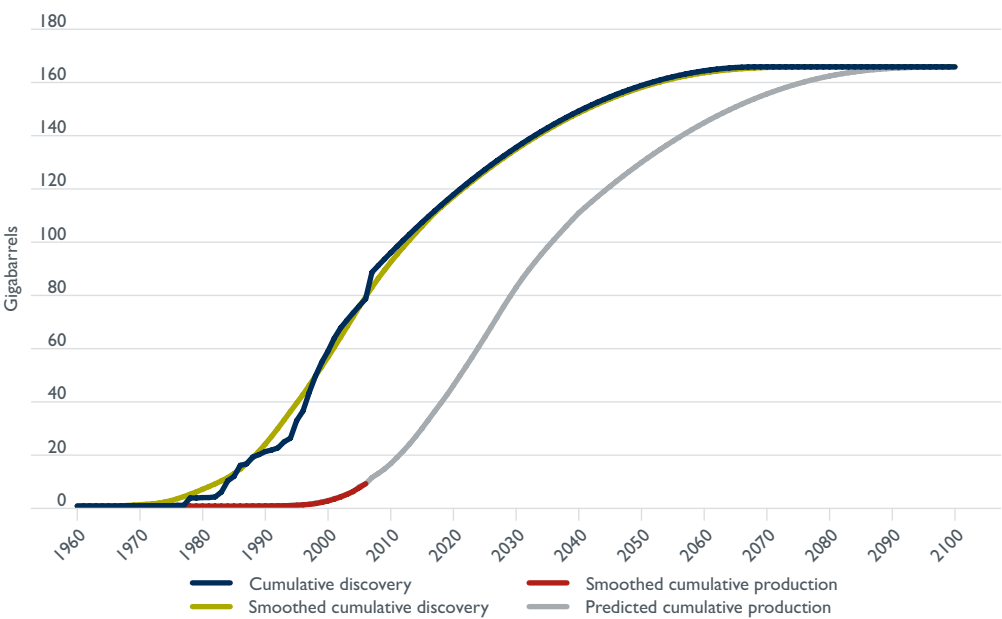


Figure 11.5 Deep water cumulative discovery and cumulative production curves



Regional deep water oil production

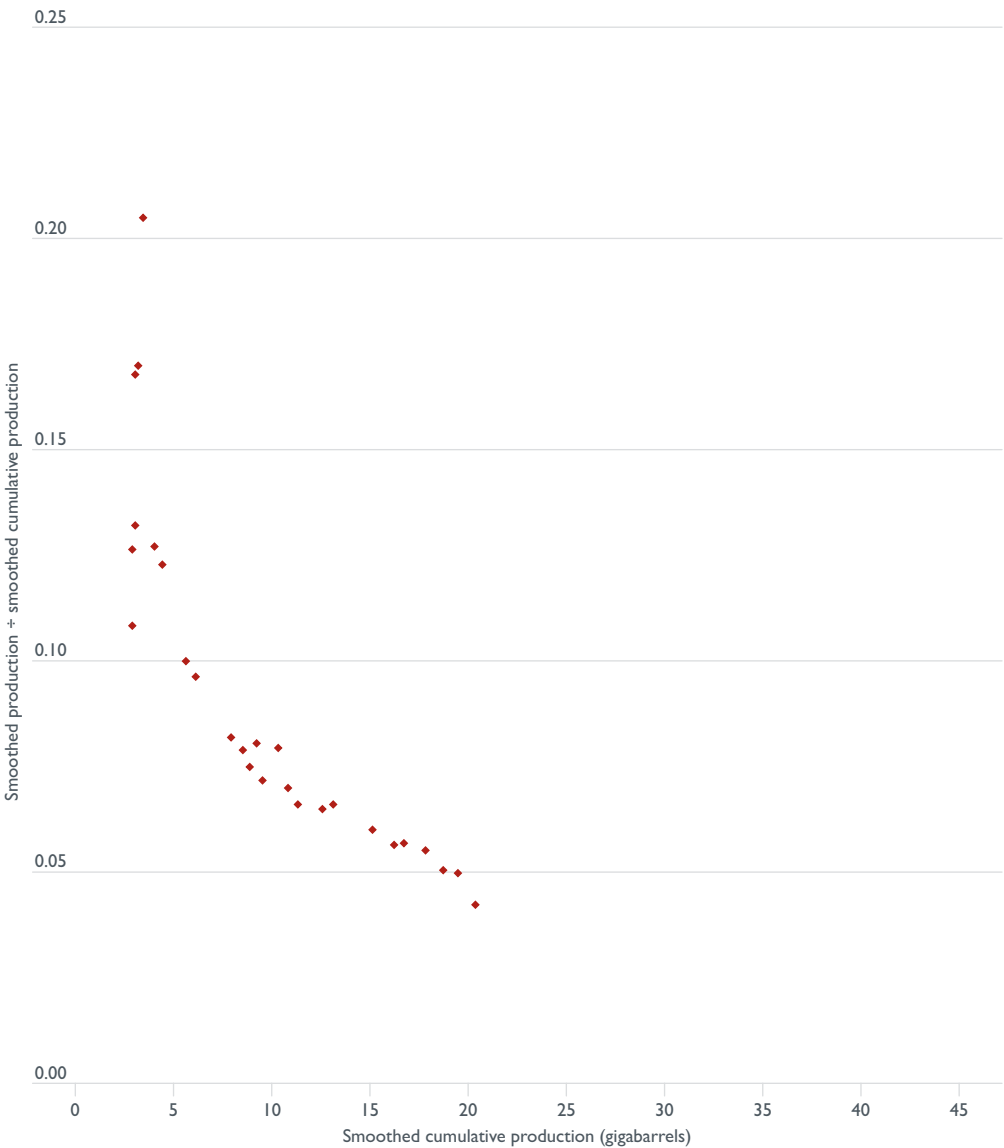
A forecast for total world deep water production has been arrived at, but it is necessary to ascertain the regions that will produce it. These regions currently are the Gulf of Mexico, Brazil, Nigeria, Angola and 'other deep water'. These forecasts have been made by applying the same forecast methods to each region (splitting the 'other' region between the East and China). Once the regions have been forecast a comparison can be made to the aggregate forecast.

The Gulf of Mexico

Table 11.2 sets out the calculations from the seven steps to a forecast of production of Gulf of Mexico deep water oil.

1. Discovery (D) and cumulative discovery (CD) are smoothed with 11 year moving averages.
2. The fractional growth in discovery (SD/SCD) is calculated and plotted against last year's smoothed cumulative discovery (shown in Figure 11.6).

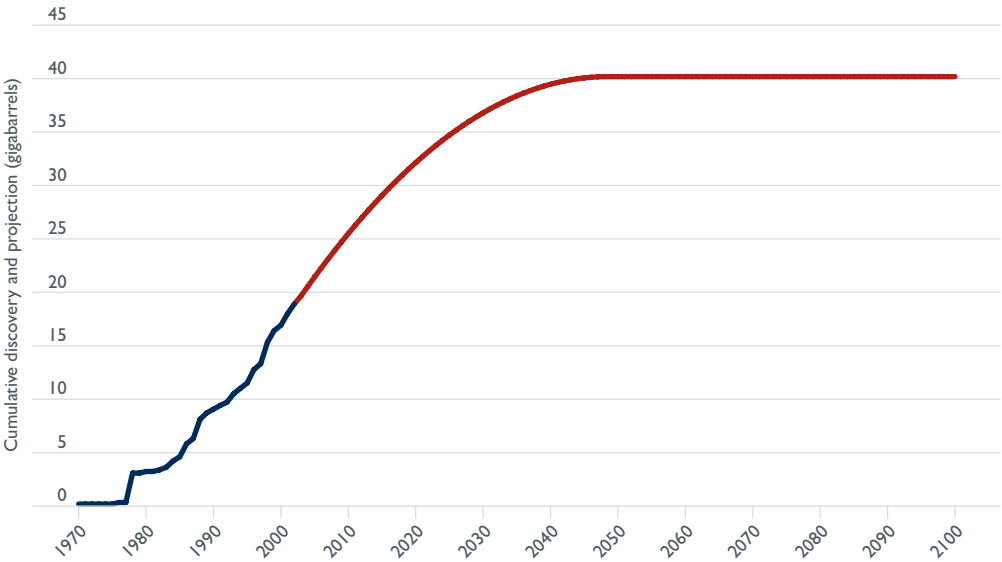
Figure 11.6 Gulf of Mexico deep water cumulative discovery growth curve



3. The plot is examined and a best guess at an ultimate discovery (UD) is made. In this case it is 40 gigabarrels.

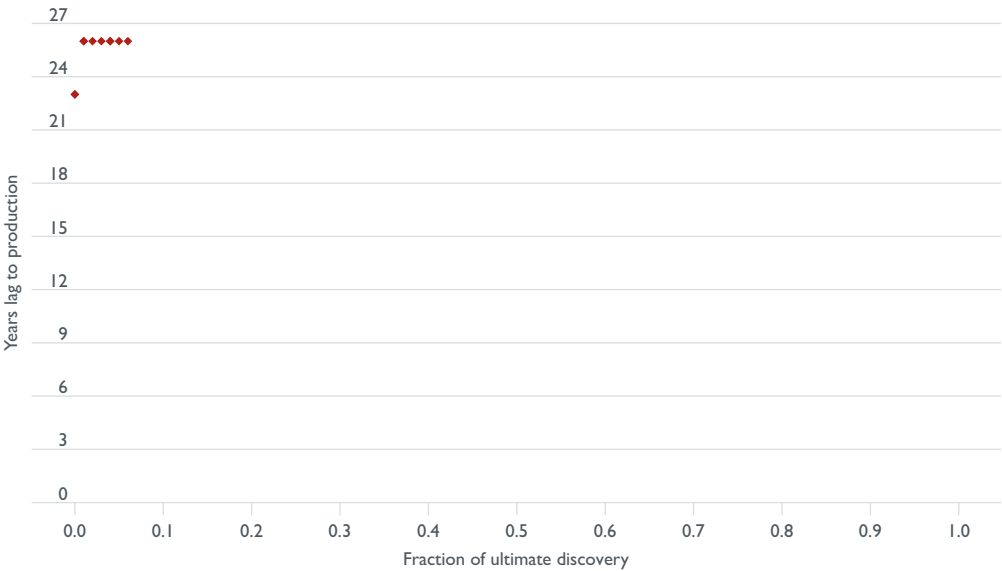
4. Cumulative discovery in 2006 is then projected to UD by bringing SD estimated for 2007 to zero in 2049. For Gulf of Mexico deep water oil, the projection of the cumulative discovery curve is shown in Figure 11.7.

Figure 11.7 Gulf of Mexico deep water cumulative discovery projection

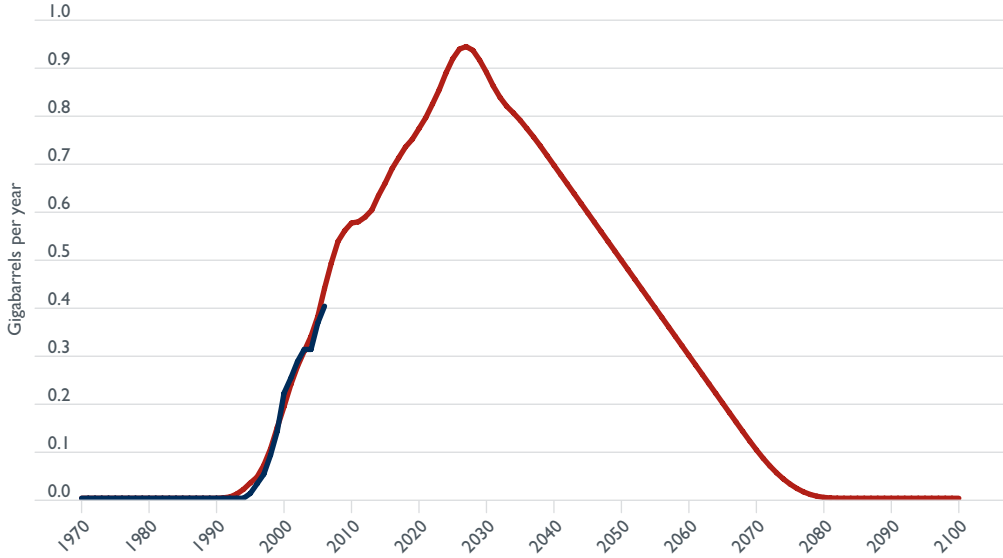


5. The lag from cumulative production is immature, but extrapolating the trend at 26 years at 1.0 allows the rest of the cumulative production curve to be forecast from the discovery curve and the predicted lags.

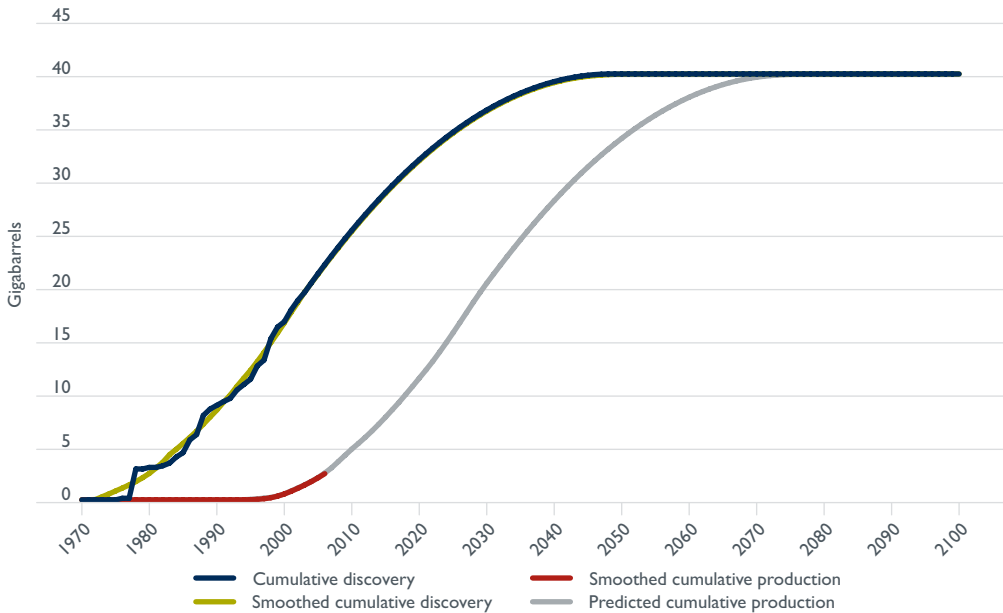
Figure 11.8 Gulf of Mexico deep water stretch lag curve



6. The predicted cumulative production curve is smoothed with a five year average and then differenced to give a raw predicted annual production. This is then averaged over five years to give a final forecast for Gulf of Mexico deep water annual production. This is shown in Figure 11.9.

Figure 11.9 Actual and predicted Gulf of Mexico crude oil production

7. Finally the cumulative discovery and production curves (actual and forecast) are plotted in Figure 11.10. This allows a spatial understanding of the relationship between production and discovery.

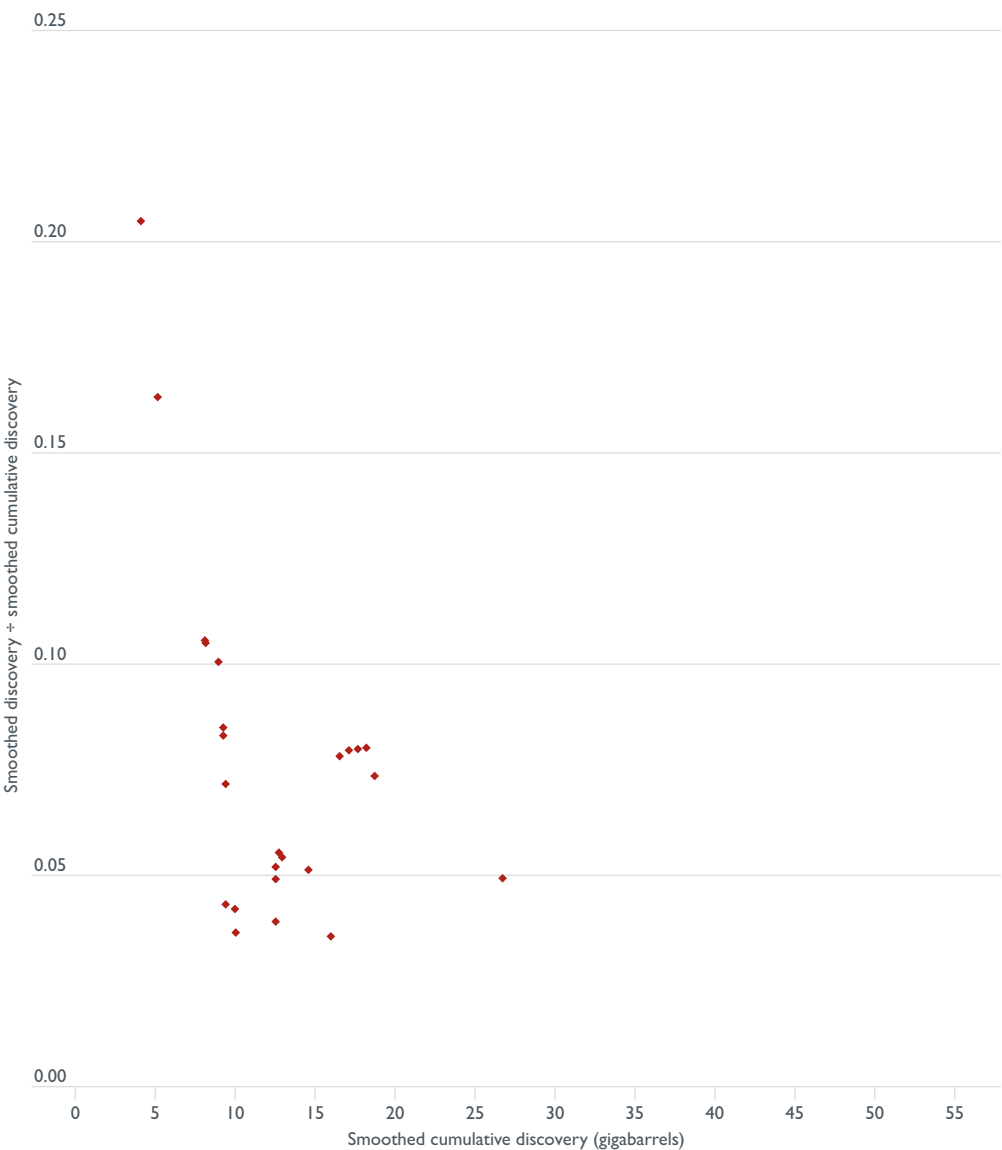
Figure 11.10 Gulf of Mexico deep water cumulative discovery and cumulative production curves

Brazil

Table 11.3 sets out the calculations from the seven steps to a forecast of production of Brazilian deep water oil.

- 1. Discovery (D) and cumulative discovery (CD) are smoothed with 11 year moving averages.
- 2. The fractional growth in discovery (SD/SCD) is calculated and plotted against last year's smoothed cumulative discovery (Figure 11.11).

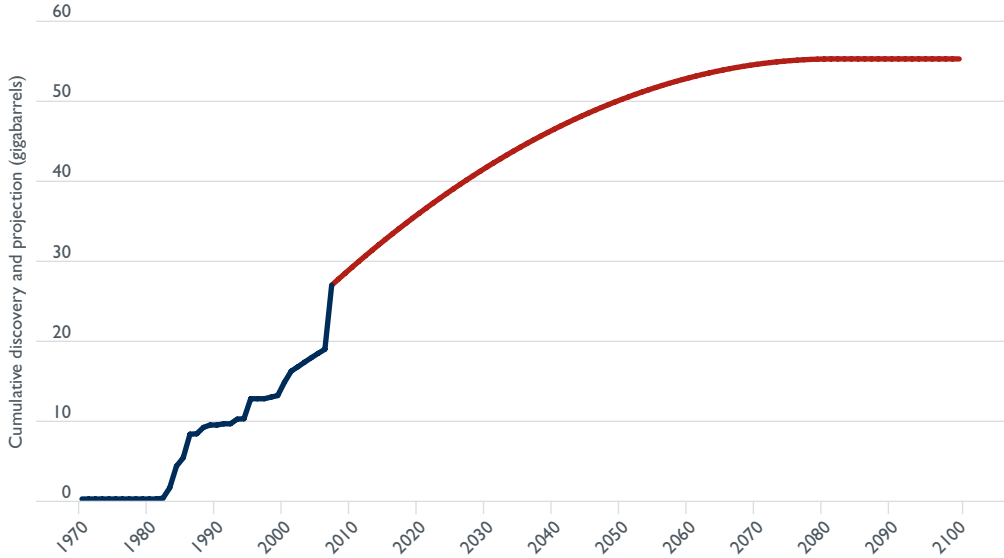
Figure 11.11 Brazilian deep water cumulative discovery growth curve



- 3. The plot is examined and a best guess at an ultimate discovery (UD) is made. In this case it is 55 gigabarrels.

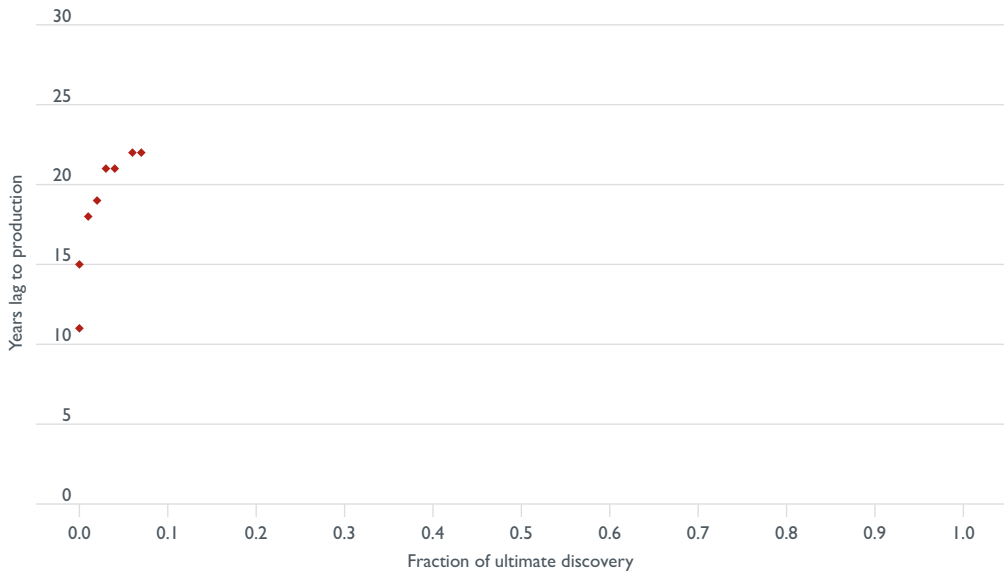
- Cumulative discovery in 2007 is then projected to UD by bringing SD estimated for 2007 to zero in 2081. For Brazilian deep water oil, the projection of the cumulative discovery curve is shown in Figure 11.12.

Figure 11.12 Brazilian deep water cumulative discovery projection



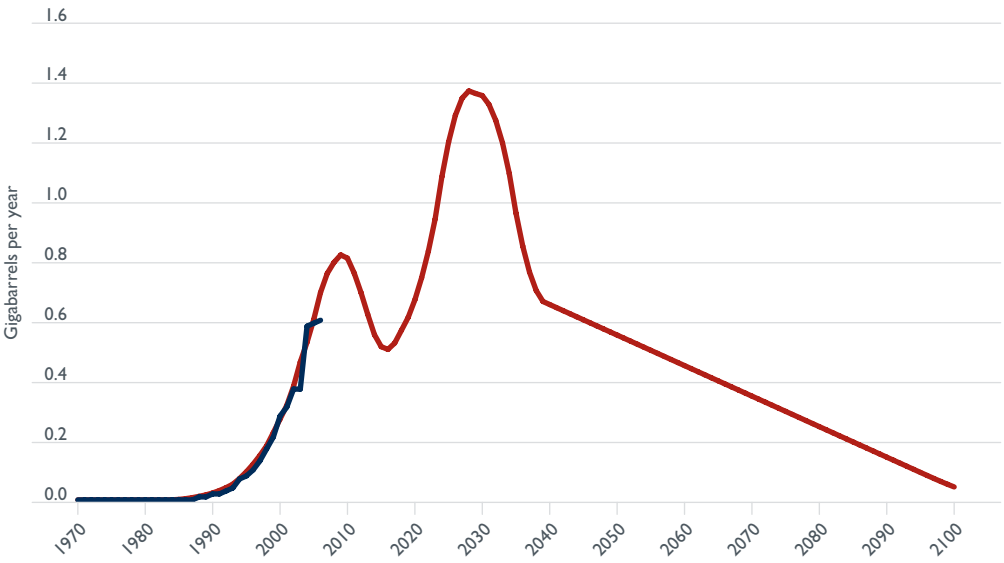
- The lag from cumulative production is immature, but extrapolating the trend at 22 years to 1.0 allows the rest of the cumulative production curve to be forecast from the discovery curve and the predicted lags.

Figure 11.13 Brazilian deep water stretch lag curve



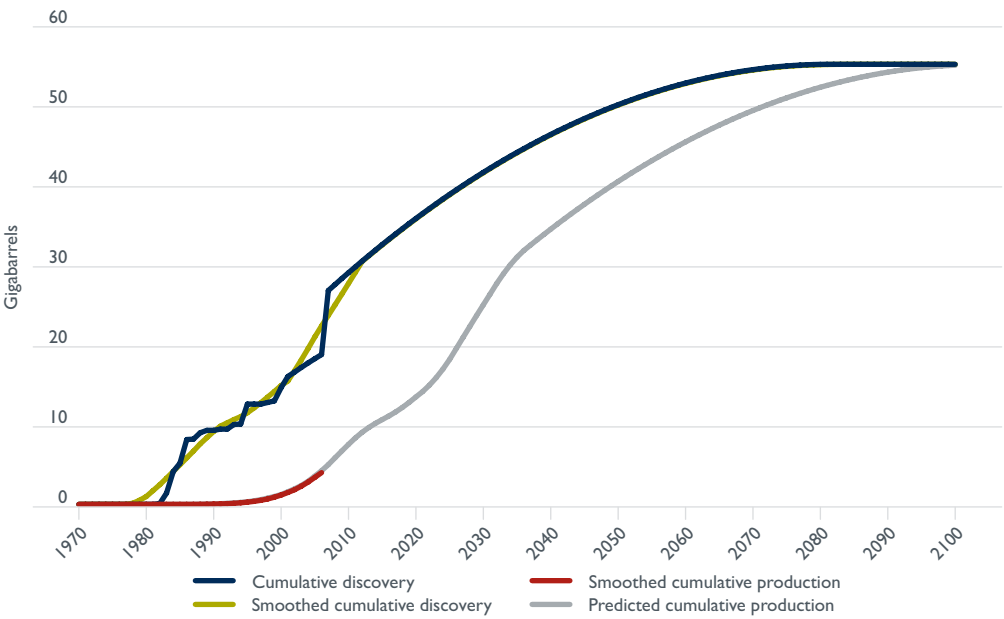
- The predicted cumulative production curve is smoothed with a five year average and then differenced to give a raw predicted annual production. This is then averaged over five years to give a final forecast for Brazilian deep water annual production. This is shown in Figure 11.14.

Figure 11.14 Actual and predicted Brazilian deep water crude oil production



7. Finally the cumulative discovery and production curves (actual and forecast) are plotted in Figure 11.15. This allows a spatial understanding of the relationship between production and discovery.

Figure 11.15 Brazilian deep water cumulative discovery and cumulative production curves

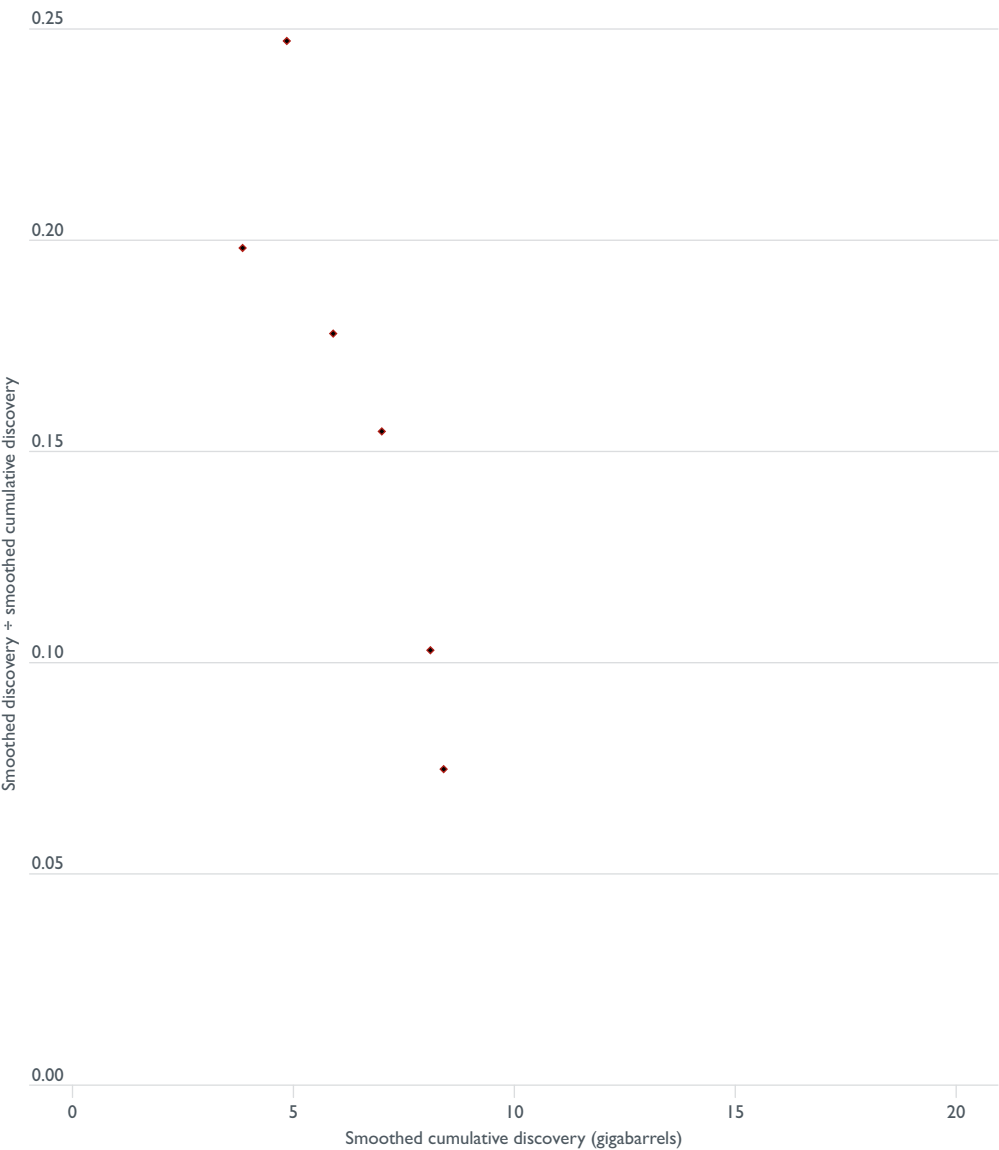


Nigeria

Table 11.4 sets out the calculations from the seven steps to a forecast of production of Nigerian deep water oil.

- 1. Discovery (D) and cumulative discovery (CD) are smoothed with 11 year moving averages.
- 2. The fractional growth in discovery (SD/SCD) is calculated and plotted against last year's smoothed cumulative discovery (Figure 11.16).

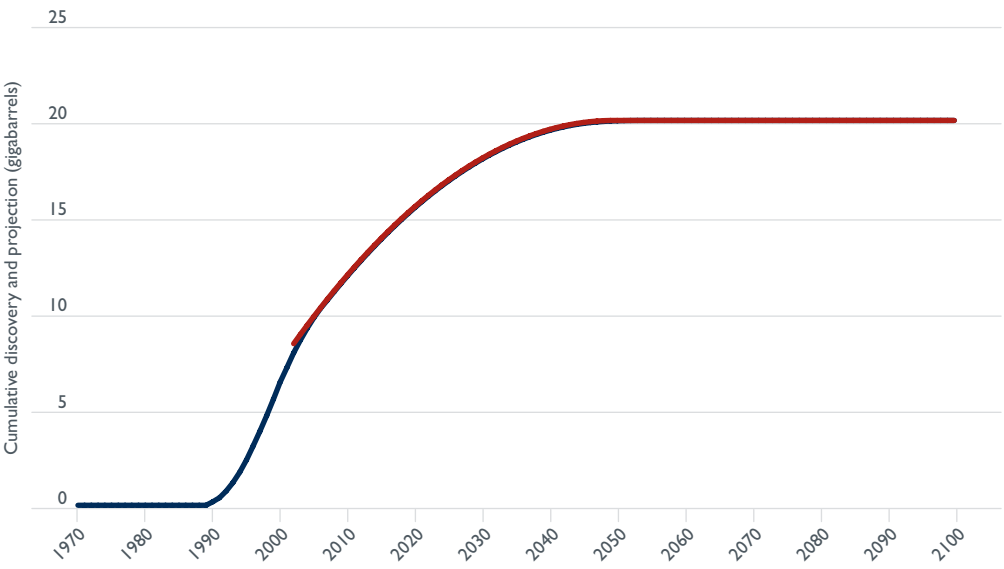
Figure 11.16 Nigerian deep water cumulative discovery growth curve



- 3. The plot is examined and a best guess at an ultimate discovery (UD) is made. In this case it is 20 gigabarrels.

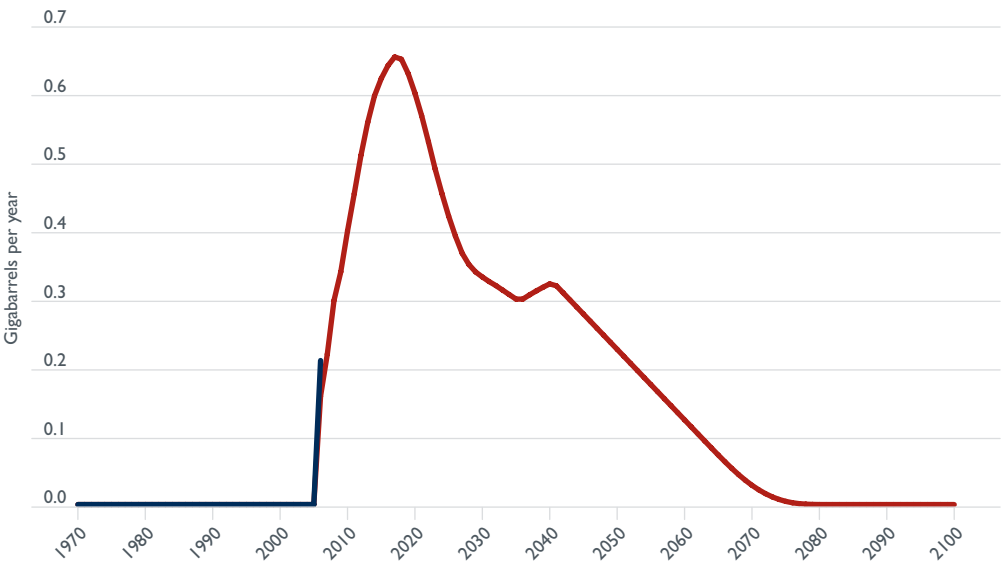
- 4. Cumulative discovery in 2006 is then projected to UD by bringing SD estimated for 2007 to zero in 2049. For Nigerian deep water oil, the projection of the cumulative discovery curve is shown in Figure 11.17.

Figure 11.17 Nigerian deep water cumulative discovery projection



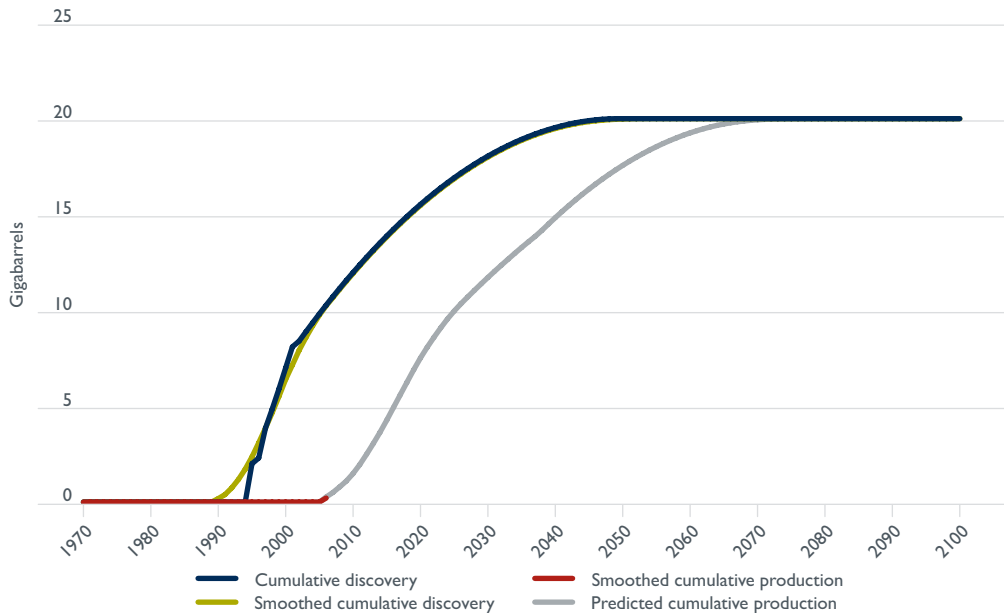
- 5. Nigerian deep water production has just begun, but raising the lag from cumulative production from 16 years to 22 years and then extrapolating the trend at 22 years to 1.0 allows the rest of the cumulative production curve to be forecast from the discovery curve and the predicted lags.
- 6. The predicted cumulative production curve is smoothed with a five year average and then differenced to give a raw predicted annual production. This is then averaged over five years to give a final forecast for world deep water annual production. This is shown in Figure 11.18.

Figure 11.18 Actual and predicted Nigerian deep water crude oil production



- Finally the cumulative discovery and production curves (actual and forecast) are plotted in Figure 11.19. This allows a spatial understanding of the relationship between production and discovery.

Figure 11.19 Nigerian deep water cumulative discovery and cumulative production curves

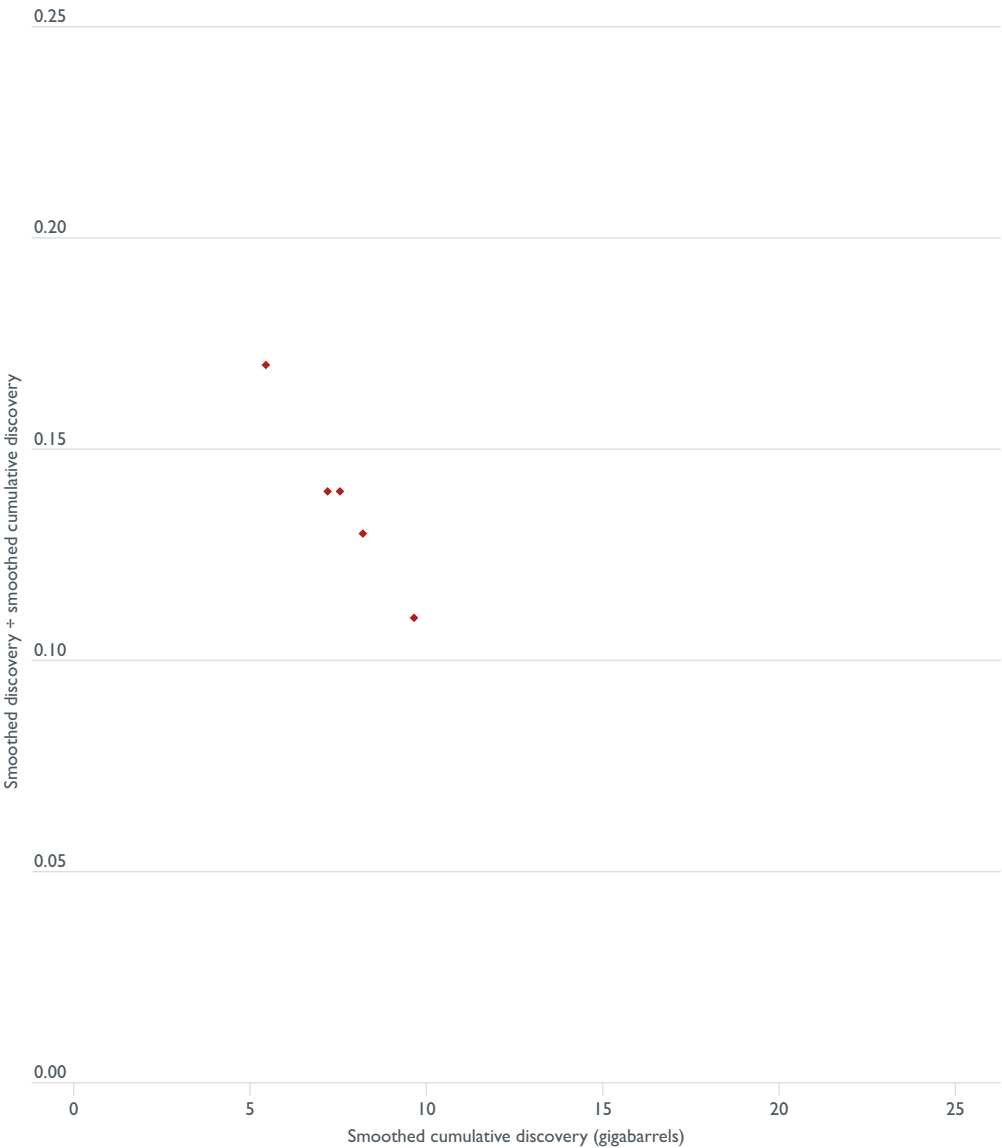


Angola

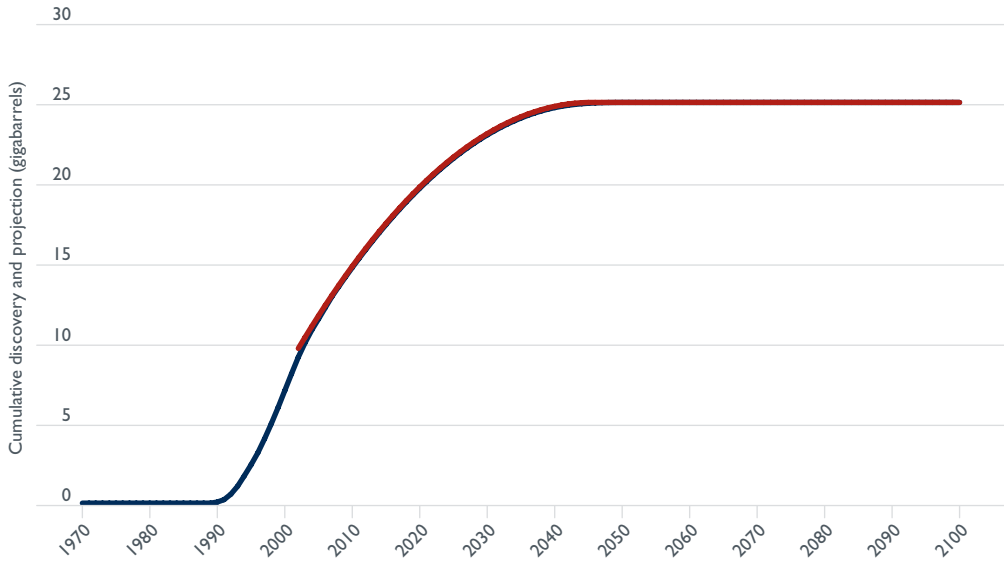
Table 11.5 sets out the calculations from the seven steps to a forecast of production of Angolan deep water oil.

- Discovery (D) and cumulative discovery (CD) are smoothed with 11 year moving averages.
- The fractional growth in discovery (SD/SCD) is calculated and plotted against last year's smoothed cumulative discovery (Figure 11.20).
- The plot is examined and a best guess at an ultimate discovery (UD) is made. In this case it is 25 gigabarrels.
- Cumulative discovery in 2006 is then projected to UD by bringing SD estimated for 2007 to zero in 2046. For Angolan deep water oil, the projection of the cumulative discovery curve is shown in Figure 11.21.

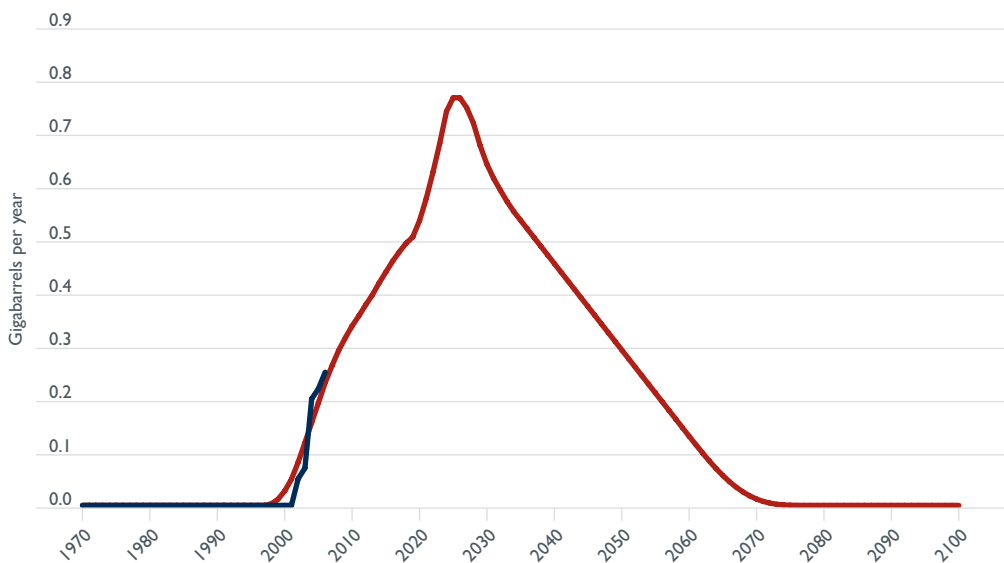
Figure 11.20 Angolan deep water cumulative discovery growth curve



5. The lag from cumulative production is immature, but raising the lag from 12 years to 22 years and then extrapolating the trend at 22 years to 1.0 allows the rest of the cumulative production curve to be forecast from the Angolan discovery curve and the predicted lags.

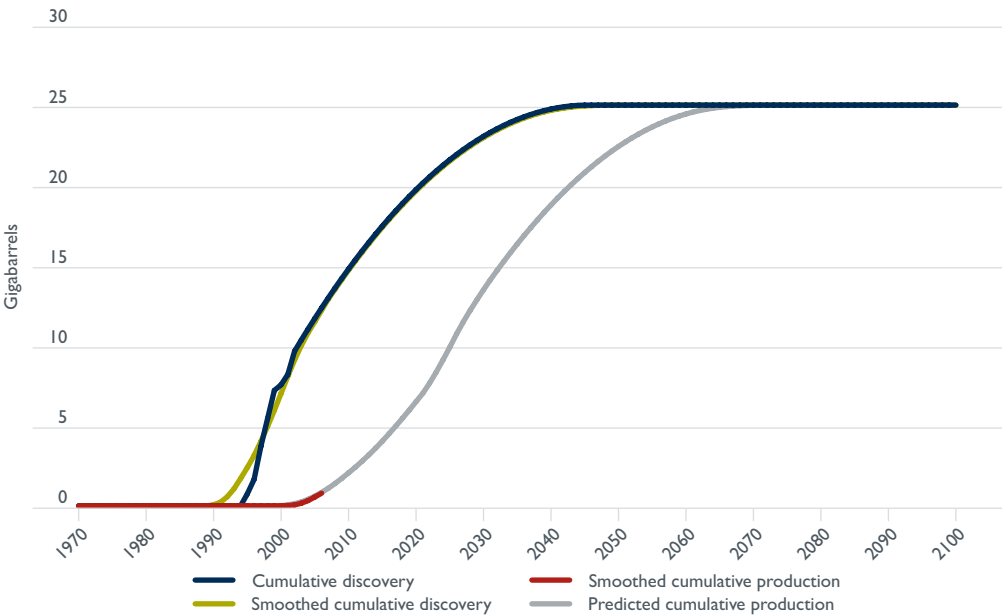
Figure 11.21 Angolan deep water cumulative discovery projection

6. The predicted cumulative production curve is smoothed with a five year average and then differenced to give a raw predicted annual production. This is then averaged over five years to give a final forecast for Angolan deep water annual production. This is shown in Figure 11.22.

Figure 11.22 Actual and predicted Angolan deep water crude oil production

7. Finally the cumulative discovery and production curves (actual and forecast) are plotted in Figure 11.23. This allows a spatial understanding of the relationship between production and discovery.

Figure 11.23 Angolan deep water cumulative discovery and cumulative production curves



Other deep water

Table 11.6 sets out the calculations from the seven steps to a forecast of production of 'Other' deep water oil.

1. Discovery (D) and cumulative discovery (CD) are smoothed with 11 year moving averages.
2. The fractional growth in discovery (SD/SCD) is calculated and plotted against last year's smoothed cumulative discovery (Figure 11.24).
3. The plot is examined and a best guess at an ultimate discovery (UD) is made. In this case it is 25 gigabarrels.
4. Cumulative discovery in 2006 is then projected to UD by bringing SD estimated for 2007 to zero in 2041. For other deep water oil, the projection of the cumulative discovery curve is shown in Figure 11.25.
5. The lag from cumulative production is immature, but extrapolating the trend at 21 years to 1.0 allows the rest of the cumulative production curve to be forecast from the discovery curve and the predicted lags.

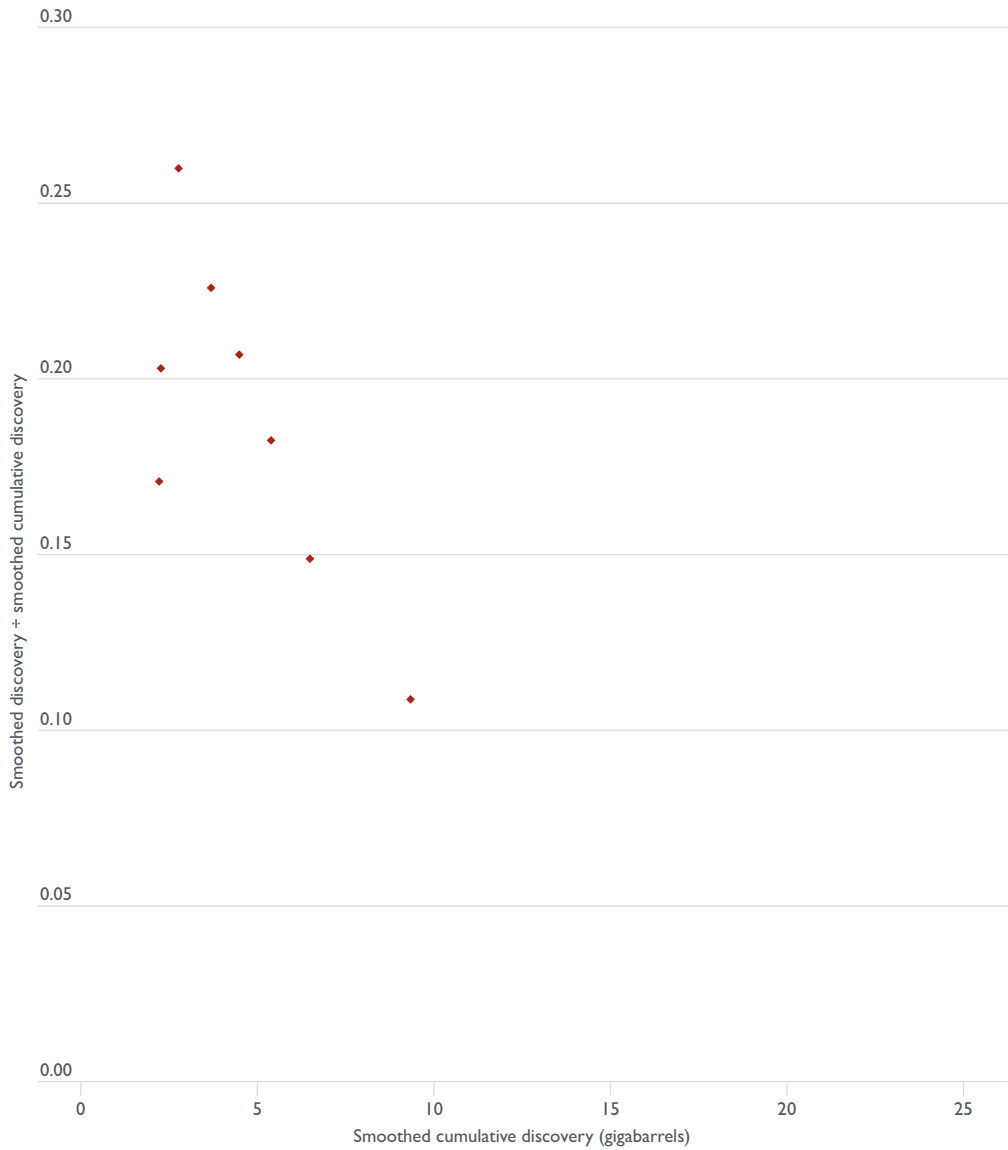
Figure 11.24 'Other' deep water cumulative discovery growth curve

Figure 11.25 Other deep water cumulative discovery projection

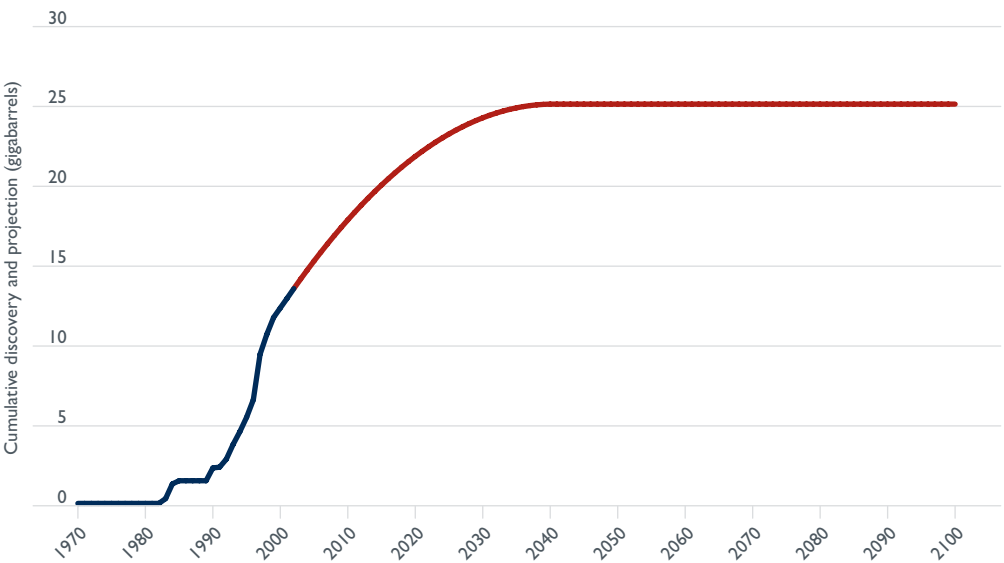
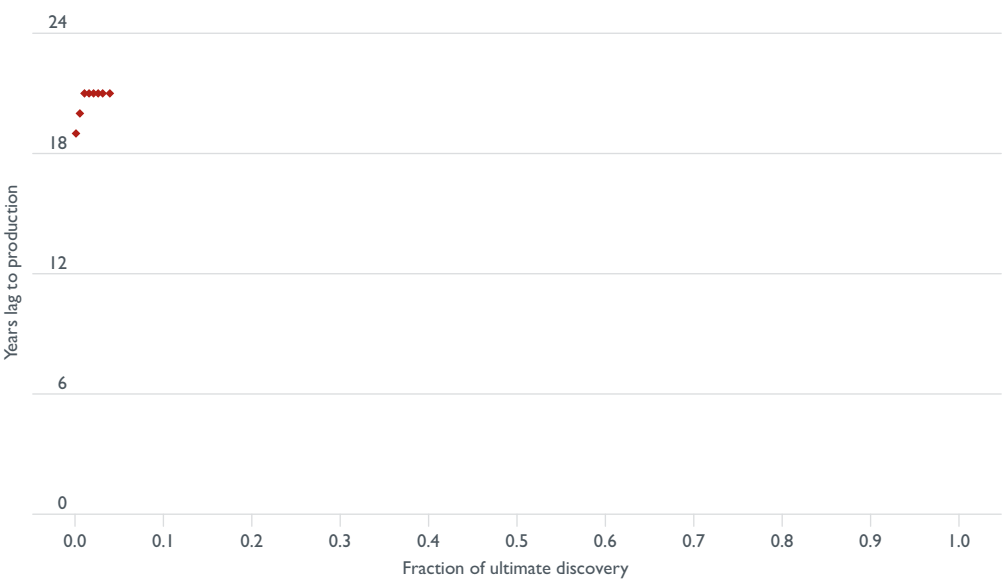
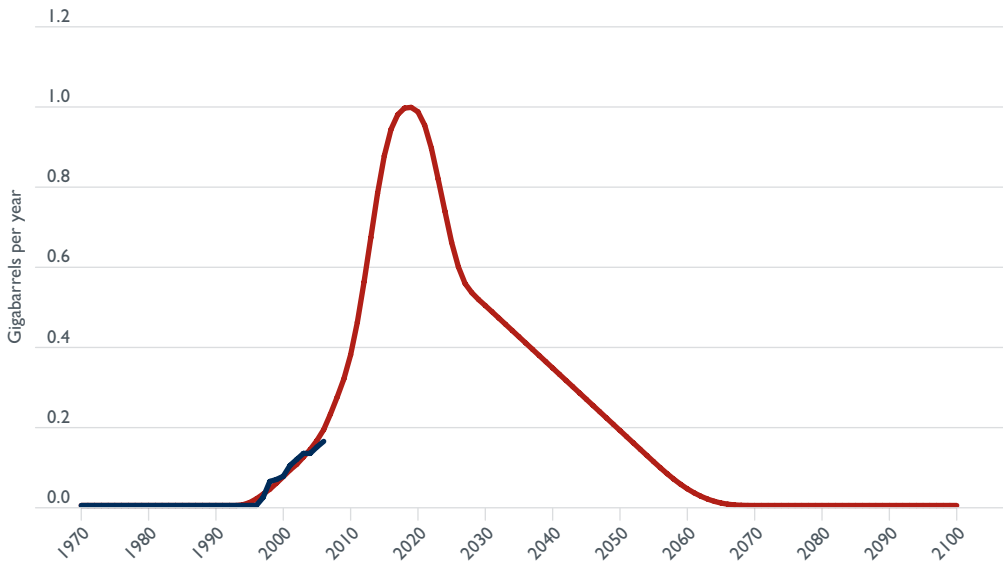
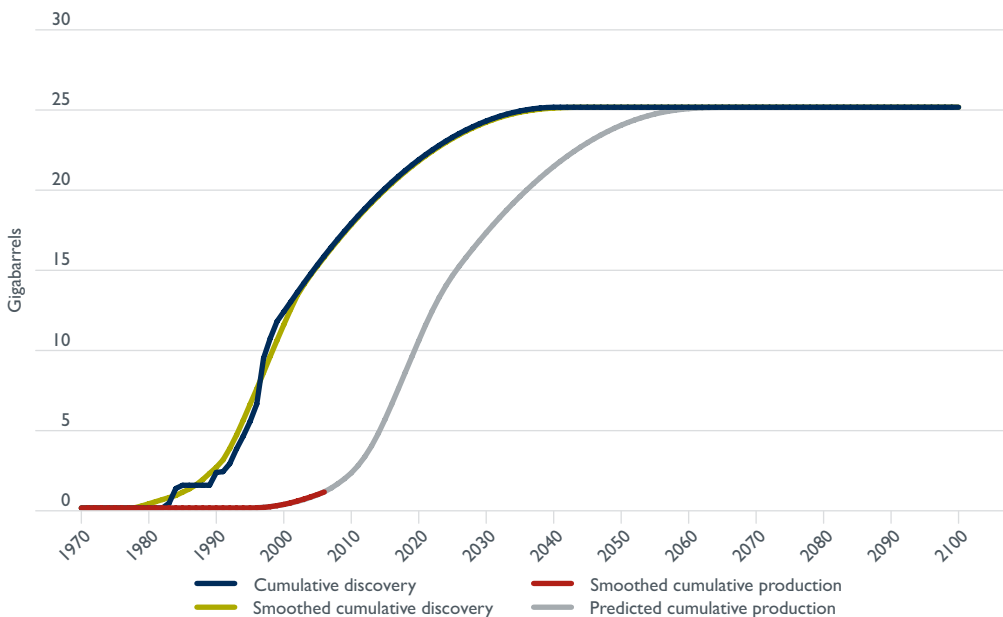


Figure 11.26 Other deep water stretch lag curve



6. The predicted cumulative production curve is smoothed with a five year average and then differenced to give a raw predicted annual production. This is then averaged over five years to give a final forecast for other deep water annual production. This is shown in Figure 11.27.
7. Finally the cumulative discovery and production curves (actual and forecast) are plotted in Figure 11.28. This allows a spatial understanding of the relationship between production and discovery.

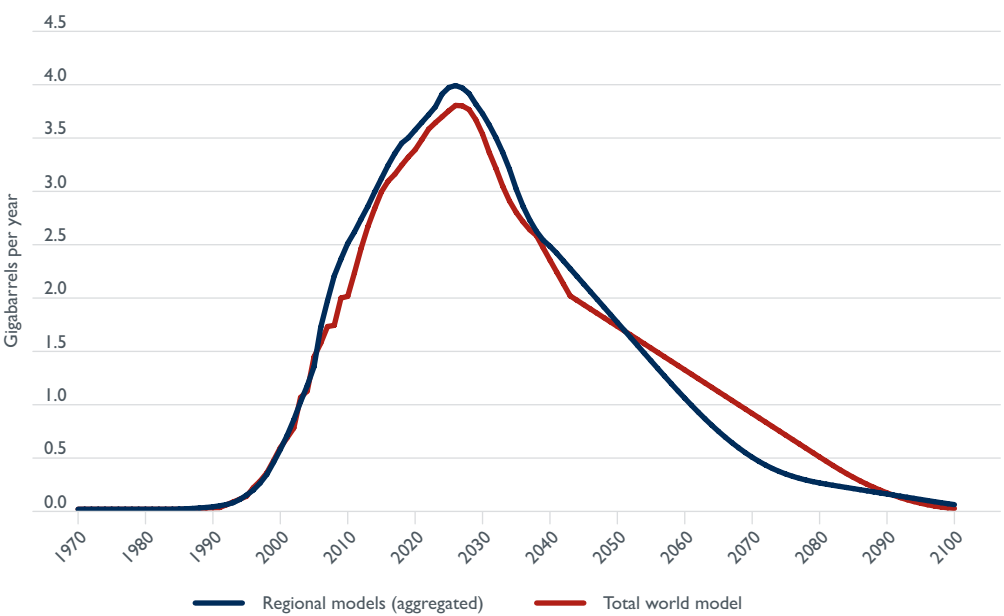
Figure 11.27 Actual and predicted other deep water crude oil production**Figure 11.28** Other deep water cumulative discovery and cumulative production curves

8. The forecast production for 'Other deep water' is split evenly between China and the Rest of the East. This is extremely crude. For example, a small part of the other deep water is off the east coast of Canada. However, the split mentioned above is as good an approximation as can be made with the limited data available to BITRE.

Total deep water

Aggregating the regional deep water forecasts allows a comparison to the forecast from total world discovery data. This comparison is shown in Figure 11.29, and demonstrates that the two approaches give broadly the same forecast future pattern of production growth.

Figure 11.29 Comparison of total and disaggregate deep water forecasts



The disaggregate regional forecasts are used in the final forecasts of deep water production.

Table 11.1 Total Deep, gigabarrels

Year	D	CD	2 l/yr SCD	predlag	Raw Pred CP	No smth Pred SCP	SCP	Raw Pred P	5yr smth Pred SP	Actual P
1950	0.00	0.00	0.00				0.00	0.00	0.00	0.00
1951	0.00	0.00	0.00				0.00	0.00	0.00	0.00
1952	0.00	0.00	0.00				0.00	0.00	0.00	0.00
1953	0.00	0.00	0.00				0.00	0.00	0.00	0.00
1954	0.00	0.00	0.00				0.00	0.00	0.00	0.00
1955	0.00	0.00	0.00				0.00	0.00	0.00	0.00
1956	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1957	0.00	0.00	0.00	30		0.00	0.00	0.00	0.00	0.00
1958	0.00	0.00	0.01	30		0.00	0.00	0.00	0.00	0.00
1959	0.00	0.00	0.02	30		0.00	0.00	0.00	0.00	0.00
1960	0.00	0.00	0.02	29		0.00	0.00	0.00	0.00	0.00
1961	0.00	0.00	0.03	29		0.00	0.00	0.00	0.00	0.00
1962	0.00	0.00	0.04	28		0.00	0.00	0.00	0.00	0.00
1963	0.00	0.00	0.05	28		0.00	0.00	0.00	0.00	0.00
1964	0.00	0.00	0.05	27		0.00	0.00	0.00	0.00	0.00
1965	0.00	0.00	0.06	26		0.00	0.00	0.00	0.00	0.00
1966	0.00	0.00	0.07	26		0.00	0.00	0.00	0.00	0.00
1967	0.05	0.05	0.09	26		0.00	0.00	0.00	0.00	0.00
1968	0.10	0.15	0.23	26		0.00	0.00	0.00	0.00	0.00
1969	0.00	0.15	0.38	26		0.00	0.00	0.00	0.00	0.00
1970	0.00	0.15	0.53	26		0.00	0.00	0.00	0.00	0.00
1971	0.00	0.15	0.68	26		0.00	0.00	0.00	0.00	0.00
1972	0.00	0.15	0.85	26		0.00	0.00	0.00	0.00	0.00
1973	0.00	0.15	1.10	25		0.00	0.00	0.00	0.00	0.00
1974	0.00	0.15	1.55	25		0.00	0.00	0.00	0.00	0.00
1975	0.00	0.15	2.08	25		0.00	0.00	0.00	0.00	0.00
1976	0.15	0.30	2.81	25		0.00	0.00	0.00	0.00	0.00
1977	0.00	0.30	3.57	25		0.00	0.00	0.00	0.00	0.00
1978	2.75	3.05	4.44	25		0.00	0.00	0.00	0.00	0.00
1979	0.00	3.05	5.36	25		0.00	0.00	0.00	0.00	0.00
1980	0.15	3.20	6.33	25		0.00	0.00	0.00	0.00	0.00
1981	0.00	3.20	7.32	24		0.00	0.00	0.00	0.00	0.00
1982	0.25	3.45	8.35	24		0.00	0.00	0.00	0.00	0.00
1983	1.85	5.30	9.50	24		0.00	0.00	0.00	0.00	0.00
1984	4.20	9.50	10.70	23		0.00	0.00	0.00	0.00	0.00
1985	1.65	11.15	12.23	23		0.00	0.00	0.00	0.00	0.00
1986	4.15	15.30	13.92	23		0.00	0.00	0.00	0.00	0.00
1987	0.55	15.85	15.94	23	0.00	0.00	0.00	0.00	0.01	0.00
1988	2.60	18.45	18.25	23	0.01	0.01	0.01	0.01	0.01	0.01
1989	0.90	19.35	20.68	23	0.02	0.02	0.02	0.01	0.01	0.01
1990	1.15	20.50	23.31	23	0.04	0.04	0.03	0.01	0.01	0.02
1991	0.55	21.05	26.16	23	0.06	0.06	0.05	0.02	0.02	0.02
1992	0.80	21.85	29.20	23	0.07	0.07	0.08	0.01	0.04	0.03
1993	2.30	24.15	32.36	23	0.09	0.09	0.13	0.01	0.07	0.04
1994	1.35	25.50	35.56	23	0.23	0.23	0.20	0.15	0.09	0.07
1995	6.65	32.15	38.69	23	0.38	0.38	0.29	0.15	0.12	0.09
1996	3.55	35.70	41.87	23	0.53	0.53	0.43	0.15	0.20	0.13
1997	7.00	42.70	45.32	23	0.68	0.68	0.64	0.15	0.26	0.20
1998	6.20	48.90	48.87	23	1.10	1.10	0.95	0.42	0.34	0.32
1999	5.15	54.05	52.41	23	1.55	1.55	1.39	0.45	0.46	0.42
2000	4.20	58.25	56.02	23	2.08	2.08	1.94	0.53	0.58	0.57
2001	4.85	63.10	59.68	23	2.81	2.81	2.62	0.73	0.67	0.66
2002	3.80	66.90	63.44	23	3.57	3.57	3.41	0.75	0.76	0.82
2003	2.89	69.79	67.26	23	4.44	4.44	4.38	0.88	1.05	0.88
2004	2.79	72.58	71.08	23	5.36	5.36	5.52	0.91	1.11	1.22
2005	2.68	75.26	74.94	23	7.32	7.32	6.90	1.96	1.43	1.32
2006	2.58	77.84	78.59	23	8.35	8.35	8.42	1.03	1.56	1.62
2007	9.98	87.82	82.17	23	10.70	10.70		2.35	1.71	
2008	2.49	90.31	85.52	23	12.23	12.23		1.52	1.72	
2009	2.45	92.76	88.66	23	13.92	13.92		1.69	1.98	
2010	2.41	95.16	91.66	23	15.94	15.94		2.02	2.00	
2011	2.37	97.53	94.55	23	18.25	18.25		2.31	2.22	
2012	2.33	99.86	97.30	23	20.68	20.68		2.43	2.45	
2013	2.29	102.14	99.96	23	23.31	23.31		2.63	2.65	
2014	2.24	104.39	102.57	23	26.16	26.16		2.85	2.82	
2015	2.20	106.59	105.14	23	29.20	29.20		3.03	2.98	
2016	2.16	108.76	107.65	23	32.36	32.36		3.16	3.08	
2017	2.12	110.88	110.13	23	35.56	35.56		3.20	3.14	
2018	2.08	112.96	112.21	23	38.69	38.69		3.13	3.22	
2019	2.04	115.00	114.25	23	41.87	41.87		3.18	3.30	
2020	2.00	117.00	116.25	23	45.32	45.32		3.45	3.37	
2021	1.96	118.96	118.21	23	48.87	48.87		3.55	3.46	
2022	1.92	120.88	120.13	23	52.41	52.41		3.54	3.56	
2023	1.88	122.76	122.01	23	56.02	56.02		3.61	3.62	
2024	1.84	124.59	123.84	23	59.68	59.68		3.67	3.68	
2025	1.80	126.39	125.64	23	63.44	63.44		3.75	3.74	
2026	1.76	128.14	127.40	23	67.26	67.26		3.82	3.79	
2027	1.71	129.86	129.11	23	71.08	71.08		3.82	3.78	
2028	1.67	131.53	130.78	23	74.94	74.94		3.86	3.75	
2029	1.63	133.16	132.42	23	78.59	78.59		3.65	3.65	
2030	1.59	134.16	134.01	23	82.17	82.17		3.58	3.52	

(continued)

Table 11.1 Total Deep, gigabarrels

Year	D	CD	21yr SCD	predlag	Raw Pred CP	No smth Pred SCP	SCP	Raw Pred P	5yr smth Pred SP	Actual P
2031	1.55	135.16	135.56	23	85.52	85.52		3.35	3.34	
2032	1.51	137.82	137.07	23	88.66	88.66		3.15	3.19	
2033	1.47	139.29	138.54	23	91.66	91.66		3.00	3.03	
2034	1.43	140.72	139.97	23	94.55	94.55		2.89	2.89	
2035	1.39	142.10	141.36	23	97.30	97.30		2.75	2.78	
2036	1.35	143.45	142.70	23	99.96	99.96		2.66	2.69	
2037	1.31	144.76	144.01	23	102.57	102.57		2.61	2.62	
2038	1.27	146.02	145.27	23	105.14	105.14		2.56	2.57	
2039	1.22	147.25	146.50	23	107.65	107.65		2.52	2.45	
2040	1.18	148.43	147.68	23	110.13	110.13		2.48	2.34	
2041	1.14	149.57	148.82	23	112.21	112.21		2.08	2.22	
2042	1.10	150.67	149.93	23	114.25	114.25		2.04	2.11	
2043	1.06	151.74	150.99	23	116.25	116.25		2.00	2.00	
2044	1.02	152.76	152.01	23	118.21	118.21		1.96	1.96	
2045	0.98	153.74	152.99	23	120.13	120.13		1.92	1.92	
2046	0.94	154.67	153.93	23	122.01	122.01		1.88	1.88	
2047	0.90	155.57	154.82	23	123.84	123.84		1.84	1.84	
2048	0.86	156.43	155.68	23	125.64	125.64		1.80	1.80	
2049	0.82	157.25	156.50	23	127.40	127.40		1.76	1.76	
2050	0.78	158.02	157.27	23	129.11	129.11		1.71	1.71	
2051	0.73	158.76	158.01	23	130.78	130.78		1.67	1.67	
2052	0.69	159.45	158.70	23	132.42	132.42		1.63	1.63	
2053	0.65	160.10	159.36	23	134.01	134.01		1.59	1.59	
2054	0.61	160.72	159.97	23	135.56	135.56		1.55	1.55	
2055	0.57	161.29	160.54	23	137.07	137.07		1.51	1.51	
2056	0.53	161.82	161.07	23	138.54	138.54		1.47	1.47	
2057	0.49	162.31	161.56	23	139.97	139.97		1.43	1.43	
2058	0.45	162.76	162.01	23	141.36	141.36		1.39	1.39	
2059	0.41	163.16	162.42	23	142.70	142.70		1.35	1.35	
2060	0.37	163.53	162.79	23	144.01	144.01		1.31	1.31	
2061	0.33	163.86	163.12	23	145.27	145.27		1.27	1.27	
2062	0.29	164.14	163.42	23	146.50	146.50		1.22	1.22	
2063	0.24	164.39	163.68	23	147.68	147.68		1.18	1.18	
2064	0.20	164.59	163.91	23	148.82	148.82		1.14	1.14	
2065	0.16	164.76	164.12	23	149.93	149.93		1.10	1.10	
2066	0.12	164.88	164.29	23	150.99	150.99		1.06	1.06	
2067	0.08	164.96	164.44	23	152.01	152.01		1.02	1.02	
2068	0.04	165.00	164.57	23	152.99	152.99		0.98	0.98	
2069	0.00	165.00	164.68	23	153.93	153.93		0.94	0.94	
2070	0.00	165.00	164.77	23	154.82	154.82		0.90	0.90	
2071	0.00	165.00	164.84	23	155.68	155.68		0.86	0.86	
2072	0.00	165.00	164.89	23	156.50	156.50		0.82	0.82	
2073	0.00	165.00	164.93	23	157.27	157.27		0.78	0.78	
2074	0.00	165.00	164.96	23	158.01	158.01		0.73	0.73	
2075	0.00	165.00	164.98	23	158.70	158.70		0.69	0.69	
2076	0.00	165.00	164.99	23	159.36	159.36		0.65	0.65	
2077	0.00	165.00	165.00	23	159.97	159.97		0.61	0.61	
2078	0.00	165.00	165.00	23	160.54	160.54		0.57	0.57	
2079	0.00	165.00	165.00	23	161.07	161.07		0.53	0.53	
2080	0.00	165.00	165.00	23	161.56	161.56		0.49	0.49	
2081	0.00	165.00	165.00	23	162.01	162.01		0.45	0.45	
2082	0.00	165.00	165.00	23	162.42	162.42		0.41	0.41	
2083	0.00	165.00	165.00	23	162.79	162.79		0.37	0.37	
2084	0.00	165.00	165.00	23	163.12	163.12		0.33	0.33	
2085	0.00	165.00	165.00	23	163.42	163.42		0.30	0.30	
2086	0.00	165.00	165.00	23	163.68	163.68		0.26	0.27	
2087	0.00	165.00	165.00	23	163.91	163.91		0.23	0.24	
2088	0.00	165.00	165.00	23	164.12	164.12		0.20	0.21	
2089	0.00	165.00	165.00	23	164.29	164.29		0.18	0.18	
2090	0.00	165.00	165.00	23	164.44	164.44		0.15	0.15	
2091	0.00	165.00	165.00	23	164.57	164.57		0.13	0.13	
2092	0.00	165.00	165.00	23	164.68	164.68		0.11	0.11	
2093	0.00	165.00	165.00	23	164.77	164.77		0.09	0.09	
2094	0.00	165.00	165.00	23	164.84	164.84		0.07	0.07	
2095	0.00	165.00	165.00	23	164.89	164.89		0.05	0.06	
2096	0.00	165.00	165.00	23	164.93	164.93		0.04	0.04	
2097	0.00	165.00	165.00	23	164.96	164.96		0.03	0.03	
2098	0.00	165.00	165.00	23	164.98	164.98		0.02	0.02	
2099	0.00	165.00	165.00	23	164.99	164.99		0.01	0.01	
2100	0.00	165.00	165.00	23	165.00	165.00		0.01	0.01	

Notes: D—discovery; CD—cumulative discovery; SCD—smoothed cumulative discovery (years = number of years centred moving average); adj—adjusted (to match cumulative production maximum); predlag—predicted lag between cumulative discovery and cumulative production; raw Pred CP—prediction using direct lag of cumulative discovery by predicted lag years; Pred SCP—raw predicted CP smoothed (with years = number of years centred moving average); SCP—smoothed actual cumulative production (years = number of years centred moving average); raw Pred P—one year change in predicted smoothed cumulative production; Pred SP—smoothed raw Pred P (years = number of years centred moving average); Actual P—actual annual oil production. Shaded numbers are interpolations, extrapolations or forecasts.

Table 11.2 Gulf of Mexico deep, gigabarrels

Year	Gb D	CD	1 Yr SCD	Predlag	Raw pred CP	5yr smth pred SCP	SCP	Raw pred P	5yr smth pred SP	Actual P
1970	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1971	0.00	0.00	0.01	23		0.00	0.00	0.00	0.00	0.00
1972	0.00	0.00	0.03	23		0.00	0.00	0.00	0.00	0.00
1973	0.00	0.00	0.29	26		0.00	0.00	0.00	0.00	0.00
1974	0.00	0.00	0.55	26		0.00	0.00	0.00	0.00	0.00
1975	0.00	0.00	0.83	26		0.00	0.00	0.00	0.00	0.00
1976	0.15	0.15	1.11	26		0.00	0.00	0.00	0.00	0.00
1977	0.00	0.15	1.40	26		0.00	0.00	0.00	0.00	0.00
1978	2.75	2.90	1.71	26		0.00	0.00	0.00	0.00	0.00
1979	0.00	2.90	2.08	26		0.00	0.00	0.00	0.00	0.00
1980	0.15	3.05	2.48	26		0.00	0.00	0.00	0.00	0.00
1981	0.00	3.05	2.99	26		0.00	0.00	0.00	0.00	0.00
1982	0.15	3.20	3.54	26		0.00	0.00	0.00	0.00	0.00
1983	0.25	3.45	4.25	26		0.00	0.00	0.00	0.00	0.00
1984	0.58	4.03	4.76	26		0.00	0.00	0.00	0.00	0.00
1985	0.40	4.43	5.30	26		0.00	0.00	0.00	0.00	0.00
1986	1.20	5.63	5.86	26		0.00	0.00	0.00	0.00	0.00
1987	0.50	6.13	6.45	26		0.00	0.00	0.00	0.00	0.00
1988	1.80	7.93	7.10	26		0.00	0.00	0.00	0.00	0.00
1989	0.60	8.53	7.77	26		0.00	0.00	0.00	0.00	0.00
1990	0.35	8.88	8.43	26		0.00	0.00	0.00	0.00	0.00
1991	0.35	9.23	9.18	26		0.00	0.00	0.00	0.00	0.00
1992	0.30	9.53	9.86	26		0.00	0.00	0.00	0.00	0.00
1993	0.80	10.33	10.68	26		0.01	0.00	0.01	0.01	0.00
1994	0.50	10.83	11.43	26	0.01	0.01	0.00	0.01	0.02	0.00
1995	0.50	11.33	12.18	26	0.03	0.04	0.02	0.03	0.03	0.01
1996	1.25	12.58	12.99	26	0.09	0.09	0.05	0.05	0.04	0.03
1997	0.55	13.13	13.85	26	0.16	0.16	0.10	0.07	0.07	0.05
1998	2.00	15.13	14.76	26	0.23	0.23	0.20	0.07	0.10	0.09
1999	1.10	16.23	15.67	26	0.29	0.36	0.35	0.13	0.15	0.14
2000	0.50	16.73	16.62	26	0.55	0.56	0.55	0.20	0.19	0.22
2001	1.10	17.83	17.60	26	0.83	0.83	0.80	0.27	0.24	0.25
2002	0.90	18.73	18.54	26	1.11	1.11	1.08	0.28	0.27	0.29
2003	0.75	19.48	19.50	26	1.40	1.41	1.38	0.29	0.31	0.31
2004	0.89	20.37	20.36	26	1.71	1.73	1.71	0.32	0.34	0.31
2005	0.87	21.24	21.18	26	2.08	2.09	2.07	0.36	0.38	0.37
2006	0.85	22.10	22.03	26	2.48	2.52	2.46	0.43	0.44	0.40
2007	0.83	22.93	22.84	26	2.99	3.01		0.49	0.49	
2008	0.81	23.74	23.64	26	3.54	3.59		0.59	0.54	
2009	0.79	24.53	24.44	26	4.25	4.18		0.59	0.56	
2010	0.77	25.31	25.21	26	4.76	4.77		0.59	0.57	
2011	0.75	26.06	25.96	26	5.30	5.31		0.54	0.58	
2012	0.73	26.79	26.70	26	5.86	5.87		0.56	0.59	
2013	0.71	27.51	27.41	26	6.45	6.47		0.60	0.60	
2014	0.69	28.20	28.10	26	7.10	7.11		0.64	0.63	
2015	0.67	28.88	28.78	26	7.77	7.77		0.66	0.66	
2016	0.65	29.53	29.43	26	8.43	8.46		0.69	0.69	
2017	0.63	30.16	30.07	26	9.18	9.16		0.70	0.71	
2018	0.61	30.78	30.68	26	9.86	9.90		0.75	0.73	
2019	0.59	31.37	31.27	26	10.68	10.65		0.75	0.75	
2020	0.57	31.95	31.85	26	11.43	11.43		0.77	0.77	
2021	0.56	32.50	32.40	26	12.18	12.20		0.77	0.79	
2022	0.54	33.04	32.94	26	12.99	13.01		0.81	0.82	
2023	0.52	33.55	33.45	26	13.85	13.87		0.86	0.85	
2024	0.50	34.05	33.95	26	14.76	14.76		0.89	0.89	
2025	0.48	34.53	34.43	26	15.67	15.68		0.92	0.92	
2026	0.46	34.98	34.88	26	16.62	16.63		0.95	0.94	
2027	0.44	35.42	35.32	26	17.60	17.58		0.96	0.94	
2028	0.42	35.83	35.73	26	18.54	18.54		0.96	0.93	
2029	0.40	36.23	36.13	26	19.50	19.46		0.92	0.91	
2030	0.38	36.61	36.51	26	20.36	20.35		0.88	0.89	
2031	0.36	36.96	36.86	26	21.18	21.19		0.84	0.86	
2032	0.34	37.30	37.20	26	22.03	22.02		0.83	0.84	
2033	0.32	37.62	37.52	26	22.84	22.84		0.82	0.82	
2034	0.30	37.91	37.82	26	23.64	23.64		0.80	0.80	
2035	0.28	38.19	38.09	26	24.44	24.43		0.79	0.79	
2036	0.26	38.45	38.35	26	25.21	25.20		0.77	0.77	
2037	0.24	38.69	38.59	26	25.96	25.96		0.75	0.75	
2038	0.22	38.91	38.81	26	26.70	26.69		0.73	0.73	
2039	0.20	39.10	39.01	26	27.41	27.40		0.71	0.71	
2040	0.18	39.28	39.18	26	28.10	28.10		0.69	0.69	
2041	0.16	39.44	39.34	26	28.78	28.77		0.67	0.67	
2042	0.14	39.58	39.48	26	29.43	29.42		0.65	0.65	
2043	0.12	39.70	39.60	26	30.07	30.06		0.63	0.63	
2044	0.10	39.80	39.70	26	30.68	30.67		0.61	0.61	
2045	0.08	39.88	39.78	26	31.27	31.27		0.59	0.59	
2046	0.06	39.94	39.84	26	31.85	31.84		0.57	0.57	
2047	0.04	39.98	39.90	26	32.40	32.40		0.56	0.56	
2048	0.02	40.00	39.93	26	32.94	32.93		0.54	0.54	
2049	0.00	40.00	39.96	26	33.45	33.45		0.52	0.52	
2050	0.00	40.00	39.98	26	33.95	33.94		0.50	0.50	

(continued)

Table 11.2 Gulf of Mexico deep, gigabarrels

Year	Gb D	CD	1 lyr SCD	Predlag	Raw pred CP	Syr smth pred SCP	SCP	Raw pred P	Syr smth pred SP	Actual P
2051	0.00	40.00	39.99	26	34.43	34.42		0.48	0.48	
2052	0.00	40.00	39.99	26	34.88	34.88		0.46	0.46	
2053	0.00	40.00	40.00	26	35.32	35.31		0.44	0.44	
2054	0.00	40.00	40.00	26	35.73	35.73		0.42	0.42	
2055	0.00	40.00	40.00	26	36.13	36.12		0.40	0.40	
2056	0.00	40.00	40.00	26	36.51	36.50		0.38	0.38	
2057	0.00	40.00	40.00	26	36.86	36.86		0.36	0.36	
2058	0.00	40.00	40.00	26	37.20	37.19		0.34	0.34	
2059	0.00	40.00	40.00	26	37.52	37.51		0.32	0.32	
2060	0.00	40.00	40.00	26	37.82	37.81		0.30	0.30	
2061	0.00	40.00	40.00	26	38.09	38.09		0.28	0.28	
2062	0.00	40.00	40.00	26	38.35	38.34		0.26	0.26	
2063	0.00	40.00	40.00	26	38.59	38.58		0.24	0.24	
2064	0.00	40.00	40.00	26	38.81	38.80		0.22	0.22	
2065	0.00	40.00	40.00	26	39.01	39.00		0.20	0.20	
2066	0.00	40.00	40.00	26	39.18	39.18		0.18	0.18	
2067	0.00	40.00	40.00	26	39.34	39.34		0.16	0.16	
2068	0.00	40.00	40.00	26	39.48	39.47		0.14	0.14	
2069	0.00	40.00	40.00	26	39.60	39.59		0.12	0.12	
2070	0.00	40.00	40.00	26	39.70	39.69		0.10	0.10	
2071	0.00	40.00	40.00	26	39.78	39.77		0.08	0.08	
2072	0.00	40.00	40.00	26	39.84	39.84		0.07	0.07	
2073	0.00	40.00	40.00	26	39.90	39.89		0.05	0.05	
2074	0.00	40.00	40.00	26	39.93	39.93		0.04	0.04	
2075	0.00	40.00	40.00	26	39.96	39.96		0.03	0.03	
2076	0.00	40.00	40.00	26	39.98	39.98		0.02	0.02	
2077	0.00	40.00	40.00	26	39.99	39.99		0.01	0.01	
2078	0.00	40.00	40.00	26	39.99	39.99		0.01	0.01	
2079	0.00	40.00	40.00	26	40.00	40.00		0.00	0.00	
2080	0.00	40.00	40.00	26	40.00	40.00		0.00	0.00	
2081	0.00	40.00	40.00	26	40.00	40.00		0.00	0.00	
2082	0.00	40.00	40.00	26	40.00	40.00		0.00	0.00	
2083	0.00	40.00	40.00	26	40.00	40.00		0.00	0.00	
2084	0.00	40.00	40.00	26	40.00	40.00		0.00	0.00	
2085	0.00	40.00	40.00	26	40.00	40.00		0.00	0.00	
2086	0.00	40.00	40.00	26	40.00	40.00		0.00	0.00	
2087	0.00	40.00	40.00	26	40.00	40.00		0.00	0.00	
2088	0.00	40.00	40.00	26	40.00	40.00		0.00	0.00	
2089	0.00	40.00	40.00	26	40.00	40.00		0.00	0.00	
2090	0.00	40.00	40.00	26	40.00	40.00		0.00	0.00	
2091	0.00	40.00	40.00	26	40.00	40.00		0.00	0.00	
2092	0.00	40.00	40.00	26	40.00	40.00		0.00	0.00	
2093	0.00	40.00	40.00	26	40.00	40.00		0.00	0.00	
2094	0.00	40.00	40.00	26	40.00	40.00		0.00	0.00	
2095	0.00	40.00	40.00	26	40.00	40.00		0.00	0.00	
2096	0.00	40.00	40.00	26	40.00	40.00		0.00	0.00	
2097	0.00	40.00	40.00	26	40.00	40.00		0.00	0.00	
2098	0.00	40.00	40.00	26	40.00	40.00		0.00	0.00	
2099	0.00	40.00	40.00	26	40.00	40.00		0.00	0.00	
2100	0.00	40.00	40.00	26	40.00	40.00		0.00	0.00	

Notes: D—discovery; CD—cumulative discovery; SCD—smoothed cumulative discovery (years = number of years centred moving average); adj—adjusted (to match cumulative production maximum); predlag—predicted lag between cumulative discovery and cumulative production; raw Pred CP—prediction using direct lag of cumulative discovery by predicted lag years; Pred SCP—raw predicted CP smoothed (with years = number of years centred moving average); SCP—smoothed actual cumulative production (years = number of years centred moving average); raw Pred P—one year change in predicted smoothed cumulative production; Pred SP—smoothed raw Pred P (years = number of years centred moving average); Actual P—actual annual oil production. Shaded numbers are interpolations, extrapolations or forecasts.

Table 11.3 Brazilian deep water oil production, gigabarrels

Year	D	CD	1 lyr SCD	Predlag	Raw pred CP	5yr smth pred SCP	SCP	Raw pred P	5yr smth pred SP	Actual P
1970	0.00	0.00	0.00				0.00	0.00	0.00	0.00
1971	0.00	0.00	0.00				0.00	0.00	0.00	0.00
1972	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1973	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1974	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1975	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1976	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1977	0.00	0.00	0.01	11		0.00	0.00	0.00	0.00	0.00
1978	0.00	0.00	0.14	15		0.00	0.00	0.00	0.00	0.00
1979	0.00	0.00	0.51	18		0.00	0.00	0.00	0.00	0.00
1980	0.00	0.00	0.98	19		0.00	0.00	0.00	0.00	0.00
1981	0.00	0.00	1.71	21		0.00	0.00	0.00	0.00	0.00
1982	0.10	0.10	2.45	21		0.00	0.00	0.00	0.00	0.00
1983	1.30	1.40	3.27	22		0.00	0.00	0.00	0.00	0.00
1984	2.70	4.10	4.11	22		0.00	0.00	0.00	0.00	0.00
1985	1.05	5.15	4.95	22		0.00	0.00	0.00	0.00	0.00
1986	2.95	8.10	5.80	22		0.00	0.00	0.00	0.00	0.00
1987	0.05	8.15	6.66	22		0.01	0.00	0.01	0.01	0.00
1988	0.80	8.95	7.56	22	0.01	0.02	0.01	0.01	0.01	0.01
1989	0.30	9.25	8.34	22	0.03	0.04	0.02	0.02	0.02	0.01
1990	0.00	9.25	9.11	22	0.06	0.06	0.03	0.02	0.02	0.02
1991	0.15	9.40	9.78	22	0.09	0.09	0.05	0.03	0.03	0.02
1992	0.00	9.40	10.18	22	0.11	0.12	0.08	0.04	0.04	0.03
1993	0.58	9.98	10.60	22	0.14	0.18	0.13	0.05	0.05	0.04
1994	0.05	10.03	10.96	22	0.23	0.24	0.19	0.07	0.07	0.07
1995	2.50	12.53	11.44	22	0.32	0.32	0.28	0.08	0.09	0.08
1996	0.00	12.53	12.06	22	0.42	0.44	0.38	0.12	0.12	0.10
1997	0.00	12.53	12.70	22	0.51	0.59	0.51	0.15	0.15	0.13
1998	0.20	12.73	13.41	22	0.74	0.77	0.67	0.18	0.18	0.17
1999	0.20	12.93	14.10	22	0.98	0.98	0.89	0.21	0.22	0.21
2000	1.65	14.58	14.85	22	1.22	1.23	1.16	0.24	0.27	0.28
2001	1.40	15.98	15.41	22	1.47	1.57	1.48	0.34	0.32	0.31
2002	0.55	16.53	16.70	22	1.71	1.94	1.83	0.38	0.38	0.37
2003	0.58	17.11	18.06	22	2.45	2.35	2.27	0.41	0.46	0.37
2004	0.56	17.67	19.47	22	2.86	2.88	2.78	0.53	0.53	0.58
2005	0.54	18.20	20.92	22	3.27	3.53	3.37	0.65	0.60	0.59
2006	0.52	18.72	22.29	22	4.11	4.20	3.97	0.67	0.69	0.60
2007	8.00	26.72	23.60	22	4.95	4.96		0.76	0.76	
2008	0.75	27.47	24.93	22	5.80	5.82		0.86	0.79	
2009	0.74	28.22	26.26	22	6.66	6.66		0.85	0.82	
2010	0.73	28.95	27.61	22	7.56	7.49		0.83	0.81	
2011	0.72	29.67	28.97	22	8.34	8.29		0.79	0.76	
2012	0.71	30.39	30.34	22	9.11	8.99		0.70	0.69	
2013	0.70	31.09	31.04	22	9.78	9.60		0.61	0.62	
2014	0.69	31.78	31.73	22	10.18	10.13		0.52	0.55	
2015	0.68	32.47	32.42	22	10.60	10.59		0.47	0.51	
2016	0.67	33.14	33.09	22	10.96	11.05		0.46	0.50	
2017	0.66	33.80	33.75	22	11.44	11.55		0.50	0.52	
2018	0.65	34.45	34.40	22	12.06	12.11		0.56	0.57	
2019	0.64	35.10	35.05	22	12.70	12.74		0.63	0.61	
2020	0.63	35.73	35.68	22	13.41	13.42		0.68	0.67	
2021	0.62	36.35	36.30	22	14.10	14.09		0.67	0.74	
2022	0.61	36.96	36.91	22	14.85	14.89		0.80	0.83	
2023	0.60	37.56	37.51	22	15.41	15.82		0.93	0.94	
2024	0.59	38.16	38.10	22	16.70	16.90		1.07	1.08	
2025	0.58	38.74	38.69	22	18.06	18.11		1.22	1.20	
2026	0.57	39.31	39.26	22	19.47	19.49		1.38	1.28	
2027	0.56	39.87	39.82	22	20.92	20.87		1.38	1.34	
2028	0.55	40.42	40.37	22	22.29	22.24		1.37	1.37	
2029	0.54	40.96	40.91	22	23.60	23.60		1.36	1.36	
2030	0.53	41.49	41.44	22	24.93	24.94		1.34	1.35	
2031	0.52	42.01	41.96	22	26.26	26.27		1.33	1.32	
2032	0.51	42.52	42.47	22	27.61	27.62		1.35	1.27	
2033	0.50	43.02	42.97	22	28.97	28.84		1.22	1.19	
2034	0.49	43.51	43.46	22	30.34	29.94		1.09	1.09	
2035	0.48	43.99	43.93	22	31.04	30.90		0.96	0.96	
2036	0.47	44.45	44.40	22	31.73	31.72		0.82	0.85	
2037	0.46	44.91	44.86	22	32.42	32.41		0.68	0.76	
2038	0.45	45.36	45.31	22	33.09	33.08		0.67	0.70	
2039	0.44	45.80	45.75	22	33.75	33.74		0.66	0.66	
2040	0.43	46.23	46.18	22	34.40	34.39		0.65	0.65	
2041	0.42	46.65	46.60	22	35.05	35.04		0.64	0.64	
2042	0.41	47.05	47.00	22	35.68	35.67		0.63	0.63	
2043	0.40	47.45	47.40	22	36.30	36.29		0.62	0.62	
2044	0.39	47.84	47.79	22	36.91	36.90		0.61	0.61	
2045	0.38	48.22	48.16	22	37.51	37.50		0.60	0.60	
2046	0.37	48.58	48.53	22	38.10	38.09		0.59	0.59	
2047	0.36	48.94	48.89	22	38.69	38.67		0.58	0.58	
2048	0.35	49.29	49.24	22	39.26	39.25		0.57	0.57	
2049	0.34	49.62	49.57	22	39.82	39.81		0.56	0.56	
2050	0.33	49.95	49.90	22	40.37	40.36		0.55	0.55	

(continued)

Table 11.3 Brazilian deep water oil production, gigabarrels (continued)

Year	D	CD	I / yr SCD	Predlag	Raw pred CP	5yr smth pred SCP	SCP	Raw pred P	5yr smth pred SP	Actual P
2051	0.32	50.26	50.21	22	40.91	40.90		0.54	0.54	
2052	0.31	50.57	50.52	22	41.44	41.43		0.53	0.53	
2053	0.30	50.87	50.82	22	41.96	41.95		0.52	0.52	
2054	0.29	51.15	51.10	22	42.47	42.46		0.51	0.51	
2055	0.28	51.43	51.38	22	42.97	42.96		0.50	0.50	
2056	0.27	51.69	51.64	22	43.46	43.45		0.49	0.49	
2057	0.25	51.95	51.90	22	43.93	43.92		0.48	0.48	
2058	0.24	52.19	52.14	22	44.40	44.39		0.47	0.47	
2059	0.23	52.43	52.37	22	44.86	44.85		0.46	0.46	
2060	0.22	52.65	52.60	22	45.31	45.30		0.45	0.45	
2061	0.21	52.86	52.81	22	45.75	45.74		0.44	0.44	
2062	0.20	53.07	53.02	22	46.18	46.17		0.43	0.43	
2063	0.19	53.26	53.21	22	46.60	46.58		0.42	0.42	
2064	0.18	53.44	53.39	22	47.00	46.99		0.41	0.41	
2065	0.17	53.62	53.57	22	47.40	47.39		0.40	0.40	
2066	0.16	53.78	53.73	22	47.79	47.78		0.39	0.39	
2067	0.15	53.93	53.88	22	48.16	48.15		0.38	0.38	
2068	0.14	54.08	54.03	22	48.53	48.52		0.37	0.37	
2069	0.13	54.21	54.16	22	48.89	48.88		0.36	0.36	
2070	0.12	54.33	54.28	22	49.24	49.22		0.35	0.35	
2071	0.11	54.44	54.39	22	49.57	49.56		0.34	0.34	
2072	0.10	54.55	54.49	22	49.90	49.89		0.33	0.33	
2073	0.09	54.64	54.59	22	50.21	50.20		0.32	0.32	
2074	0.08	54.72	54.67	22	50.52	50.51		0.31	0.31	
2075	0.07	54.79	54.74	22	50.82	50.80		0.30	0.30	
2076	0.06	54.85	54.80	22	51.10	51.09		0.29	0.29	
2077	0.05	54.90	54.85	22	51.38	51.37		0.28	0.28	
2078	0.04	54.94	54.89	22	51.64	51.63		0.27	0.27	
2079	0.03	54.97	54.93	22	51.90	51.89		0.25	0.25	
2080	0.02	54.99	54.95	22	52.14	52.13		0.24	0.24	
2081	0.01	55.00	54.97	22	52.37	52.36		0.23	0.23	
2082	0.00	55.00	54.99	22	52.60	52.59		0.22	0.22	
2083	0.00	55.00	55.00	22	52.81	52.80		0.21	0.21	
2084	0.00	55.00	55.00	22	53.02	53.01		0.20	0.20	
2085	0.00	55.00	55.00	22	53.21	53.20		0.19	0.19	
2086	0.00	55.00	55.00	22	53.39	53.38		0.18	0.18	
2087	0.00	55.00	55.00	22	53.57	53.56		0.17	0.17	
2088	0.00	55.00	55.00	22	53.73	53.72		0.16	0.16	
2089	0.00	55.00	55.00	22	53.88	53.87		0.15	0.15	
2090	0.00	55.00	55.00	22	54.03	54.02		0.14	0.14	
2091	0.00	55.00	55.00	22	54.16	54.15		0.13	0.13	
2092	0.00	55.00	55.00	22	54.28	54.27		0.12	0.12	
2093	0.00	55.00	55.00	22	54.39	54.38		0.11	0.11	
2094	0.00	55.00	55.00	22	54.49	54.48		0.10	0.10	
2095	0.00	55.00	55.00	22	54.59	54.58		0.09	0.09	
2096	0.00	55.00	55.00	22	54.67	54.66		0.08	0.08	
2097	0.00	55.00	55.00	22	54.74	54.73		0.07	0.07	
2098	0.00	55.00	55.00	22	54.80	54.79		0.06	0.06	
2099	0.00	55.00	55.00	22	54.85	54.84		0.05	0.05	
2100	0.00	55.00	55.00	22	54.89	54.88		0.04	0.04	

Notes: D—discovery; CD—cumulative discovery; SCD—smoothed cumulative discovery (years = number of years centred moving average); adj—adjusted (to match cumulative production maximum); predlag—predicted lag between cumulative discovery and cumulative production; raw Pred CP—prediction using direct lag of cumulative discovery by predicted lag years; Pred SCP—raw predicted CP smoothed (with years = number of years centred moving average); SCP—smoothed actual cumulative production (years = number of years centred moving average); raw Pred P—one year change in predicted smoothed cumulative production; Pred SP—smoothed raw Pred P (years = number of years centred moving average); Actual P—actual annual oil production. Shaded numbers are interpolations, extrapolations or forecasts.

Table 11.4 Nigerian deep water oil production, gigabarrels

Year	D	CD	1 Yr SCD	Predlag	Raw pred CP	5yr smth pred SCP	SCP	Raw pred P	5yr smth pred SP	Actual P
1970	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1971	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1972	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1973	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1974	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1975	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1976	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1977	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1978	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1979	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1980	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1981	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1982	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1983	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1984	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1985	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1986	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1987	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1988	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1989	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1990	0.00	0.00	0.18	16		0.00	0.00	0.00	0.00	0.00
1991	0.00	0.00	0.39	16		0.00	0.00	0.00	0.00	0.00
1992	0.00	0.00	0.74	16		0.00	0.00	0.00	0.00	0.00
1993	0.00	0.00	1.18	16		0.00	0.00	0.00	0.00	0.00
1994	0.00	0.00	1.72	17		0.00	0.00	0.00	0.00	0.00
1995	2.00	2.00	2.35	17		0.00	0.00	0.00	0.00	0.00
1996	0.30	2.30	3.09	17		0.00	0.00	0.00	0.00	0.00
1997	1.55	3.85	3.85	17		0.00	0.00	0.00	0.00	0.00
1998	1.00	4.85	4.66	18		0.00	0.00	0.00	0.00	0.00
1999	1.05	5.90	5.51	18		0.00	0.00	0.00	0.00	0.00
2000	1.10	7.00	6.41	18		0.00	0.00	0.00	0.00	0.00
2001	1.10	8.10	7.16	18		0.00	0.00	0.00	0.00	0.00
2002	0.30	8.40	7.92	19		0.00	0.00	0.00	0.00	0.00
2003	0.48	8.88	8.59	19		0.00	0.00	0.00	0.00	0.00
2004	0.47	9.36	9.20	19		0.00	0.00	0.00	0.00	0.00
2005	0.46	9.82	9.75	19		0.00	0.00	0.00	0.00	0.00
2006	0.45	10.27	10.24	20	0.18	0.26	0.21	0.26	0.16	0.21
2007	0.44	10.71	10.66	20	0.39	0.50		0.24	0.22	
2008	0.43	11.15	11.10	20	0.74	0.79		0.29	0.30	
2009	0.42	11.57	11.52	20	1.18	1.10		0.31	0.34	
2010	0.41	11.98	11.93	21	1.45	1.49		0.39	0.40	
2011	0.40	12.38	12.33	21	1.72	1.96		0.47	0.45	
2012	0.39	12.77	12.72	21	2.35	2.49		0.53	0.51	
2013	0.38	13.15	13.10	21	3.09	3.06		0.56	0.56	
2014	0.37	13.52	13.47	22	3.85	3.64		0.59	0.60	
2015	0.36	13.88	13.83	22	4.26	4.28		0.63	0.62	
2016	0.35	14.23	14.18	22	4.66	4.94		0.66	0.64	
2017	0.34	14.57	14.52	22	5.51	5.60		0.66	0.65	
2018	0.33	14.90	14.85	22	6.41	6.26		0.66	0.65	
2019	0.32	15.22	15.17	22	7.16	6.91		0.65	0.63	
2020	0.31	15.53	15.48	22	7.54	7.52		0.61	0.60	
2021	0.30	15.83	15.78	22	7.92	8.08		0.56	0.57	
2022	0.29	16.12	16.06	22	8.59	8.60		0.52	0.53	
2023	0.28	16.39	16.34	22	9.20	9.09		0.49	0.49	
2024	0.27	16.66	16.61	22	9.75	9.55		0.46	0.45	
2025	0.26	16.92	16.87	22	9.99	9.97		0.42	0.42	
2026	0.25	17.16	17.11	22	10.24	10.35		0.38	0.39	
2027	0.24	17.40	17.35	22	10.66	10.70		0.35	0.37	
2028	0.23	17.63	17.58	22	11.10	11.05		0.35	0.35	
2029	0.22	17.84	17.79	22	11.52	11.39		0.34	0.34	
2030	0.21	18.05	18.00	22	11.72	11.72		0.33	0.33	
2031	0.20	18.24	18.19	22	11.93	12.04		0.33	0.33	
2032	0.19	18.43	18.38	22	12.33	12.36		0.32	0.32	
2033	0.17	18.60	18.55	22	12.72	12.67		0.31	0.31	
2034	0.16	18.77	18.72	22	13.10	12.98		0.31	0.31	
2035	0.15	18.92	18.87	22	13.29	13.28		0.30	0.30	
2036	0.14	19.07	19.02	22	13.47	13.57		0.29	0.30	
2037	0.13	19.20	19.15	22	13.83	13.86		0.28	0.31	
2038	0.12	19.33	19.27	22	14.18	14.17		0.31	0.31	
2039	0.11	19.44	19.39	22	14.52	14.51		0.34	0.32	
2040	0.10	19.54	19.49	22	14.85	14.84		0.33	0.32	
2041	0.09	19.63	19.58	22	15.17	15.16		0.32	0.32	
2042	0.08	19.72	19.66	22	15.48	15.47		0.31	0.31	
2043	0.07	19.79	19.74	22	15.78	15.77		0.30	0.30	
2044	0.06	19.85	19.80	22	16.06	16.05		0.29	0.29	
2045	0.05	19.90	19.85	22	16.34	16.33		0.28	0.28	
2046	0.04	19.94	19.89	22	16.61	16.60		0.27	0.27	
2047	0.03	19.97	19.93	22	16.87	16.86		0.26	0.26	
2048	0.02	19.99	19.95	22	17.11	17.10		0.25	0.25	
2049	0.01	20.00	19.97	22	17.35	17.34		0.24	0.24	
2050	0.00	20.00	19.99	22	17.58	17.57		0.23	0.23	

(continued)

Table 11.4 Nigerian deep water oil production, gigabarrels (continued)

Year	D	CD	I /yr SCD	Predlag	Raw pred CP	Syr smth pred SCP	SCP	Raw pred P	Syr smth pred SP	Actual P
2051	0.00	20.00	19.99	22	17.79	17.78		0.22	0.22	
2052	0.00	20.00	20.00	22	18.00	17.99		0.21	0.21	
2053	0.00	20.00	20.00	22	18.19	18.18		0.20	0.20	
2054	0.00	20.00	20.00	22	18.38	18.37		0.19	0.19	
2055	0.00	20.00	20.00	22	18.55	18.54		0.17	0.17	
2056	0.00	20.00	20.00	22	18.72	18.71		0.16	0.16	
2057	0.00	20.00	20.00	22	18.87	18.86		0.15	0.15	
2058	0.00	20.00	20.00	22	19.02	19.01		0.14	0.14	
2059	0.00	20.00	20.00	22	19.15	19.14		0.13	0.13	
2060	0.00	20.00	20.00	22	19.27	19.26		0.12	0.12	
2061	0.00	20.00	20.00	22	19.39	19.38		0.11	0.11	
2062	0.00	20.00	20.00	22	19.49	19.48		0.10	0.10	
2063	0.00	20.00	20.00	22	19.58	19.57		0.09	0.09	
2064	0.00	20.00	20.00	22	19.66	19.65		0.08	0.08	
2065	0.00	20.00	20.00	22	19.74	19.73		0.07	0.07	
2066	0.00	20.00	20.00	22	19.80	19.79		0.06	0.06	
2067	0.00	20.00	20.00	22	19.85	19.84		0.05	0.05	
2068	0.00	20.00	20.00	22	19.89	19.88		0.04	0.04	
2069	0.00	20.00	20.00	22	19.93	19.92		0.03	0.04	
2070	0.00	20.00	20.00	22	19.95	19.95		0.03	0.03	
2071	0.00	20.00	20.00	22	19.97	19.97		0.02	0.02	
2072	0.00	20.00	20.00	22	19.99	19.98		0.01	0.02	
2073	0.00	20.00	20.00	22	19.99	19.99		0.01	0.01	
2074	0.00	20.00	20.00	22	20.00	20.00		0.01	0.01	
2075	0.00	20.00	20.00	22	20.00	20.00		0.00	0.01	
2076	0.00	20.00	20.00	22	20.00	20.00		0.00	0.00	
2077	0.00	20.00	20.00	22	20.00	20.00		0.00	0.00	
2078	0.00	20.00	20.00	22	20.00	20.00		0.00	0.00	
2079	0.00	20.00	20.00	22	20.00	20.00		0.00	0.00	
2080	0.00	20.00	20.00	22	20.00	20.00		0.00	0.00	
2081	0.00	20.00	20.00	22	20.00	20.00		0.00	0.00	
2082	0.00	20.00	20.00	22	20.00	20.00		0.00	0.00	
2083	0.00	20.00	20.00	22	20.00	20.00		0.00	0.00	
2084	0.00	20.00	20.00	22	20.00	20.00		0.00	0.00	
2085	0.00	20.00	20.00	22	20.00	20.00		0.00	0.00	
2086	0.00	20.00	20.00	22	20.00	20.00		0.00	0.00	
2087	0.00	20.00	20.00	22	20.00	20.00		0.00	0.00	
2088	0.00	20.00	20.00	22	20.00	20.00		0.00	0.00	
2089	0.00	20.00	20.00	22	20.00	20.00		0.00	0.00	
2090	0.00	20.00	20.00	22	20.00	20.00		0.00	0.00	
2091	0.00	20.00	20.00	22	20.00	20.00		0.00	0.00	
2092	0.00	20.00	20.00	22	20.00	20.00		0.00	0.00	
2093	0.00	20.00	20.00	22	20.00	20.00		0.00	0.00	
2094	0.00	20.00	20.00	22	20.00	20.00		0.00	0.00	
2095	0.00	20.00	20.00	22	20.00	20.00		0.00	0.00	
2096	0.00	20.00	20.00	22	20.00	20.00		0.00	0.00	
2097	0.00	20.00	20.00	22	20.00	20.00		0.00	0.00	
2098	0.00	20.00	20.00	22	20.00	20.00		0.00	0.00	
2099	0.00	20.00	20.00	22	20.00	20.00		0.00	0.00	
2100	0.00	20.00	20.00	22	20.00	20.00		0.00	0.00	

Notes: D—discovery; CD—cumulative discovery; SCD—smoothed cumulative discovery (years = number of years centred moving average); adj—adjusted (to match cumulative production maximum); predlag—predicted lag between cumulative discovery and cumulative production; raw Pred CP—prediction using direct lag of cumulative discovery by predicted lag years; Pred SCP—raw predicted CP smoothed (with years = number of years centred moving average); SCP—smoothed actual cumulative production (years = number of years centred moving average); raw Pred P—one year change in predicted smoothed cumulative production; Pred SP—smoothed raw Pred P (years = number of years centred moving average); Actual P—actual annual oil production. Shaded numbers are interpolations, extrapolations or forecasts.

Table 11.5 Angolan deep water oil production, gigabarrels

Year	D	CD	1 lyr SCD	Predlag	Raw pred CP	5yr smth pred SCP	SCP	Raw pred P	5yr smth pred SP	Actual P
1970	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1971	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1972	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1973	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1974	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1975	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1976	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1977	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1978	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1979	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1980	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1981	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1982	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1983	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1984	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1985	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1986	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1987	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1988	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1989	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1990	0.00	0.00	0.07	12		0.00	0.00	0.00	0.00	0.00
1991	0.00	0.00	0.22	12		0.00	0.00	0.00	0.00	0.00
1992	0.00	0.00	0.55	13		0.00	0.00	0.00	0.00	0.00
1993	0.00	0.00	1.05	14		0.00	0.00	0.00	0.00	0.00
1994	0.00	0.00	1.70	15		0.00	0.00	0.00	0.00	0.00
1995	0.75	0.75	2.39	16		0.00	0.00	0.00	0.00	0.00
1996	0.90	1.65	3.14	17		0.00	0.00	0.00	0.00	0.00
1997	2.05	3.70	4.01	18		0.00	0.00	0.00	0.00	0.00
1998	1.75	5.45	4.95	19		0.00	0.00	0.00	0.00	0.00
1999	1.75	7.20	5.96	20		0.00	0.00	0.00	0.01	0.00
2000	0.35	7.55	7.02	21		0.01	0.00	0.01	0.03	0.00
2001	0.65	8.20	8.07	22		0.06	0.02	0.04	0.05	0.00
2002	1.45	9.65	9.10	22	0.07	0.13	0.06	0.08	0.08	0.05
2003	0.70	10.35	10.00	22	0.22	0.25	0.16	0.11	0.12	0.07
2004	0.68	11.03	10.80	22	0.39	0.41	0.33	0.16	0.16	0.20
2005	0.67	11.69	11.49	22	0.55	0.60	0.55	0.20	0.19	0.22
2006	0.65	12.34	12.19	22	0.80	0.83	0.79	0.23	0.23	0.25
2007	0.63	12.98	12.89	22	1.05	1.10		0.26	0.26	
2008	0.62	13.59	13.51	22	1.38	1.40		0.30	0.29	
2009	0.60	14.19	14.11	22	1.70	1.71		0.32	0.31	
2010	0.58	14.78	14.69	22	2.05	2.06		0.34	0.34	
2011	0.57	15.34	15.26	22	2.39	2.41		0.35	0.36	
2012	0.55	15.90	15.81	22	2.76	2.78		0.37	0.38	
2013	0.54	16.43	16.35	22	3.14	3.18		0.39	0.40	
2014	0.52	16.95	16.87	22	3.58	3.59		0.42	0.42	
2015	0.50	17.45	17.37	22	4.01	4.03		0.44	0.44	
2016	0.49	17.94	17.86	22	4.48	4.50		0.46	0.46	
2017	0.47	18.41	18.33	22	4.95	4.97		0.48	0.48	
2018	0.45	18.86	18.78	22	5.46	5.47		0.49	0.49	
2019	0.44	19.30	19.22	22	5.96	5.98		0.51	0.50	
2020	0.42	19.72	19.64	22	6.49	6.49		0.52	0.53	
2021	0.41	20.13	20.05	22	7.02	7.02		0.52	0.58	
2022	0.39	20.52	20.44	22	7.55	7.65		0.63	0.63	
2023	0.37	20.89	20.81	22	8.07	8.35		0.70	0.68	
2024	0.36	21.25	21.17	22	9.10	9.10		0.76	0.74	
2025	0.34	21.59	21.51	22	10.00	9.89		0.79	0.77	
2026	0.32	21.91	21.83	22	10.80	10.72		0.82	0.77	
2027	0.31	22.22	22.14	22	11.49	11.48		0.76	0.75	
2028	0.29	22.51	22.43	22	12.19	12.18		0.70	0.72	
2029	0.28	22.79	22.71	22	12.89	12.84		0.66	0.68	
2030	0.26	23.05	22.97	22	13.51	13.48		0.64	0.64	
2031	0.24	23.29	23.21	22	14.11	14.09		0.61	0.61	
2032	0.23	23.52	23.44	22	14.69	14.68		0.58	0.59	
2033	0.21	23.73	23.65	22	15.26	15.25		0.57	0.57	
2034	0.19	23.92	23.84	22	15.81	15.80		0.55	0.55	
2035	0.18	24.10	24.02	22	16.35	16.33		0.54	0.54	
2036	0.16	24.27	24.18	22	16.87	16.85		0.52	0.52	
2037	0.15	24.41	24.33	22	17.37	17.35		0.50	0.50	
2038	0.13	24.54	24.46	22	17.86	17.84		0.49	0.49	
2039	0.11	24.65	24.57	22	18.33	18.31		0.47	0.47	
2040	0.10	24.75	24.67	22	18.78	18.77		0.45	0.45	
2041	0.08	24.83	24.75	22	19.22	19.20		0.44	0.44	
2042	0.06	24.90	24.82	22	19.64	19.63		0.42	0.42	
2043	0.05	24.95	24.87	22	20.05	20.03		0.41	0.41	
2044	0.03	24.98	24.91	22	20.44	20.42		0.39	0.39	
2045	0.02	25.00	24.94	22	20.81	20.79		0.37	0.37	
2046	0.00	25.00	24.97	22	21.17	21.15		0.36	0.36	
2047	0.00	25.00	24.98	22	21.51	21.49		0.34	0.34	
2048	0.00	25.00	24.99	22	21.83	21.82		0.32	0.32	
2049	0.00	25.00	24.99	22	22.14	22.12		0.31	0.31	
2050	0.00	25.00	25.00	22	22.43	22.42		0.29	0.29	

(continued)

Table 11.5 Angolan deep water oil production, gigabarrels (continued)

Year	D	CD	I 1yr SCD	Predlag	Raw pred CP	5yr smth pred SCP	SCP	Raw pred P	5yr smth pred SP	Actual P
2051	0.00	25.00	25.00	22	22.71	22.69		0.28	0.28	
2052	0.00	25.00	25.00	22	22.97	22.95		0.26	0.26	
2053	0.00	25.00	25.00	22	23.21	23.19		0.24	0.24	
2054	0.00	25.00	25.00	22	23.44	23.42		0.23	0.23	
2055	0.00	25.00	25.00	22	23.65	23.63		0.21	0.21	
2056	0.00	25.00	25.00	22	23.84	23.83		0.19	0.19	
2057	0.00	25.00	25.00	22	24.02	24.01		0.18	0.18	
2058	0.00	25.00	25.00	22	24.18	24.17		0.16	0.16	
2059	0.00	25.00	25.00	22	24.33	24.31		0.15	0.15	
2060	0.00	25.00	25.00	22	24.46	24.44		0.13	0.13	
2061	0.00	25.00	25.00	22	24.57	24.56		0.11	0.11	
2062	0.00	25.00	25.00	22	24.67	24.65		0.10	0.10	
2063	0.00	25.00	25.00	22	24.75	24.74		0.08	0.08	
2064	0.00	25.00	25.00	22	24.82	24.80		0.07	0.07	
2065	0.00	25.00	25.00	22	24.87	24.86		0.05	0.06	
2066	0.00	25.00	25.00	22	24.91	24.90		0.04	0.04	
2067	0.00	25.00	25.00	22	24.94	24.93		0.03	0.03	
2068	0.00	25.00	25.00	22	24.97	24.96		0.02	0.03	
2069	0.00	25.00	25.00	22	24.98	24.97		0.02	0.02	
2070	0.00	25.00	25.00	22	24.99	24.98		0.01	0.01	
2071	0.00	25.00	25.00	22	24.99	24.99		0.01	0.01	
2072	0.00	25.00	25.00	22	25.00	24.99		0.00	0.00	
2073	0.00	25.00	25.00	22	25.00	24.99		0.00	0.00	
2074	0.00	25.00	25.00	22	25.00	25.00		0.00	0.00	
2075	0.00	25.00	25.00	22	25.00	25.00		0.00	0.00	
2076	0.00	25.00	25.00	22	25.00	25.00		0.00	0.00	
2077	0.00	25.00	25.00	22	25.00	25.00		0.00	0.00	
2078	0.00	25.00	25.00	22	25.00	25.00		0.00	0.00	
2079	0.00	25.00	25.00	22	25.00	25.00		0.00	0.00	
2080	0.00	25.00	25.00	22	25.00	25.00		0.00	0.00	
2081	0.00	25.00	25.00	22	25.00	25.00		0.00	0.00	
2082	0.00	25.00	25.00	22	25.00	25.00		0.00	0.00	
2083	0.00	25.00	25.00	22	25.00	25.00		0.00	0.00	
2084	0.00	25.00	25.00	22	25.00	25.00		0.00	0.00	
2085	0.00	25.00	25.00	22	25.00	25.00		0.00	0.00	
2086	0.00	25.00	25.00	22	25.00	25.00		0.00	0.00	
2087	0.00	25.00	25.00	22	25.00	25.00		0.00	0.00	
2088	0.00	25.00	25.00	22	25.00	25.00		0.00	0.00	
2089	0.00	25.00	25.00	22	25.00	25.00		0.00	0.00	
2090	0.00	25.00	25.00	22	25.00	25.00		0.00	0.00	
2091	0.00	25.00	25.00	22	25.00	25.00		0.00	0.00	
2092	0.00	25.00	25.00	22	25.00	25.00		0.00	0.00	
2093	0.00	25.00	25.00	22	25.00	25.00		0.00	0.00	
2094	0.00	25.00	25.00	22	25.00	25.00		0.00	0.00	
2095	0.00	25.00	25.00	22	25.00	25.00		0.00	0.00	
2096	0.00	25.00	25.00	22	25.00	25.00		0.00	0.00	
2097	0.00	25.00	25.00	22	25.00	25.00		0.00	0.00	
2098	0.00	25.00	25.00	22	25.00	25.00		0.00	0.00	
2099	0.00	25.00	25.00	22	25.00	25.00		0.00	0.00	
2100	0.00	25.00	25.00	22	25.00	25.00		0.00	0.00	

Notes: D—discovery; CD—cumulative discovery; SCD—smoothed cumulative discovery (years = number of years centred moving average); adj—adjusted (to match cumulative production maximum); predlag—predicted lag between cumulative discovery and cumulative production; raw Pred CP—prediction using direct lag of cumulative discovery by predicted lag years; Pred SCP—raw predicted CP smoothed (with years = number of years centred moving average); SCP—smoothed actual cumulative production (years = number of years centred moving average); raw Pred P—one year change in predicted smoothed cumulative production; Pred SP—smoothed raw Pred P (years = number of years centred moving average); Actual P—actual annual oil production. Shaded numbers are interpolations, extrapolations or forecasts.

Table 11.6 'Other' deep water oil production, gigabarrels

Year	D	CD	I / yr SCD	Predlag	Raw pred CP	5yr smth pred SCP	SCP	Raw pred P	5yr smth pred SP	Actual P
1970	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1971	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1972	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1973	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1974	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1975	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1976	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1977	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
1978	0.00	0.00	0.03	19		0.00	0.00	0.00	0.00	0.00
1979	0.00	0.00	0.14	20		0.00	0.00	0.00	0.00	0.00
1980	0.00	0.00	0.27	21		0.00	0.00	0.00	0.00	0.00
1981	0.00	0.00	0.40	21		0.00	0.00	0.00	0.00	0.00
1982	0.00	0.00	0.53	21		0.00	0.00	0.00	0.00	0.00
1983	0.30	0.30	0.65	21		0.00	0.00	0.00	0.00	0.00
1984	0.92	1.22	0.78	21		0.00	0.00	0.00	0.00	0.00
1985	0.20	1.42	0.99	21		0.00	0.00	0.00	0.00	0.00
1986	0.00	1.42	1.19	21		0.00	0.00	0.00	0.00	0.00
1987	0.00	1.42	1.44	21		0.00	0.00	0.00	0.00	0.00
1988	0.00	1.42	1.78	21		0.00	0.00	0.00	0.00	0.00
1989	0.00	1.42	2.16	21		0.00	0.00	0.00	0.00	0.00
1990	0.80	2.22	2.54	21		0.00	0.00	0.00	0.00	0.00
1991	0.05	2.27	3.00	21		0.00	0.00	0.00	0.00	0.00
1992	0.50	2.77	3.72	21		0.00	0.00	0.00	0.00	0.00
1993	0.92	3.69	4.55	21		0.00	0.00	0.00	0.00	0.00
1994	0.80	4.49	5.48	21		0.00	0.00	0.00	0.00	0.00
1995	0.90	5.39	6.47	21		0.01	0.00	0.01	0.01	0.00
1996	1.10	6.49	7.43	21		0.02	0.01	0.02	0.02	0.00
1997	2.85	9.34	8.45	21	0.03	0.05	0.03	0.03	0.03	0.02
1998	1.25	10.59	9.47	21	0.08	0.09	0.08	0.04	0.04	0.06
1999	1.05	11.64	10.47	21	0.14	0.14	0.15	0.05	0.06	0.07
2000	0.60	12.24	11.44	21	0.20	0.22	0.23	0.07	0.07	0.07
2001	0.60	12.84	12.38	21	0.27	0.31	0.32	0.09	0.09	0.10
2002	0.61	13.45	13.26	21	0.40	0.41	0.44	0.10	0.10	0.12
2003	0.59	14.04	13.94	21	0.53	0.53	0.56	0.12	0.12	0.13
2004	0.58	14.62	14.55	21	0.65	0.67	0.70	0.14	0.14	0.13
2005	0.56	15.18	15.10	21	0.78	0.83	0.84	0.16	0.16	0.15
2006	0.55	15.72	15.65	21	0.99	1.01	1.00	0.18	0.19	0.16
2007	0.53	16.25	16.18	21	1.19	1.24		0.22	0.23	
2008	0.51	16.77	16.69	21	1.44	1.51		0.28	0.27	
2009	0.50	17.27	17.19	21	1.78	1.82		0.31	0.32	
2010	0.48	17.75	17.67	21	2.16	2.18		0.36	0.38	
2011	0.47	18.22	18.14	21	2.54	2.64		0.46	0.46	
2012	0.45	18.67	18.59	21	3.00	3.19		0.55	0.56	
2013	0.44	19.11	19.03	21	3.72	3.86		0.66	0.67	
2014	0.42	19.53	19.45	21	4.55	4.64		0.79	0.78	
2015	0.41	19.93	19.86	21	5.48	5.53		0.89	0.87	
2016	0.39	20.32	20.25	21	6.47	6.48		0.95	0.94	
2017	0.37	20.70	20.62	21	7.43	7.46		0.98	0.98	
2018	0.36	21.06	20.98	21	8.45	8.46		1.00	0.99	
2019	0.34	21.40	21.32	21	9.47	9.45		0.99	0.99	
2020	0.33	21.73	21.65	21	10.47	10.44		0.99	0.98	
2021	0.31	22.04	21.96	21	11.44	11.40		0.96	0.95	
2022	0.30	22.33	22.26	21	12.38	12.30		0.89	0.89	
2023	0.28	22.61	22.54	21	13.26	13.11		0.82	0.81	
2024	0.27	22.88	22.80	21	13.94	13.85		0.73	0.73	
2025	0.25	23.13	23.05	21	14.55	14.50		0.65	0.66	
2026	0.23	23.36	23.29	21	15.10	15.08		0.58	0.60	
2027	0.22	23.58	23.50	21	15.65	15.63		0.55	0.55	
2028	0.20	23.78	23.71	21	16.18	16.16		0.53	0.53	
2029	0.19	23.97	23.89	21	16.69	16.68		0.51	0.51	
2030	0.17	24.14	24.06	21	17.19	17.17		0.50	0.50	
2031	0.16	24.30	24.22	21	17.67	17.66		0.48	0.48	
2032	0.14	24.44	24.36	21	18.14	18.12		0.47	0.47	
2033	0.12	24.56	24.49	21	18.59	18.58		0.45	0.45	
2034	0.11	24.67	24.59	21	19.03	19.01		0.44	0.44	
2035	0.09	24.77	24.69	21	19.45	19.43		0.42	0.42	
2036	0.08	24.84	24.77	21	19.86	19.84		0.41	0.41	
2037	0.06	24.91	24.83	21	20.25	20.23		0.39	0.39	
2038	0.05	24.95	24.88	21	20.62	20.60		0.37	0.37	
2039	0.03	24.98	24.92	21	20.98	20.96		0.36	0.36	
2040	0.02	25.00	24.95	21	21.32	21.31		0.34	0.34	
2041	0.00	25.00	24.97	21	21.65	21.63		0.33	0.33	
2042	0.00	25.00	24.99	21	21.96	21.94		0.31	0.31	
2043	0.00	25.00	24.99	21	22.26	22.24		0.30	0.30	
2044	0.00	25.00	25.00	21	22.54	22.52		0.28	0.28	
2045	0.00	25.00	25.00	21	22.80	22.79		0.27	0.27	
2046	0.00	25.00	25.00	21	23.05	23.04		0.25	0.25	
2047	0.00	25.00	25.00	21	23.29	23.27		0.23	0.23	
2048	0.00	25.00	25.00	21	23.50	23.49		0.22	0.22	
2049	0.00	25.00	25.00	21	23.71	23.69		0.20	0.20	
2050	0.00	25.00	25.00	21	23.89	23.88		0.19	0.19	

(continued)

Table 11.6 'Other' deep water oil production, gigabarrels (continued)

Year	D	CD	1 / yr SCD	Predlag	Raw pred CP	Syr smth pred SCP	SCP	Raw pred P	Syr smth pred SP	Actual P
2051	0.00	25.00	25.00	21	24.06	24.05		0.17	0.17	
2052	0.00	25.00	25.00	21	24.22	24.20		0.16	0.16	
2053	0.00	25.00	25.00	21	24.36	24.35		0.14	0.14	
2054	0.00	25.00	25.00	21	24.49	24.47		0.12	0.12	
2055	0.00	25.00	25.00	21	24.59	24.58		0.11	0.11	
2056	0.00	25.00	25.00	21	24.69	24.67		0.09	0.09	
2057	0.00	25.00	25.00	21	24.77	24.75		0.08	0.08	
2058	0.00	25.00	25.00	21	24.83	24.82		0.07	0.07	
2059	0.00	25.00	25.00	21	24.88	24.87		0.05	0.05	
2060	0.00	25.00	25.00	21	24.92	24.91		0.04	0.04	
2061	0.00	25.00	25.00	21	24.95	24.94		0.03	0.03	
2062	0.00	25.00	25.00	21	24.97	24.96		0.02	0.02	
2063	0.00	25.00	25.00	21	24.99	24.98		0.02	0.02	
2064	0.00	25.00	25.00	21	24.99	24.99		0.01	0.01	
2065	0.00	25.00	25.00	21	25.00	25.00		0.01	0.01	
2066	0.00	25.00	25.00	21	25.00	25.00		0.00	0.00	
2067	0.00	25.00	25.00	21	25.00	25.00		0.00	0.00	
2068	0.00	25.00	25.00	21	25.00	25.00		0.00	0.00	
2069	0.00	25.00	25.00	21	25.00	25.00		0.00	0.00	
2070	0.00	25.00	25.00	21	25.00	25.00		0.00	0.00	
2071	0.00	25.00	25.00	21	25.00	25.00		0.00	0.00	
2072	0.00	25.00	25.00	21	25.00	25.00		0.00	0.00	
2073	0.00	25.00	25.00	21	25.00	25.00		0.00	0.00	
2074	0.00	25.00	25.00	21	25.00	25.00		0.00	0.00	
2075	0.00	25.00	25.00	21	25.00	25.00		0.00	0.00	
2076	0.00	25.00	25.00	21	25.00	25.00		0.00	0.00	
2077	0.00	25.00	25.00	21	25.00	25.00		0.00	0.00	
2078	0.00	25.00	25.00	21	25.00	25.00		0.00	0.00	
2079	0.00	25.00	25.00	21	25.00	25.00		0.00	0.00	
2080	0.00	25.00	25.00	21	25.00	25.00		0.00	0.00	
2081	0.00	25.00	25.00	21	25.00	25.00		0.00	0.00	
2082	0.00	25.00	25.00	21	25.00	25.00		0.00	0.00	
2083	0.00	25.00	25.00	21	25.00	25.00		0.00	0.00	
2084	0.00	25.00	25.00	21	25.00	25.00		0.00	0.00	
2085	0.00	25.00	25.00	21	25.00	25.00		0.00	0.00	
2086	0.00	25.00	25.00	21	25.00	25.00		0.00	0.00	
2087	0.00	25.00	25.00	21	25.00	25.00		0.00	0.00	
2088	0.00	25.00	25.00	21	25.00	25.00		0.00	0.00	
2089	0.00	25.00	25.00	21	25.00	25.00		0.00	0.00	
2090	0.00	25.00	25.00	21	25.00	25.00		0.00	0.00	
2091	0.00	25.00	25.00	21	25.00	25.00		0.00	0.00	
2092	0.00	25.00	25.00	21	25.00	25.00		0.00	0.00	
2093	0.00	25.00	25.00	21	25.00	25.00		0.00	0.00	
2094	0.00	25.00	25.00	21	25.00	25.00		0.00	0.00	
2095	0.00	25.00	25.00	21	25.00	25.00		0.00	0.00	
2096	0.00	25.00	25.00	21	25.00	25.00		0.00	0.00	
2097	0.00	25.00	25.00	21	25.00	25.00		0.00	0.00	
2098	0.00	25.00	25.00	21	25.00	25.00		0.00	0.00	
2099	0.00	25.00	25.00	21	25.00	25.00		0.00	0.00	
2100	0.00	25.00	25.00	21	25.00	25.00		0.00	0.00	

Notes: D—discovery; CD—cumulative discovery; SCD—smoothed cumulative discovery (years = number of years centred moving average); adj—adjusted (to match cumulative production maximum); predlag—predicted lag between cumulative discovery and cumulative production; raw Pred CP—prediction using direct lag of cumulative discovery by predicted lag years; Pred SCP—raw predicted CP smoothed (with years = number of years centred moving average); SCP—smoothed actual cumulative production (years = number of years centred moving average); raw Pred P—one year change in predicted smoothed cumulative production; Pred SP—smoothed raw Pred P (years = number of years centred moving average); Actual P—actual annual oil production. Shaded numbers are interpolations, extrapolations or forecasts.

Table 11.7 Summary of deep water oil production, gigabarrels

Year	Gulf Mexico	Brazil	Nigeria	Angola	Other	Other China	Other rest East	Total
1970	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1971	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1972	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1973	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1974	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1975	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1976	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1977	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1978	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1979	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1980	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1981	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1982	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1983	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1984	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1985	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1986	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1987	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01
1988	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01
1989	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.02
1990	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.02
1991	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.03
1992	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.04
1993	0.01	0.05	0.00	0.00	0.00	0.00	0.00	0.06
1994	0.02	0.07	0.00	0.00	0.00	0.00	0.00	0.09
1995	0.03	0.09	0.00	0.00	0.01	0.00	0.01	0.13
1996	0.04	0.12	0.00	0.00	0.02	0.00	0.02	0.18
1997	0.07	0.15	0.00	0.00	0.03	0.02	0.01	0.25
1998	0.10	0.18	0.00	0.00	0.04	0.06	-0.02	0.33
1999	0.15	0.22	0.00	0.01	0.06	0.06	-0.01	0.44
2000	0.19	0.27	0.00	0.03	0.07	0.07	0.00	0.56
2001	0.24	0.32	0.00	0.05	0.09	0.07	0.02	0.69
2002	0.27	0.38	0.00	0.08	0.10	0.07	0.03	0.84
2003	0.31	0.46	0.00	0.12	0.12	0.07	0.05	1.01
2004	0.34	0.53	0.00	0.16	0.14	0.07	0.07	1.16
2005	0.38	0.60	0.00	0.19	0.16	0.09	0.08	1.34
2006	0.44	0.69	0.16	0.23	0.19	0.10	0.09	1.71
2007	0.49	0.76	0.22	0.26	0.23	0.11	0.11	1.95
2008	0.54	0.79	0.30	0.29	0.27	0.14	0.14	2.19
2009	0.56	0.82	0.34	0.31	0.32	0.16	0.16	2.35
2010	0.57	0.81	0.40	0.34	0.38	0.19	0.19	2.49
2011	0.58	0.76	0.45	0.36	0.46	0.23	0.23	2.60
2012	0.59	0.69	0.51	0.38	0.56	0.28	0.28	2.72
2013	0.60	0.62	0.56	0.40	0.67	0.33	0.33	2.84
2014	0.63	0.55	0.60	0.42	0.78	0.39	0.39	2.97
2015	0.66	0.51	0.62	0.44	0.87	0.44	0.44	3.10
2016	0.69	0.50	0.64	0.46	0.94	0.47	0.47	3.23
2017	0.71	0.52	0.65	0.48	0.98	0.49	0.49	3.34
2018	0.73	0.57	0.65	0.49	0.99	0.50	0.50	3.43
2019	0.75	0.61	0.63	0.50	0.99	0.50	0.50	3.48
2020	0.77	0.67	0.60	0.53	0.98	0.49	0.49	3.55
2021	0.79	0.74	0.57	0.58	0.95	0.47	0.47	3.63
2022	0.82	0.83	0.53	0.63	0.89	0.45	0.45	3.70
2023	0.85	0.94	0.49	0.68	0.81	0.41	0.41	3.77
2024	0.89	1.08	0.45	0.74	0.73	0.37	0.37	3.89
2025	0.92	1.20	0.42	0.77	0.66	0.33	0.33	3.95
2026	0.94	1.28	0.39	0.77	0.60	0.30	0.30	3.97
2027	0.94	1.34	0.37	0.75	0.55	0.28	0.28	3.95
2028	0.93	1.37	0.35	0.72	0.53	0.27	0.27	3.90
2029	0.91	1.36	0.34	0.68	0.51	0.26	0.26	3.80
2030	0.89	1.35	0.33	0.64	0.50	0.25	0.25	3.71
2031	0.86	1.32	0.33	0.61	0.48	0.24	0.24	3.60
2032	0.84	1.27	0.32	0.59	0.47	0.23	0.23	3.48
2033	0.82	1.19	0.31	0.57	0.45	0.23	0.23	3.34
2034	0.80	1.09	0.31	0.55	0.44	0.22	0.22	3.19
2035	0.79	0.96	0.30	0.54	0.42	0.21	0.21	3.00
2036	0.77	0.85	0.30	0.52	0.41	0.20	0.20	2.84
2037	0.75	0.76	0.31	0.50	0.39	0.19	0.19	2.71
2038	0.73	0.70	0.31	0.49	0.37	0.19	0.19	2.60
2039	0.71	0.66	0.32	0.47	0.36	0.18	0.18	2.52
2040	0.69	0.65	0.32	0.45	0.34	0.17	0.17	2.47
2041	0.67	0.64	0.32	0.44	0.33	0.16	0.16	2.40
2042	0.65	0.63	0.31	0.42	0.31	0.16	0.16	2.33
2043	0.63	0.62	0.30	0.41	0.30	0.15	0.15	2.26
2044	0.61	0.61	0.29	0.39	0.28	0.14	0.14	2.18
2045	0.59	0.60	0.28	0.37	0.27	0.13	0.13	2.11
2046	0.57	0.59	0.27	0.36	0.25	0.12	0.12	2.04
2047	0.56	0.58	0.26	0.34	0.23	0.12	0.12	1.97
2048	0.54	0.57	0.25	0.32	0.22	0.11	0.11	1.90
2049	0.52	0.56	0.24	0.31	0.20	0.10	0.10	1.82
2050	0.50	0.55	0.23	0.29	0.19	0.09	0.09	1.75

(continued)

Table 11.7 Summary of deep water oil production, gigabarrels (continued)

Year	Gulf Mexico	Brazil	Nigeria	Angola	Other	Other China	Other rest East	Total
2051	0.48	0.54	0.22	0.28	0.17	0.09	0.09	1.68
2052	0.46	0.53	0.21	0.26	0.16	0.08	0.08	1.61
2053	0.44	0.52	0.20	0.24	0.14	0.07	0.07	1.54
2054	0.42	0.51	0.19	0.23	0.12	0.06	0.06	1.46
2055	0.40	0.50	0.17	0.21	0.11	0.05	0.05	1.39
2056	0.38	0.49	0.16	0.19	0.09	0.05	0.05	1.32
2057	0.36	0.48	0.15	0.18	0.08	0.04	0.04	1.25
2058	0.34	0.47	0.14	0.16	0.07	0.03	0.03	1.18
2059	0.32	0.46	0.13	0.15	0.05	0.03	0.03	1.11
2060	0.30	0.45	0.12	0.13	0.04	0.02	0.02	1.04
2061	0.28	0.44	0.11	0.11	0.03	0.02	0.02	0.97
2062	0.26	0.43	0.10	0.10	0.02	0.01	0.01	0.91
2063	0.24	0.42	0.09	0.08	0.02	0.01	0.01	0.85
2064	0.22	0.41	0.08	0.07	0.01	0.01	0.01	0.79
2065	0.20	0.40	0.07	0.06	0.01	0.00	0.00	0.73
2066	0.18	0.39	0.06	0.04	0.00	0.00	0.00	0.68
2067	0.16	0.38	0.05	0.03	0.00	0.00	0.00	0.62
2068	0.14	0.37	0.04	0.03	0.00	0.00	0.00	0.58
2069	0.12	0.36	0.04	0.02	0.00	0.00	0.00	0.53
2070	0.10	0.35	0.03	0.01	0.00	0.00	0.00	0.49
2071	0.08	0.34	0.02	0.01	0.00	0.00	0.00	0.45
2072	0.07	0.33	0.02	0.00	0.00	0.00	0.00	0.41
2073	0.05	0.32	0.01	0.00	0.00	0.00	0.00	0.38
2074	0.04	0.31	0.01	0.00	0.00	0.00	0.00	0.35
2075	0.03	0.30	0.01	0.00	0.00	0.00	0.00	0.33
2076	0.02	0.29	0.00	0.00	0.00	0.00	0.00	0.31
2077	0.01	0.28	0.00	0.00	0.00	0.00	0.00	0.29
2078	0.01	0.27	0.00	0.00	0.00	0.00	0.00	0.27
2079	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.26
2080	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.25
2081	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.24
2082	0.00	0.22	0.00	0.00	0.00	0.00	0.00	0.22
2083	0.00	0.21	0.00	0.00	0.00	0.00	0.00	0.21
2084	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.20
2085	0.00	0.19	0.00	0.00	0.00	0.00	0.00	0.19
2086	0.00	0.18	0.00	0.00	0.00	0.00	0.00	0.18
2087	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.17
2088	0.00	0.16	0.00	0.00	0.00	0.00	0.00	0.16
2089	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.15
2090	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.14
2091	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.13
2092	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.12
2093	0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.11
2094	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.10
2095	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.09
2096	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.08
2097	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.07
2098	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.06
2099	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.05
2100	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.04

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Chapter 12

Non-conventional oil



Chapter 12 Non-conventional oil

There are many sources of non-conventional oils and petroleum liquids.

The non-conventional oils include extra heavy oil, tar sands and oil shale. Possible sources of non-conventional liquids are stranded gas deposits and coalbed methane, both converted to liquids. In fact, any natural gas can be converted, but that leaves less to power energy processes traditional to gas.

Table 12.1 sets out an attempt at an energy balance for the petroleum liquids sector.

‘Old oil’ is taken as conventional oil discovered before 2007. ‘New oil’ is conventional oil expected to be discovered from 2007 on, as well as all deep water oil.

Table 12.1 Petroleum liquids energy balances

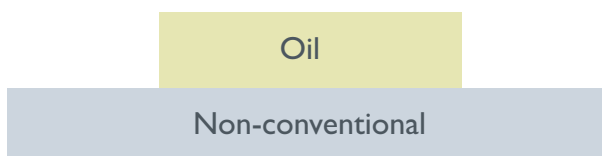
	<i>Gigabarrels resource</i>	<i>Fraction recovery</i>	<i>Gigabarrels recoverable</i>	<i>Fraction net energy</i>	<i>Gigabarrels net energy</i>	<i>Eroei</i>
Old oil	3 868	0.50	1 934	0.96	1 850	23
New oil	778	0.50	389	0.91	354	11
Extra heavy oil	1 333	0.23	300	0.80	240	5
Tar sands	2 000	0.20	400	0.80	320	5
Shale oil	2 700	0.08	216	0.60	130	2.5
GTL (stranded gas)	1 000	0.35	350	0.80	280	5
Coalbed methane	829	0.35	290	0.80	232	5
	<i>Gigabarrels resource</i>	<i>Per cent</i>	<i>Gigabarrels recoverable</i>	<i>Per cent</i>	<i>Gigabarrels net energy</i>	<i>Per cent</i>
Conventional oil	4 646	37	2 323	60	2 204	65
Non-conventional	7 862	63	1 556	40	1 202	35
Total	12 508	100	3 879	100	3 405	100

Notes: Eroei—energy return on energy invested: energy units per unit of energy required to produce the energy;
GTL—gas to liquids; fraction net energy = (Eroei–1.0)/ Eroei.

It can be seen from the second part of the table that the amount of liquids deemed recoverable from non-conventional sources is not negligible—1556 gigabarrels.

In fact, in terms of initial resources, non-conventional far outweighs conventional. Non conventional sources comprise about two-thirds of the total liquids resource of 12 508. This is the so-called ‘resources triangle’, with conventional oil forming the smaller apex (see Figure 12.1).

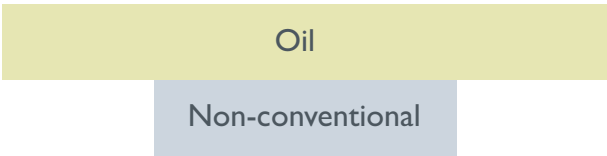
Figure 12.1 The ‘resources triangle’—almost two-thirds non-conventional



But the main non-conventional sources have a lower recoverable fraction, meaning that in terms of recoverable resources, the weighting reverses, with conventional oil comprising about 6/10ths.

Furthermore, when the considerable energy required to produce the non-conventional sources is taken into account (energy return on energy invested, or eroei), their net energy returns are uniformly lower than for conventional oil. This means their energy profit per barrel is lower. When this is taken into account, the total net energy represented by conventional oil approaches two-thirds of that available from the world's resources of liquid fuels. Instead of the resource triangle, there is the 'oil T-Junction' (see Figure 12.2).

Figure 12.2 The oil 'T-Junction'—almost two-thirds conventional oil



Furthermore, the rate at which the production of the recoverable energy resources locked up in non-conventional deposits can be ramped up is another limitation on their being able to replace conventional oil production. There are environmental and infrastructure constraints that tend to mean that the production profiles for non-conventional oils are going to be longer and shallower than for conventional deposits.

Two of the non-conventional oil resources that are already in production are extra heavy oil and tar sands. The following sections estimate their likely contribution to crude oil production in this century.

Non-conventional oil

Non-conventional oils comprise deposits formed when what was conventional oil has been transformed by bacterial action over long periods of time into a much thicker residue. The consistency of the residue can be a viscose liquid—'extra heavy oil', as in Venezuela—or more toward a semi-solid—as in the 'tar' of the Canadian tar sands or the natural bitumen of other localities around the world.

Canadian non-conventional

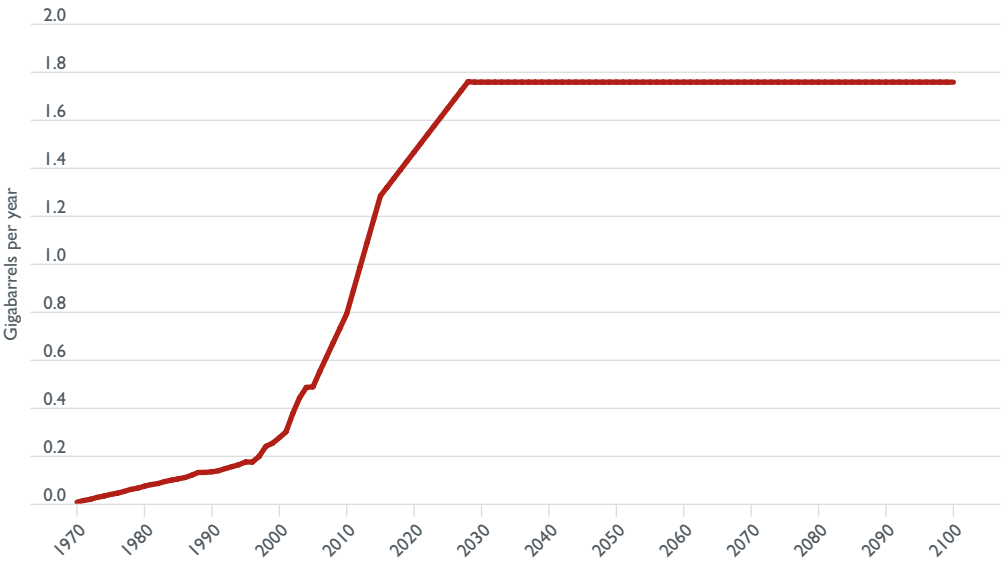
The three deposits of tar sands in Alberta contain at least two-thirds of the world's discoveries of natural bitumen, and are currently the only deposits being exploited commercially.

Deposits at depths of less than about 80 metres can be mined after removal of the overburden. The tar is then separated from the sand with hot water, and processed at refineries that can make use of the product. About two-thirds of current production of Canadian non-conventional oil is from mined deposits of tar sands. Deposits at

deeper depths are extracted ‘in situ’, usually using steam or combustion to reduce the viscosity of the tar.

The Canadian Association of Petroleum producers, whose members supply over 98 per cent of Canada’s crude oil and natural gas, conducts annual surveys to assess the outlook for crude oil production from the tar sands and develops forecasts every two years. The current forecasts have non-conventional production approximately doubling from 2007 levels by 2015 (CAPP 2007). In forecasts for the rest of the century, it has been assumed that production will triple by 2030 to 2.75 gigabarrels per year, and then be maintained that level of production to the end of the century.

Figure 12.3 Canadian non-conventional production and forecast

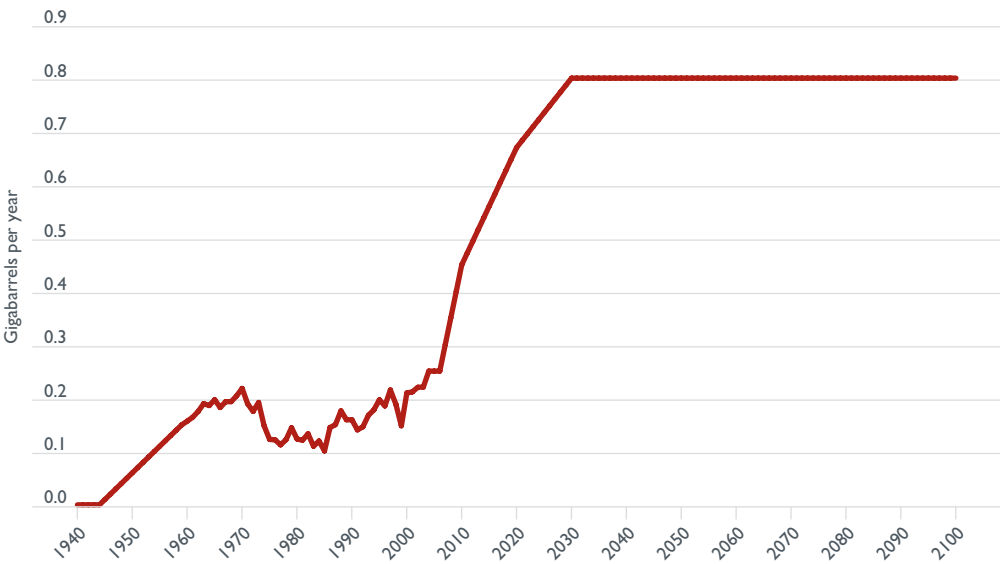


Venezuelan non-conventional

Extra-heavy oil is just that—it is still liquid but much less so than normal oil. As such, special extraction techniques are necessary to get it to flow out of the ground.

Venezuela holds about 90 per cent of the world’s discoveries of heavy oil in the Orinoco River oil belt. In forecasts for the rest of the century, it has been assumed that Venezuelan production of heavy oil will more than triple by 2030 to 0.8 gigabarrels per year, and then be maintained at that level of production to the end of the century.

Figure 12.4 **Venezuelan non-conventional production and forecast**



Total non-conventional

The total production of non-conventional oil accounted for above amounts to 3.5 gigabarrels per year by 2030. The projection of the International Energy Agency (IEA 2006, p97) is for non-conventional oil production to reach 9 megabarrels per day or 3.3 gigabarrels per year by 2030. The Energy Information Administration projects 11.5 megabarrels per day or 4.2 gigabarrels per year (EIA 2006), but this includes coal-to-liquids, gas-to-liquids and shale oil.

Not included in the estimates of this chapter are petroleum liquids production from coal and gas (coal-to-liquids CTL and gas-to-liquids GTL). Production of liquids from coal and conventional gas are likely to be two of the ways employed to ease the downturn in oil production detailed in the next two chapters.

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Chapter 13

World crude oil production



Chapter 13 World crude oil production

This report has forecast crude oil production for the major oil-producing regions: North America, Latin America, Africa, Europe, Eurasia, the East, Non-Gulf Middle East and the Middle East Gulf.

Production has included conventional, deep water and non-conventional crude oil. Table 13.1 summarises the results.

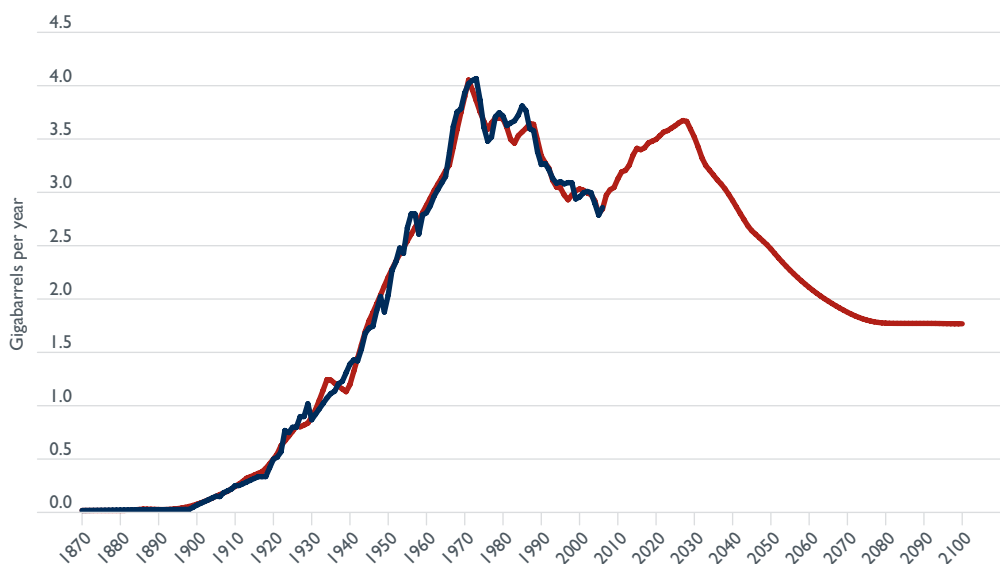
Perhaps it is worthwhile reviewing each region's forecasts before turning to the implications for the aggregate world forecast.

Regional oil production

North American crude oil production is set to rise until about 2035 (see Figure 13.1).

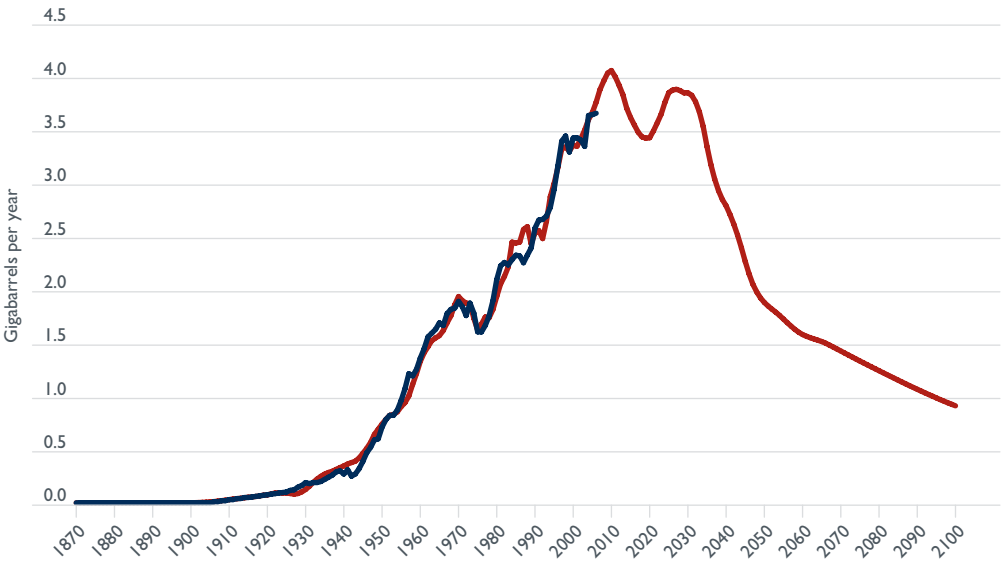
But it is also apparent that after about 2030, a decline in North American production should resume, as the declines in conventional, Alaskan and deep water oil overwhelm the additions from Canadian non-conventional oil.

Figure 13.1 Actual and predicted North American crude oil production



Latin American crude oil production is forecast to fluctuate until about 2035 (see Figure 13.2), after which production declines are likely to begin. The forecast path of crude oil production in the Latin American region to 2035 is based on continued expansion of Brazilian deep water and Venezuelan non-conventional production until that time. After 2013, Venezuelan conventional and Rest of Latin America oil production anticipate the subsequent decline after the secondary peak.

Figure 13.2 Actual and predicted Latin American crude oil production



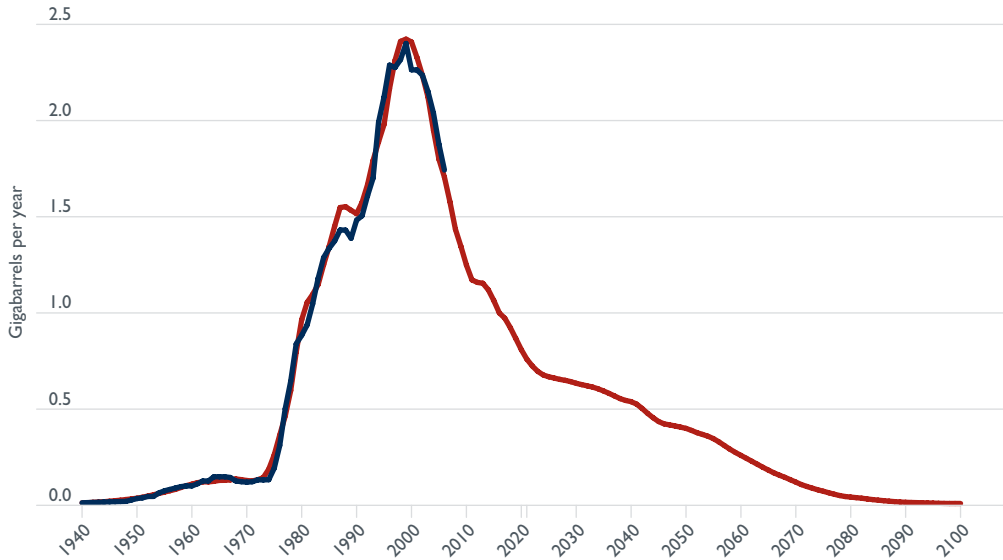
African conventional oil production is likely to decline after 2015, but the advent of deep water production (likely to peak in 2025) suggests that any decline in African oil production will be delayed until 2020 (see Figure 13.3). In the meantime, production is likely to rise by 0.6 gigabarrels per year (or 17 per cent) in the period to 2020 as deep water production continues to expand.

Figure 13.3 Actual and predicted African crude oil production



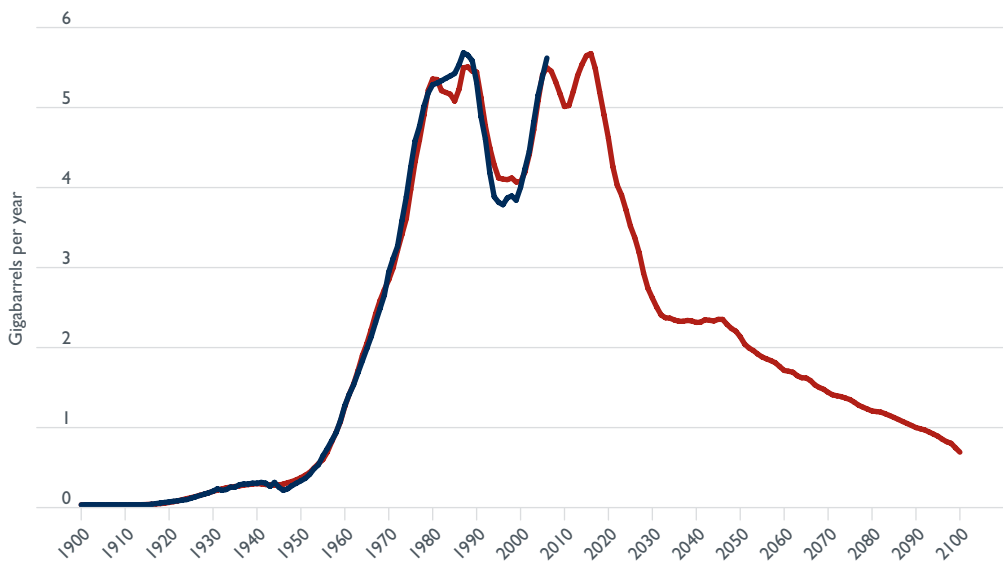
European oil production is now in steep decline, after peaking near 2.4 gigabarrels per year near the turn of the century. Figure 13.4 shows the fit of actual and predicted and illustrates the trend.

Figure 13.4 Actual and predicted European crude oil production



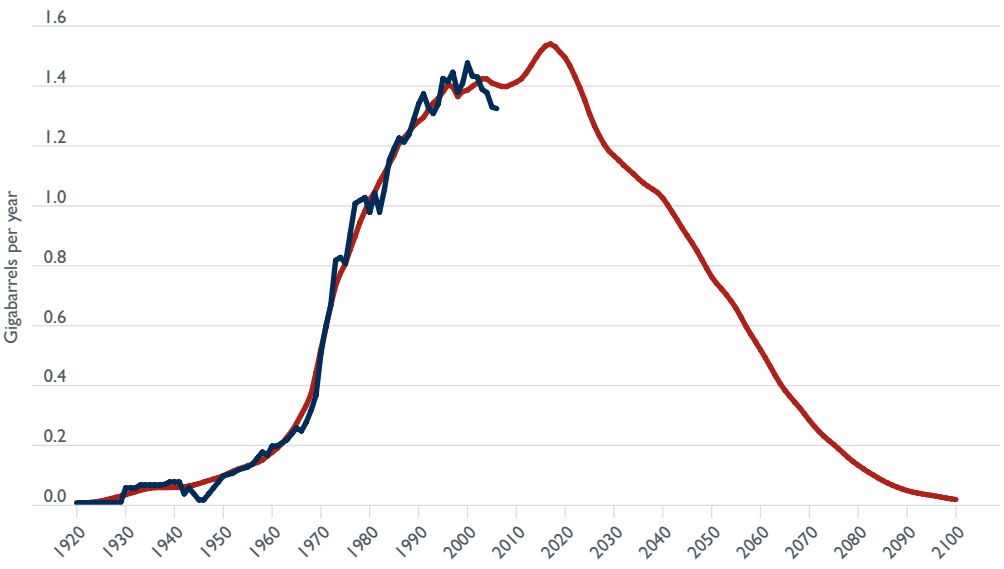
Eurasian oil production is projected to fluctuate until 2020. After that time, the decline will be more rapid, as the turn-off in cumulative discovery after the 1980s feeds through with a lag (see Figure 13.5). The dominant influence on this trend will be declining oil production in Russia.

Figure 13.5 Actual and predicted Eurasian crude oil production



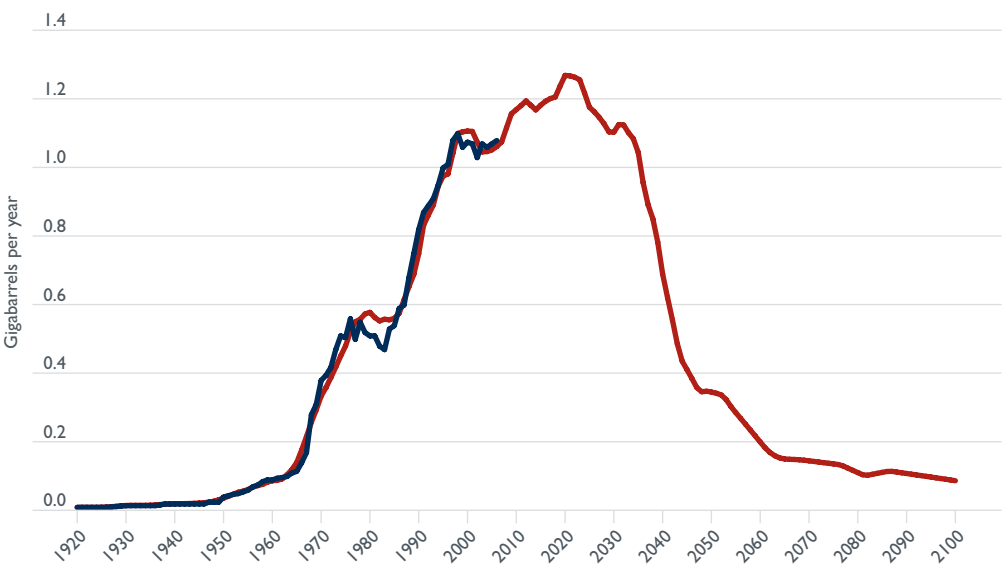
The major producing countries of **the East** region are all into a stage of declining *conventional* oil production. A downward trend in Indonesian production is important for this trend. But the expansion of deep water oil production will see a short term recovery to 2020 (see Figure 13.6).

Figure 13.6 Actual and predicted East crude oil production

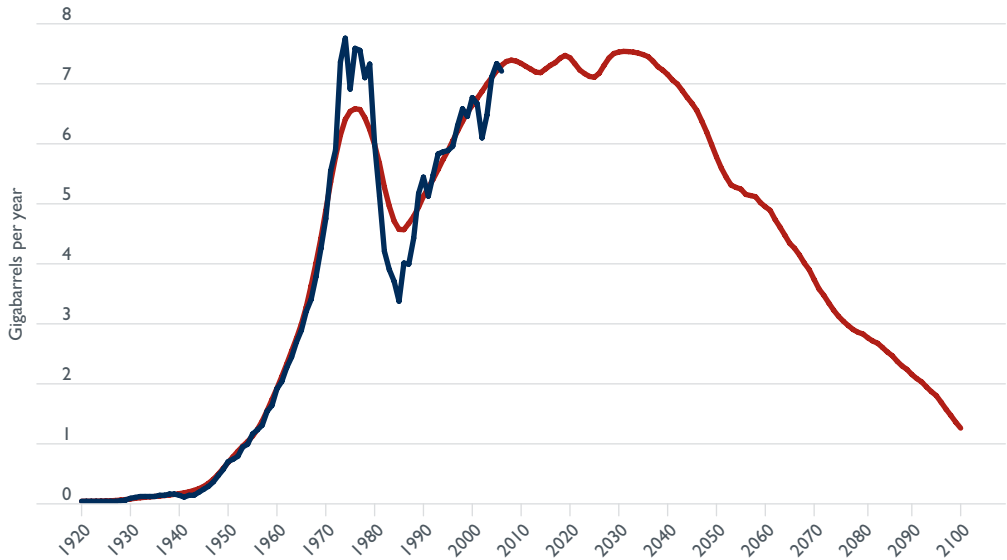


Non-Gulf Middle East production is likely to expand to 2025. This is shown in Figure 13.7.

Figure 13.7 Actual and predicted Non-Gulf Middle East crude oil production



Middle East Gulf region production is shown in Figure 13.8. Under business-as-usual production (i.e. in the absence of a slacking of the rise in the stretch lags—a deliberate increase in production rates), production from the Gulf region is set to plateau in the period to 2040.

Figure 13.8 Actual and predicted Middle East Gulf crude oil production

World oil production

Putting together the production patterns from around the world results in the crude oil forecasts set out in Table 13.1.

Figures 13.9 and 13.10 and Table 13.2 show the implications for world conventional crude oil production.

Figure 13.9 Annual world discovery and production of conventional oil

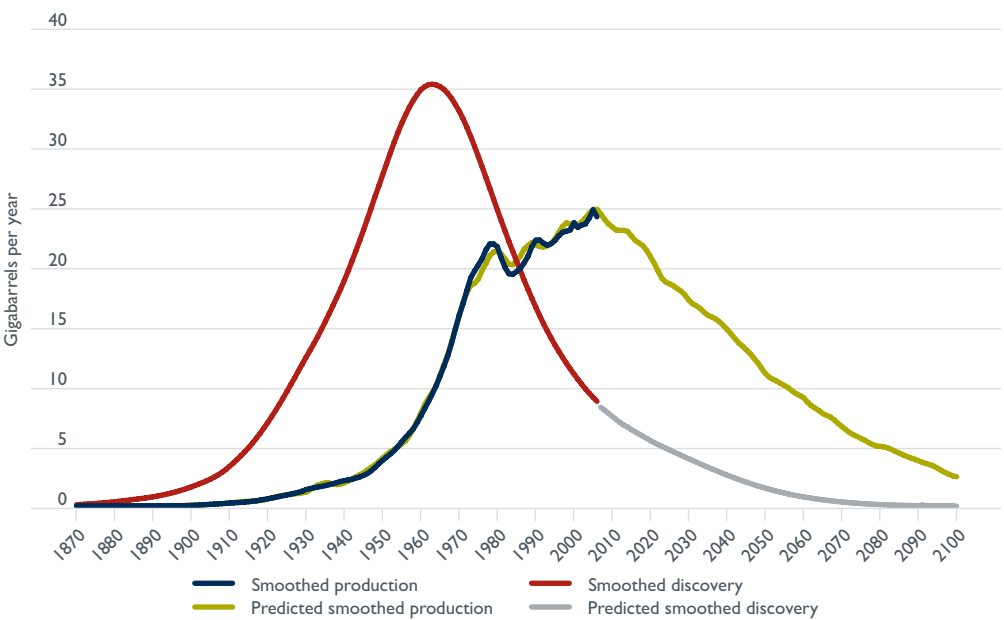
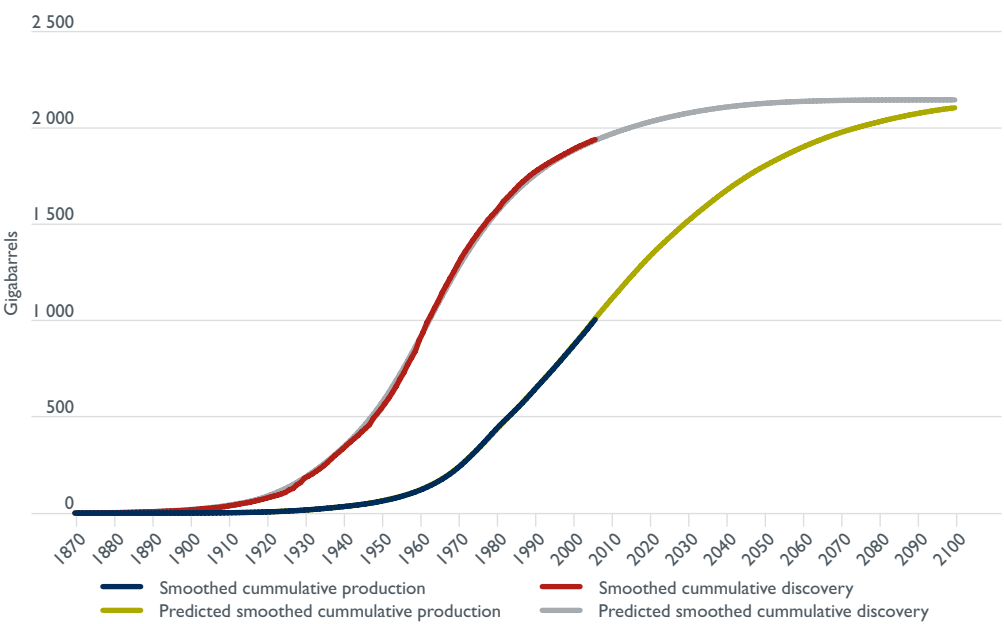


Figure 13.10 Cumulative conventional oil discovery and production

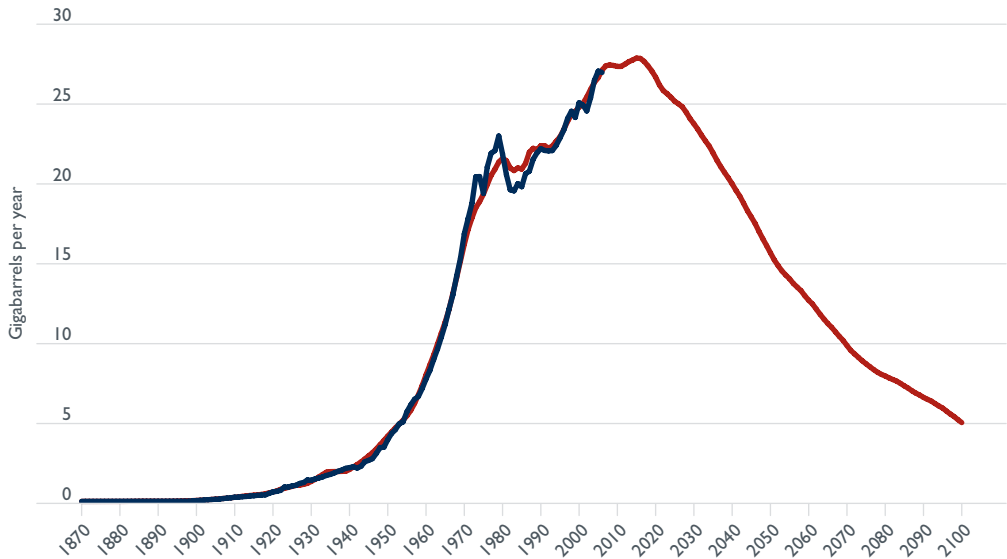


According to the aggregation of the adjusted cumulative discovery curves, slightly more than 90 per cent of the conventional oil that will ever be discovered has already been discovered. The rate of discovery peaked in the early 1960s.

According to the aggregation of predictions of annual potential oil production, world production of conventional oil is currently just past its highest point. A predicted shallow decline in the short run should give way to a steeper decline after 2016.

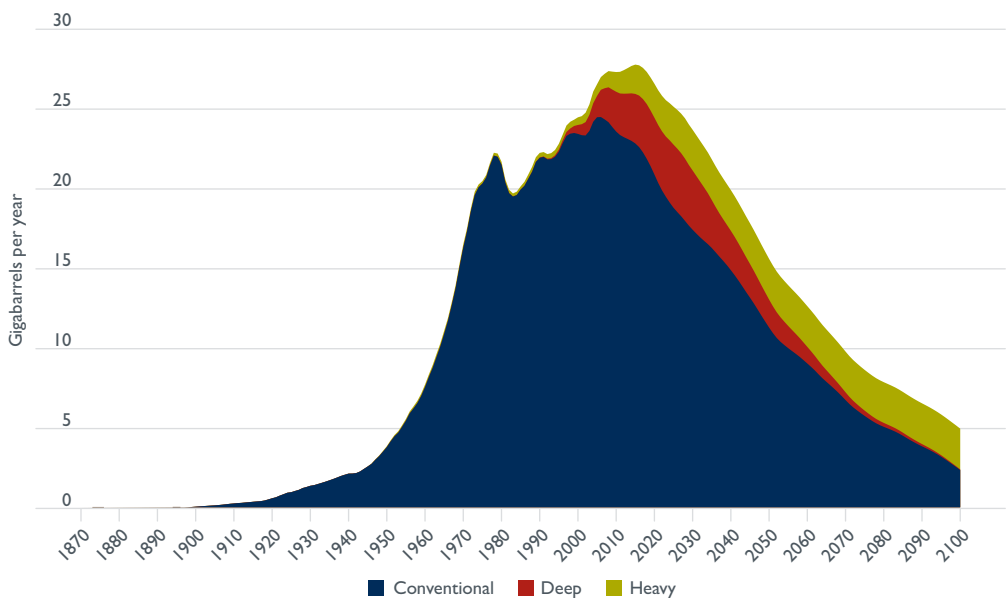
But of course, deep water and non-conventional oil production are growing strongly, turning a slight decline into a plateau (Figure 13.11 and Table 13.3).

Figure 13.11 Actual and predicted total world crude oil production



Thus the prognosis is for a slightly upward sloping plateau in potential production from 2005 to 2016, before crude oil production declines begin in earnest. Figure 13.12 and Table 13.3 show that it is the projected expansion of deep water and non-conventional heavy oil production that turns what is predicted to be a 2006 peak in conventional oil into a more drawn out plateau over 10 years for total crude.

Figure 13.12 Components of total world crude oil production



Of course, these are base case forecasts. It might be contended that increased Middle East production out of their large reserves could prevent production declines in the next decade.

To test this, a scenario was run whereby all Middle East Gulf countries increased production to ‘fund’ a 1.5 per cent per year increase in world crude oil production. Basically, world oil production increasing at 1.5 per cent per year was calculated, and the difference from the base case world oil forecast was met by increased Middle East Gulf production. This arrangement was maintained until Middle East Gulf lags would have actually started to decrease. At this point they were held constant for the remainder of the century (itself a favourable assumption for production). The result of that scenario for the Gulf is shown in Figure 13.13.

The net effect of this scenario is to bring forward production from the tail of base case production to greatly increased production in the period centred on 2025. Of course this means that world production increases to this date and then drops off rather more suddenly than in the base case (see Figure 13.14). Arguably, this could be a worse scenario as far as the world being able to cope comfortably with the transition.

It is probable that the actual path of world crude oil production will follow a path somewhere between the two lines in Figure 13.14. This assumes that OPEC will not restrict supply to raise prices when the market will be raising prices on its own. But whether the drop-off starts in 2016 or more suddenly in 2025, crude oil production is likely to start contracting in the not too distant future (as measured against the time needed to retool our economies).

Figure 13.13 Middle East base case and scenario forecasts

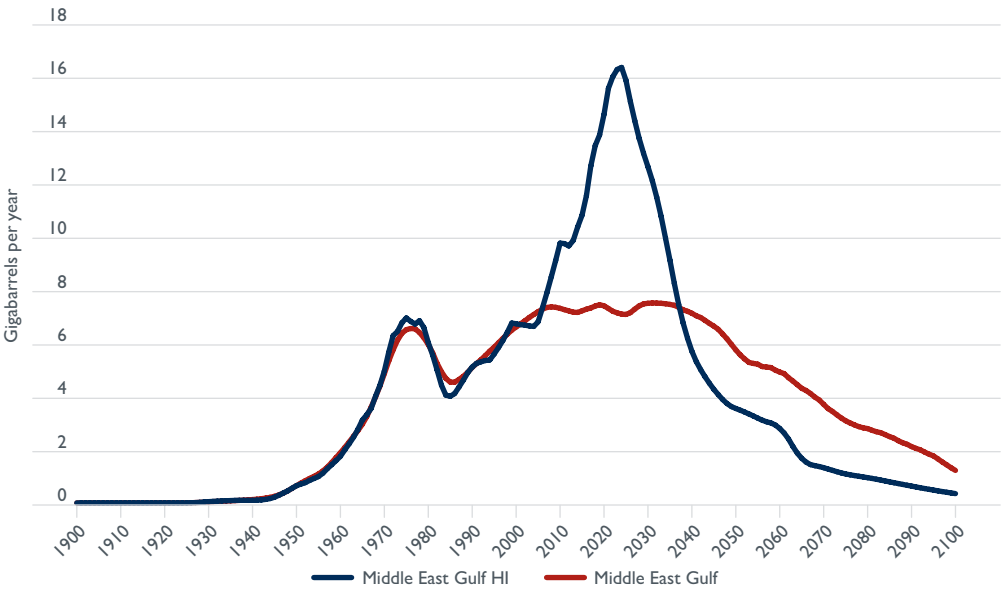
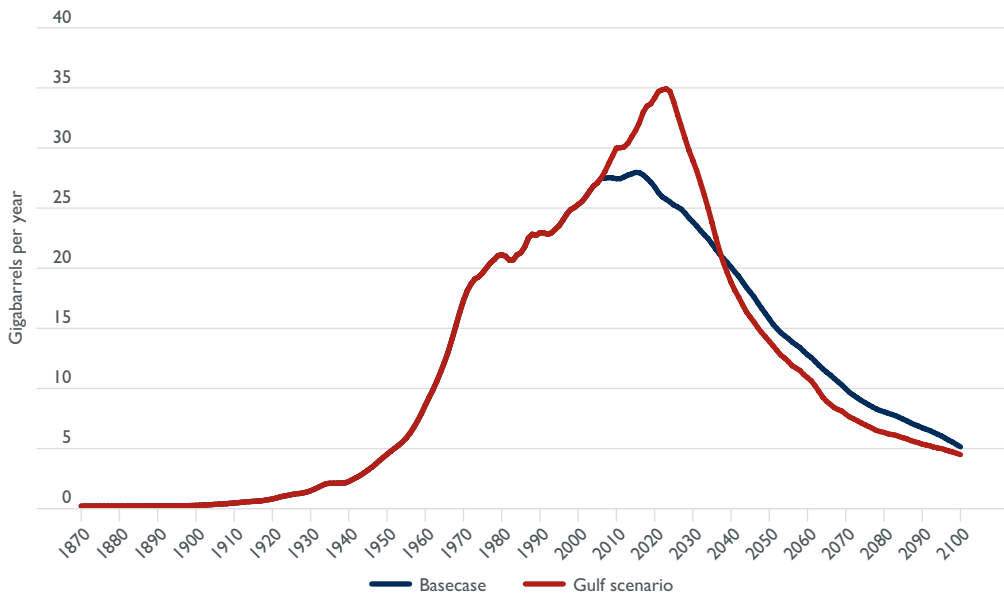
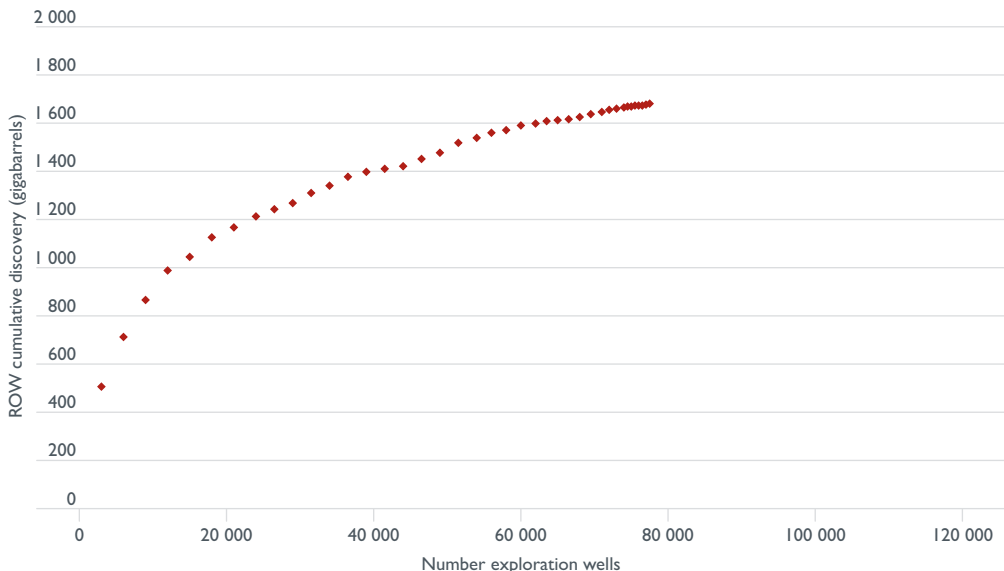


Figure 13.14 World production under the high Middle East Gulf scenario

This conclusion is true regardless of the path of world oil prices. Higher prices encourage exploration, which is a necessary condition for discovery. But as Figure 13.15 shows, it is not a sufficient condition. Figure 13.15 displays what is called a 'creaming curve' (for the Rest of the World aside from North America) covering the whole history of the oil industry outside North America from 1870. Higher prices mean more wells are drilled, but there are diminishing returns. Even a 50 per cent increase in historical drilling will only mean that the discovery of some of the remaining 10 per cent of conventional oil might be brought forward slightly. Given the lags, this will not materially alter the forecast path of production set out in Figure 13.14.

Figure 13.15 Creaming curve for the Rest of the World outside North America

Nor is it the case that national ownership restrictions and other restrictions on international firms mean that some areas of the world are significantly underexplored. This is not the case in Russia, where state ownership before 1990 meant if anything greater exploration. Since 1990, there has been much less exploration and much less discovery. Moreover, a greater rate of discovery in the future has been allowed for (see Figure 7.3). There is no under-exploration in the Middle East, where the small size and extremely promising possibilities have led to almost total exploration. Venezuela had completed most of its exploration before Chavez (see Figure 4.3). The slowdown in discovery in Libya predated Gaddafi (see Figure 5.3).

Similarly, the effect of price on production (as opposed, for example, to the effect of OPEC production on price) appears to be limited. Figure 13.16 shows the US lower 48 production curve. After the high oil prices of the late 1970s, there is a shoulder on the right flank of the declining production curve that is probably related to the earlier high prices. But the effect is marginal. The extreme peak of production in the US came in 1971, after years of low and falling real oil prices.

Finally, it can be noted that any bring-forward of oil production in response to higher prices will only mean a more substantial rate of decline in subsequent decades (analogous to the Middle East scenario).

The argument is often made that reported reserves of oil have continued to increase and that this is likely to continue—voiding the oil depletion argument. But historical increases in reported reserves (the difference between assessed cumulative discovery and cumulative production at any point in time) have been responding to upward revisions in estimates of past cumulative discovery and to further discovery. Both of these factors are now very small and declining for conventional oil. Figure 13.17 shows approximate shifts over time in estimates of cumulative discovery, and the resulting size of reported reserves of conventional oil over time (arrows). It can be seen that the size of the shifts over time have been declining. Moreover, the highest cumulative discovery curve in Figure 13.17 represents the current report's estimate of an ultimate for conventional oil, based not on discovery data, but on patterns of cumulative production. It is contended that this ultimate is less likely to change significantly in the future.

Figure 13.16 Production in the US lower 48 states.

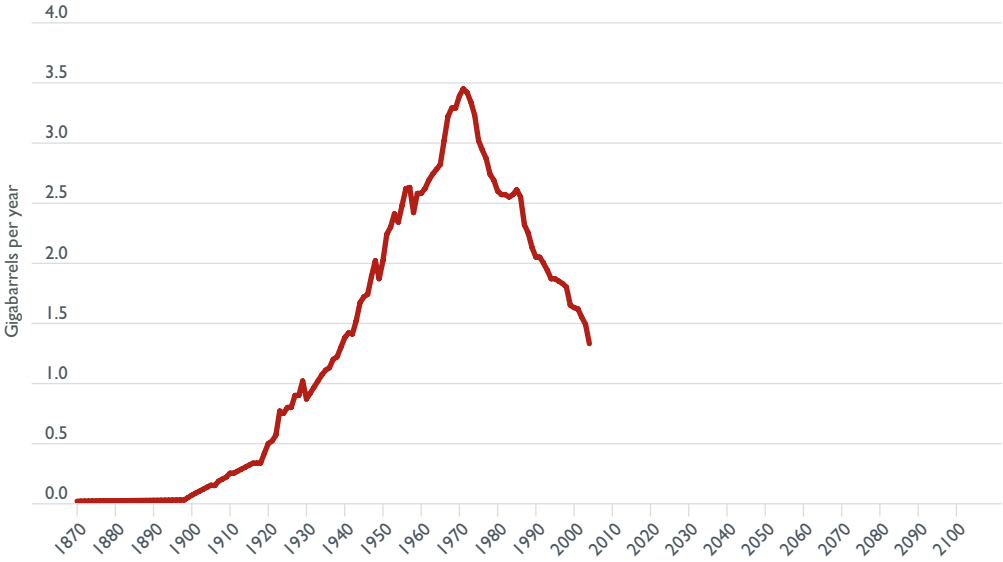
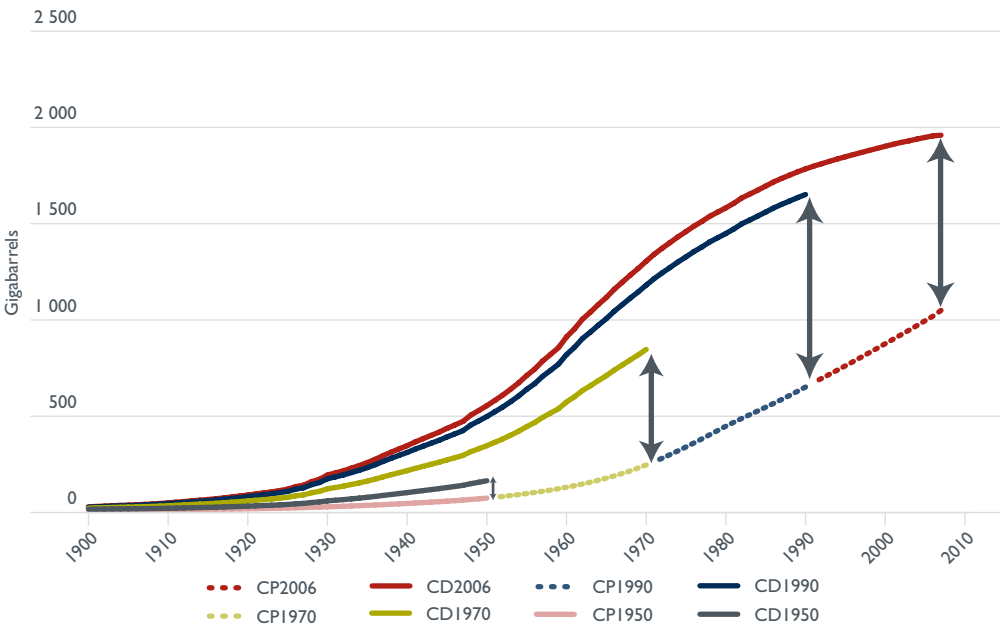


Figure 13.17 Revisions to cumulative discovery estimates over time



Another argument often made is that because non-transport uses of oil are large, there will be ample opportunity to switch oil from these uses to transport and thus avoid a contraction in transport oil use. Figures 13.18 and 13.19 show transport and non-transport uses of oil in the US and the world. It can be seen that after the early 1970s, non-transport uses of oil have broadly been unchanged for 30 years.

Figure 13.18 Transport and other uses of oil in the US

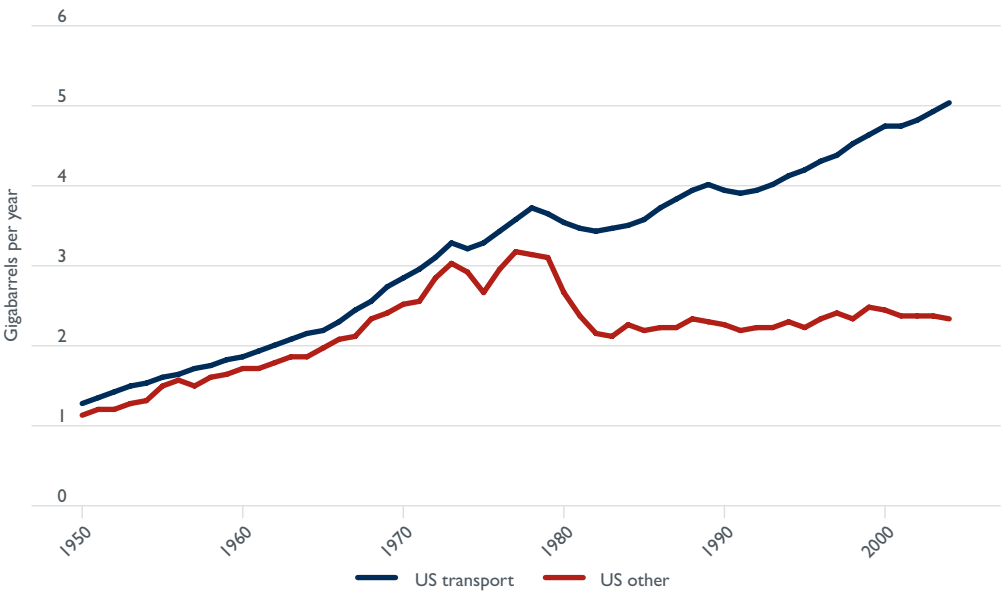
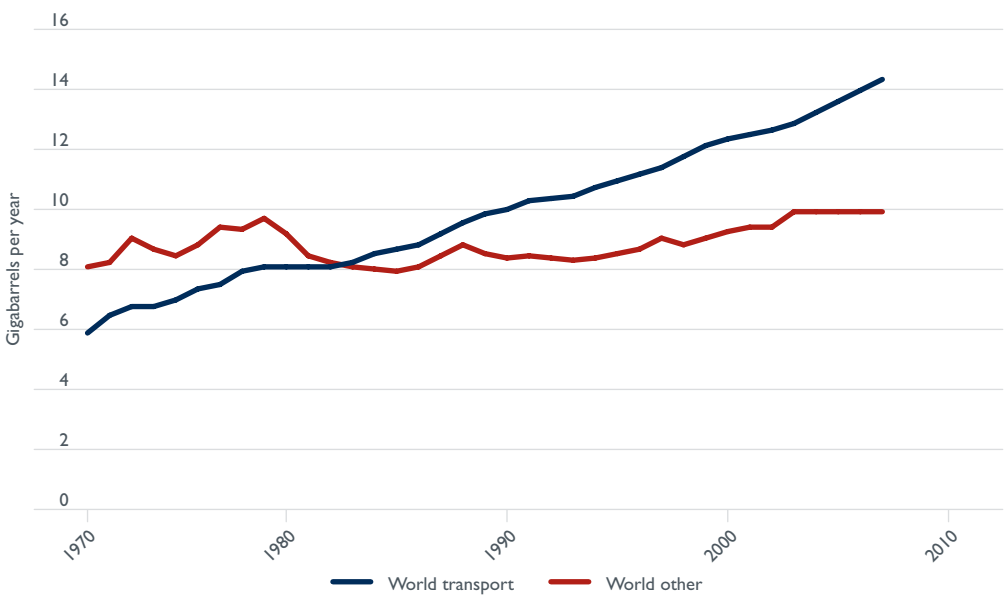


Figure 13.19 World transport and other use of oil



If we assume that by 2016, non-transport uses of oil account for 35 per cent of world oil use, the first part of Box 13.1 shows a projected base for oil use. If we also assume that non-transport uses of oil could be halved by 2050, the second part of Box 13.1 shows the result for transport fuel availability. While total oil use falls 45 per cent (and non-transport is assumed to halve), transport use of oil falls 42 per cent—not much different to the total fall. Thus shifting oil from non-transport uses is not very much of a solution.

Box 13.1 Transport and other uses of oil—reduction scenario

	Sector	Gigabarrels per year: use	Change (per cent)
World 2016	Transport	18.2	
	Non-transport	9.8	
	Total	28	
World 2050	Transport	10.6	−42
	Non-transport	$9.8 \times 1/2 = 4.9$	−50
	Total	15.5	−45

The next chapter will examine the outlook for other liquid fuels that stand in for crude oil in supplying a portion of our energy needs—other ‘liquids’.

Table 13.1 World crude (including deep, polar, and non-conventional)—actual production, gigabarrels

Year	Actual N America	Actual L America	Actual Africa	Actual Europe	Actual Eurasia	Actual East	Actual ME Other	Actual ME Gulf	Actual Other	Actual sum world crude
1870	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1871	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1872	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1873	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1874	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1875	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1876	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1877	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1878	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1879	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1880	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1881	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1882	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1883	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
1884	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
1885	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
1886	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
1887	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
1888	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
1889	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
1890	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
1891	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
1892	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
1893	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
1894	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
1895	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
1896	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
1897	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
1898	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
1899	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03
1900	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05
1901	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07
1902	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08
1903	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
1904	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12
1905	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13
1906	0.13	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14
1907	0.17	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18
1908	0.18	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20
1909	0.20	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22
1910	0.23	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26
1911	0.23	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26
1912	0.25	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29
1913	0.27	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.31
1914	0.28	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33
1915	0.30	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.35
1916	0.32	0.06	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.38
1917	0.32	0.06	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.39
1918	0.32	0.07	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.41
1919	0.40	0.07	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.50
1920	0.48	0.08	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.60
1921	0.50	0.08	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.63
1922	0.55	0.09	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.69
1923	0.75	0.09	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.90
1924	0.73	0.10	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.90
1925	0.78	0.10	0.00	0.00	0.08	0.00	0.00	0.00	0.01	0.97
1926	0.78	0.12	0.00	0.00	0.10	0.00	0.00	0.00	0.01	1.00
1927	0.88	0.12	0.00	0.00	0.12	0.00	0.00	0.00	0.01	1.13
1928	0.88	0.15	0.00	0.00	0.13	0.00	0.00	0.01	0.01	1.18
1929	1.00	0.16	0.00	0.00	0.15	0.00	0.00	0.02	0.01	1.34
1930	0.85	0.19	0.00	0.00	0.17	0.05	0.01	0.05	0.01	1.32
1931	0.90	0.18	0.00	0.00	0.20	0.05	0.01	0.07	0.01	1.41
1932	0.95	0.19	0.00	0.00	0.18	0.05	0.01	0.08	0.01	1.46
1933	1.00	0.19	0.00	0.00	0.19	0.06	0.01	0.08	0.01	1.54
1934	1.05	0.20	0.00	0.00	0.22	0.06	0.01	0.08	0.01	1.63
1935	1.10	0.22	0.00	0.00	0.22	0.06	0.01	0.08	0.01	1.69
1936	1.12	0.24	0.00	0.00	0.25	0.06	0.01	0.10	0.01	1.78
1937	1.19	0.26	0.00	0.00	0.26	0.06	0.01	0.10	0.01	1.88
1938	1.21	0.29	0.00	0.00	0.26	0.06	0.01	0.12	0.01	1.96
1939	1.29	0.30	0.00	0.00	0.27	0.07	0.01	0.12	0.01	2.07
1940	1.37	0.27	0.01	0.00	0.27	0.07	0.01	0.10	0.01	2.11
1941	1.41	0.31	0.01	0.01	0.28	0.07	0.01	0.07	0.01	2.17
1942	1.40	0.25	0.01	0.01	0.27	0.03	0.01	0.10	0.01	2.08
1943	1.51	0.27	0.01	0.01	0.23	0.05	0.01	0.10	0.01	2.20
1944	1.66	0.32	0.01	0.01	0.28	0.03	0.01	0.15	0.01	2.48
1945	1.71	0.39	0.01	0.01	0.22	0.01	0.01	0.20	0.01	2.57
1946	1.73	0.47	0.01	0.01	0.18	0.01	0.01	0.25	0.01	2.68
1947	1.88	0.52	0.01	0.01	0.20	0.03	0.02	0.33	0.01	3.00

(continued)

Table 13.1 World crude (including deep, polar, and non-conventional)—actual production, gigabarrels (continued)

Year	Actual N America	Actual L America	Actual Africa	Actual Europe	Actual Eurasia	Actual East	Actual ME Other	Actual ME Gulf	Actual Other	Actual sum world crude
1948	2.01	0.59	0.01	0.01	0.24	0.05	0.02	0.43	0.01	3.37
1949	1.86	0.60	0.01	0.02	0.27	0.07	0.02	0.53	0.01	3.39
1950	2.02	0.71	0.02	0.03	0.30	0.09	0.03	0.66	0.02	3.87
1951	2.25	0.78	0.02	0.03	0.33	0.10	0.03	0.70	0.02	4.25
1952	2.33	0.82	0.02	0.04	0.38	0.10	0.04	0.75	0.02	4.49
1953	2.46	0.82	0.02	0.04	0.45	0.11	0.04	0.91	0.02	4.86
1954	2.41	0.87	0.01	0.05	0.50	0.12	0.05	0.95	0.02	4.98
1955	2.65	0.96	0.01	0.07	0.61	0.12	0.05	1.12	0.02	5.61
1956	2.78	1.07	0.01	0.07	0.70	0.13	0.06	1.19	0.02	6.04
1957	2.78	1.21	0.02	0.08	0.80	0.15	0.07	1.27	0.02	6.40
1958	2.59	1.19	0.03	0.09	0.90	0.17	0.08	1.50	0.02	6.57
1959	2.77	1.25	0.04	0.09	1.05	0.16	0.08	1.60	0.03	7.07
1960	2.79	1.36	0.11	0.09	1.24	0.19	0.08	1.87	0.03	7.76
1961	2.86	1.44	0.18	0.10	1.38	0.19	0.09	2.00	0.03	8.26
1962	2.95	1.56	0.29	0.12	1.50	0.20	0.09	2.23	0.03	8.95
1963	3.01	1.59	0.44	0.12	1.65	0.21	0.09	2.40	0.03	9.54
1964	3.07	1.63	0.64	0.14	1.80	0.23	0.10	2.65	0.04	10.30
1965	3.13	1.69	0.84	0.14	1.95	0.25	0.11	2.85	0.04	10.99
1966	3.35	1.66	1.03	0.14	2.10	0.24	0.13	3.16	0.04	11.87
1967	3.60	1.77	1.13	0.14	2.28	0.27	0.16	3.36	0.04	12.76
1968	3.74	1.81	1.46	0.12	2.45	0.31	0.27	3.74	0.05	13.94
1969	3.76	1.82	1.84	0.11	2.62	0.36	0.30	4.21	0.05	15.08
1970	3.91	1.89	2.21	0.11	2.91	0.50	0.37	4.71	0.05	16.67
1971	4.00	1.84	2.07	0.11	3.08	0.59	0.39	5.51	0.06	17.64
1972	4.03	1.76	2.08	0.12	3.23	0.66	0.41	5.85	0.06	18.20
1973	4.05	1.87	2.15	0.12	3.55	0.81	0.46	7.32	0.06	20.39
1974	3.85	1.78	1.94	0.12	3.85	0.82	0.50	7.72	0.06	20.64
1975	3.59	1.60	1.83	0.18	4.22	0.80	0.50	6.87	0.06	19.65
1976	3.46	1.60	2.06	0.30	4.55	0.90	0.55	7.55	0.06	21.03
1977	3.50	1.66	2.31	0.49	4.73	1.00	0.49	7.51	0.07	21.76
1978	3.69	1.75	2.21	0.63	4.98	1.01	0.54	7.06	0.07	21.94
1979	3.73	1.89	2.44	0.83	5.15	1.02	0.51	7.29	0.07	22.93
1980	3.70	2.09	2.15	0.87	5.25	0.97	0.50	5.95	0.07	21.56
1981	3.61	2.22	1.75	0.93	5.27	1.03	0.50	5.09	0.07	20.47
1982	3.63	2.25	1.71	1.04	5.30	0.97	0.47	4.17	0.07	19.61
1983	3.65	2.23	1.72	1.17	5.33	1.05	0.46	3.86	0.07	19.55
1984	3.71	2.28	1.82	1.28	5.36	1.15	0.52	3.66	0.07	19.85
1985	3.79	2.32	1.94	1.33	5.39	1.18	0.53	3.33	0.08	19.89
1986	3.75	2.31	1.85	1.36	5.50	1.22	0.58	3.97	0.08	20.62
1987	3.58	2.25	1.89	1.42	5.65	1.20	0.59	3.95	0.08	20.61
1988	3.56	2.32	2.03	1.42	5.62	1.23	0.67	4.38	0.08	21.31
1989	3.36	2.39	2.08	1.38	5.55	1.28	0.74	5.13	0.08	21.99
1990	3.24	2.57	2.32	1.47	5.28	1.33	0.81	5.40	0.08	22.51
1991	3.25	2.65	2.45	1.50	4.85	1.37	0.86	5.09	0.08	22.09
1992	3.19	2.66	2.45	1.60	4.57	1.32	0.88	5.44	0.08	22.19
1993	3.11	2.69	2.41	1.69	4.15	1.30	0.90	5.79	0.07	22.11
1994	3.06	2.77	2.42	1.98	3.85	1.33	0.94	5.82	0.07	22.24
1995	3.06	2.94	2.56	2.11	3.78	1.41	0.99	5.84	0.08	22.77
1996	3.04	3.16	2.56	2.28	3.75	1.39	1.00	5.92	0.08	23.18
1997	3.03	3.39	2.65	2.27	3.84	1.43	1.07	6.26	0.08	24.02
1998	3.02	3.44	2.68	2.31	3.86	1.39	1.09	6.54	0.08	24.40
1999	2.85	3.29	2.58	2.39	3.81	1.41	1.05	6.41	0.08	23.87
2000	2.91	3.42	2.66	2.25	3.97	1.47	1.07	6.73	0.08	24.56
2001	2.94	3.42	2.67	2.25	4.20	1.44	1.06	6.63	0.08	24.68
2002	2.97	3.40	2.63	2.23	4.42	1.44	1.02	6.06	0.08	24.24
2003	2.98	3.34	2.91	2.14	4.79	1.39	1.06	6.43	0.08	25.12
2004	2.83	3.63	3.07	2.03	5.12	1.36	1.05	7.07	0.09	26.25
2005	2.76	3.64	3.27	1.87	5.36	1.31	1.06	7.29	0.09	26.64
2006	2.80	3.65	3.47	1.73	5.58	1.29	1.07	7.17	0.09	26.85

Notes: Actual—actual annual production; Predicted—predicted annual production; ME—Middle East; Other—miscellaneous sources of oil not captured in this analysis; Pred Prod—predicted annual production; Conven—conventional oil (excluding deep water).

**Table 13.1 World crude (including deep, polar, and non-conventional)
predicted production, gigabarrels**

Year	Predicted N America	Predicted L America	Predicted Africa	Predicted Europe	Predicted Eurasia	Predicted East	Predicted ME Other	Predicted ME Gulf	Predicted Other	Predicted world crude
1870	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1871	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1872	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1873	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1874	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1875	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1876	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1877	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1878	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1879	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1880	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1881	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1882	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1883	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1884	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
1885	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
1886	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
1887	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
1888	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
1889	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
1890	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
1891	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
1892	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
1893	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
1894	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
1895	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
1896	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
1897	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03
1898	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04
1899	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05
1900	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06
1901	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07
1902	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09
1903	0.10	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
1904	0.12	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12
1905	0.13	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14
1906	0.15	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16
1907	0.17	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18
1908	0.18	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20
1909	0.20	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23
1910	0.22	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26
1911	0.25	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.28
1912	0.27	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.31
1913	0.30	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.35
1914	0.32	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.37
1915	0.33	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.39
1916	0.35	0.06	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.41
1917	0.36	0.06	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.43
1918	0.39	0.07	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.48
1919	0.44	0.07	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.53
1920	0.48	0.07	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.59
1921	0.53	0.08	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.66
1922	0.61	0.09	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.75
1923	0.65	0.09	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.82
1924	0.70	0.09	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.88
1925	0.74	0.09	0.00	0.00	0.09	0.01	0.00	0.01	0.00	0.94
1926	0.79	0.09	0.00	0.00	0.10	0.01	0.00	0.01	0.01	1.00
1927	0.78	0.08	0.00	0.00	0.12	0.01	0.00	0.01	0.01	1.02
1928	0.80	0.09	0.00	0.00	0.13	0.02	0.00	0.02	0.01	1.07
1929	0.82	0.10	0.00	0.00	0.15	0.02	0.00	0.03	0.01	1.13
1930	0.88	0.13	0.00	0.00	0.17	0.03	0.01	0.04	0.01	1.25
1931	0.95	0.16	0.00	0.00	0.18	0.03	0.01	0.05	0.01	1.38
1932	1.03	0.19	0.00	0.00	0.20	0.04	0.01	0.06	0.01	1.53
1933	1.13	0.22	0.00	0.00	0.21	0.04	0.01	0.07	0.01	1.69
1934	1.23	0.25	0.00	0.00	0.22	0.05	0.01	0.07	0.01	1.83
1935	1.22	0.27	0.00	0.00	0.23	0.05	0.01	0.08	0.01	1.86
1936	1.19	0.28	0.00	0.00	0.24	0.05	0.01	0.09	0.01	1.87
1937	1.16	0.30	0.00	0.00	0.25	0.05	0.01	0.10	0.01	1.87
1938	1.14	0.31	0.00	0.00	0.25	0.05	0.01	0.10	0.01	1.88
1939	1.11	0.33	0.00	0.00	0.26	0.05	0.01	0.12	0.01	1.89
1940	1.18	0.35	0.01	0.00	0.26	0.05	0.01	0.13	0.01	2.00
1941	1.30	0.36	0.01	0.00	0.26	0.05	0.01	0.14	0.01	2.15
1942	1.43	0.38	0.01	0.01	0.25	0.05	0.01	0.16	0.01	2.30
1943	1.55	0.39	0.01	0.01	0.25	0.06	0.01	0.18	0.01	2.47
1944	1.68	0.42	0.01	0.01	0.24	0.06	0.01	0.21	0.01	2.65
1945	1.78	0.47	0.01	0.01	0.25	0.06	0.01	0.25	0.01	2.85
1946	1.86	0.51	0.01	0.01	0.26	0.07	0.01	0.30	0.01	3.05
1947	1.94	0.57	0.01	0.02	0.28	0.07	0.02	0.37	0.01	3.28
1948	2.02	0.64	0.01	0.02	0.29	0.08	0.02	0.45	0.01	3.55

(continued)

Table 13.1 World crude (including deep, polar, and non-conventional) predicted production, gigabarrels (continued)

Year	Predicted N America	Predicted L America	Predicted Africa	Predicted Europe	Predicted Eurasia	Predicted East	Predicted ME Other	Predicted ME Gulf	Predicted Other	Predicted world crude
1949	2.11	0.69	0.01	0.02	0.31	0.08	0.02	0.55	0.02	3.81
1950	2.19	0.74	0.01	0.03	0.34	0.09	0.03	0.65	0.02	4.09
1951	2.26	0.78	0.01	0.03	0.37	0.10	0.03	0.74	0.02	4.35
1952	2.34	0.82	0.01	0.04	0.40	0.11	0.04	0.83	0.02	4.61
1953	2.40	0.83	0.01	0.04	0.46	0.11	0.04	0.92	0.02	4.84
1954	2.46	0.85	0.02	0.05	0.51	0.12	0.05	1.00	0.02	5.08
1955	2.53	0.90	0.02	0.06	0.56	0.12	0.05	1.08	0.02	5.35
1956	2.59	0.94	0.04	0.07	0.66	0.13	0.06	1.20	0.02	5.69
1957	2.65	1.00	0.06	0.07	0.78	0.14	0.06	1.34	0.02	6.13
1958	2.72	1.11	0.10	0.08	0.90	0.14	0.07	1.51	0.02	6.67
1959	2.79	1.21	0.17	0.09	1.04	0.16	0.07	1.70	0.03	7.25
1960	2.86	1.33	0.25	0.10	1.23	0.17	0.08	1.88	0.03	7.92
1961	2.93	1.41	0.35	0.11	1.38	0.18	0.08	2.08	0.03	8.54
1962	3.00	1.46	0.48	0.11	1.51	0.20	0.08	2.29	0.03	9.16
1963	3.06	1.52	0.63	0.11	1.68	0.22	0.09	2.50	0.03	9.85
1964	3.12	1.55	0.79	0.12	1.87	0.24	0.11	2.72	0.04	10.54
1965	3.19	1.57	0.95	0.12	2.01	0.27	0.13	2.95	0.04	11.22
1966	3.24	1.61	1.11	0.12	2.19	0.30	0.17	3.24	0.04	12.01
1967	3.40	1.69	1.24	0.12	2.38	0.33	0.21	3.59	0.04	13.01
1968	3.57	1.75	1.37	0.13	2.55	0.37	0.25	3.97	0.05	14.01
1969	3.73	1.86	1.51	0.12	2.69	0.44	0.28	4.38	0.05	15.06
1970	3.88	1.93	1.61	0.12	2.81	0.51	0.32	4.85	0.05	16.09
1971	4.04	1.90	1.71	0.12	2.96	0.58	0.35	5.32	0.05	17.02
1972	3.94	1.87	1.80	0.12	3.18	0.66	0.38	5.74	0.05	17.75
1973	3.84	1.87	1.87	0.13	3.38	0.73	0.41	6.10	0.06	18.38
1974	3.74	1.73	1.92	0.18	3.58	0.77	0.44	6.36	0.06	18.77
1975	3.65	1.62	1.96	0.25	3.94	0.80	0.47	6.50	0.06	19.24
1976	3.57	1.68	1.98	0.36	4.29	0.85	0.51	6.54	0.06	19.83
1977	3.63	1.74	1.99	0.45	4.56	0.89	0.54	6.53	0.06	20.41
1978	3.68	1.73	1.99	0.59	4.87	0.94	0.55	6.39	0.07	20.80
1979	3.68	1.81	1.98	0.79	5.18	0.97	0.56	6.19	0.07	21.24
1980	3.67	1.94	2.00	0.96	5.32	1.01	0.57	5.94	0.07	21.48
1981	3.59	2.05	2.04	1.05	5.32	1.04	0.55	5.63	0.07	21.34
1982	3.48	2.12	2.09	1.09	5.18	1.07	0.54	5.23	0.07	20.87
1983	3.44	2.21	2.12	1.14	5.15	1.10	0.55	4.92	0.07	20.71
1984	3.51	2.44	2.13	1.24	5.13	1.13	0.55	4.67	0.07	20.88
1985	3.55	2.44	2.12	1.34	5.05	1.16	0.55	4.53	0.07	20.81
1986	3.58	2.44	2.13	1.44	5.19	1.20	0.57	4.53	0.08	21.16
1987	3.63	2.56	2.14	1.54	5.46	1.22	0.61	4.63	0.08	21.86
1988	3.62	2.59	2.17	1.54	5.47	1.24	0.64	4.75	0.08	22.11
1989	3.47	2.43	2.25	1.52	5.42	1.26	0.68	4.90	0.08	22.02
1990	3.32	2.53	2.33	1.51	5.41	1.27	0.74	5.08	0.08	22.27
1991	3.26	2.55	2.39	1.57	5.09	1.29	0.82	5.23	0.08	22.27
1992	3.21	2.48	2.43	1.66	4.73	1.31	0.85	5.37	0.08	22.12
1993	3.09	2.64	2.44	1.78	4.46	1.34	0.88	5.53	0.07	22.24
1994	3.03	2.87	2.46	1.88	4.25	1.35	0.94	5.69	0.08	22.54
1995	3.02	2.99	2.49	1.97	4.08	1.37	0.97	5.84	0.08	22.81
1996	2.96	3.14	2.51	2.16	4.07	1.40	0.97	6.01	0.08	23.29
1997	2.91	3.32	2.53	2.30	4.06	1.39	1.03	6.17	0.08	23.80
1998	2.96	3.34	2.58	2.40	4.08	1.36	1.09	6.33	0.08	24.22
1999	3.00	3.30	2.65	2.41	4.03	1.37	1.10	6.48	0.08	24.42
2000	3.01	3.35	2.73	2.40	4.03	1.38	1.10	6.60	0.08	24.68
2001	3.00	3.34	2.82	2.32	4.16	1.39	1.10	6.71	0.08	24.92
2002	2.98	3.41	2.94	2.22	4.38	1.40	1.06	6.83	0.08	25.31
2003	2.96	3.49	3.05	2.11	4.69	1.42	1.04	6.95	0.08	25.79
2004	2.90	3.59	3.14	1.94	5.05	1.42	1.04	7.07	0.09	26.23
2005	2.78	3.66	3.22	1.79	5.37	1.40	1.04	7.17	0.09	26.53
2006	2.83	3.76	3.46	1.70	5.46	1.40	1.05	7.27	0.09	27.00
2007	2.96	3.87	3.58	1.57	5.42	1.39	1.07	7.33	0.09	27.27
2008	3.01	3.96	3.71	1.43	5.29	1.39	1.11	7.35	0.09	27.32
2009	3.03	4.03	3.80	1.34	5.13	1.40	1.15	7.33	0.09	27.29
2010	3.11	4.05	3.90	1.24	4.98	1.40	1.16	7.30	0.09	27.23
2011	3.17	3.99	3.99	1.16	4.99	1.42	1.17	7.25	0.09	27.23
2012	3.19	3.91	4.05	1.15	5.17	1.43	1.19	7.20	0.09	27.37
2013	3.24	3.82	4.08	1.14	5.37	1.46	1.17	7.15	0.09	27.53
2014	3.33	3.70	4.11	1.11	5.51	1.49	1.16	7.14	0.09	27.63
2015	3.39	3.61	4.10	1.05	5.61	1.51	1.17	7.20	0.09	27.75
2016	3.38	3.54	4.11	0.99	5.64	1.53	1.18	7.27	0.09	27.73
2017	3.40	3.47	4.13	0.96	5.45	1.53	1.19	7.31	0.09	27.55
2018	3.45	3.43	4.12	0.91	5.16	1.52	1.20	7.38	0.09	27.27
2019	3.46	3.42	4.09	0.86	4.87	1.50	1.23	7.43	0.09	26.95
2020	3.48	3.42	4.06	0.80	4.58	1.49	1.26	7.39	0.08	26.56
2021	3.51	3.49	4.00	0.75	4.23	1.46	1.26	7.29	0.08	26.07
2022	3.55	3.56	3.95	0.71	3.99	1.42	1.25	7.19	0.08	25.72
2023	3.56	3.64	3.92	0.69	3.87	1.39	1.25	7.13	0.08	25.52
2024	3.58	3.75	3.90	0.67	3.69	1.35	1.21	7.08	0.08	25.30
2025	3.61	3.85	3.84	0.66	3.48	1.30	1.17	7.07	0.08	25.04
2026	3.63	3.87	3.77	0.65	3.34	1.26	1.15	7.13	0.08	24.89
2027	3.66	3.88	3.66	0.65	3.15	1.23	1.14	7.27	0.08	24.69

(continued)

Table 13.1 World crude (including deep, polar, and non-conventional) predicted production, gigabarrels (continued)

Year	Predicted N America	Predicted L America	Predicted Africa	Predicted Europe	Predicted Eurasia	Predicted East	Predicted ME Other	Predicted ME Gulf	Predicted Other	Predicted world crude
2028	3.65	3.86	3.53	0.64	2.90	1.20	1.12	7.39	0.07	24.36
2029	3.57	3.84	3.40	0.63	2.70	1.17	1.09	7.46	0.07	23.96
2030	3.50	3.84	3.28	0.62	2.58	1.16	1.09	7.49	0.07	23.64
2031	3.41	3.82	3.16	0.62	2.47	1.14	1.12	7.50	0.07	23.30
2032	3.30	3.76	3.07	0.61	2.37	1.13	1.12	7.49	0.07	22.92
2033	3.23	3.67	2.97	0.60	2.34	1.11	1.09	7.49	0.07	22.57
2034	3.19	3.53	2.89	0.60	2.33	1.10	1.07	7.47	0.06	22.24
2035	3.14	3.34	2.81	0.58	2.31	1.08	1.03	7.44	0.06	21.81
2036	3.10	3.17	2.74	0.57	2.29	1.07	0.95	7.41	0.06	21.36
2037	3.06	3.04	2.68	0.56	2.29	1.06	0.88	7.34	0.06	20.96
2038	3.01	2.93	2.61	0.55	2.30	1.05	0.84	7.24	0.06	20.59
2039	2.96	2.84	2.56	0.54	2.30	1.04	0.77	7.19	0.06	20.25
2040	2.90	2.78	2.51	0.53	2.28	1.02	0.68	7.11	0.06	19.87
2041	2.84	2.70	2.45	0.52	2.28	0.99	0.61	7.02	0.06	19.48
2042	2.78	2.61	2.38	0.49	2.31	0.97	0.55	6.95	0.05	19.11
2043	2.72	2.51	2.33	0.47	2.31	0.94	0.48	6.84	0.05	18.66
2044	2.67	2.39	2.27	0.45	2.30	0.92	0.43	6.73	0.05	18.20
2045	2.62	2.26	2.20	0.43	2.32	0.89	0.40	6.63	0.05	17.80
2046	2.59	2.15	2.13	0.41	2.32	0.87	0.38	6.51	0.05	17.40
2047	2.56	2.05	2.06	0.41	2.25	0.84	0.35	6.33	0.05	16.90
2048	2.52	1.98	1.99	0.40	2.20	0.81	0.34	6.15	0.05	16.44
2049	2.49	1.92	1.92	0.40	2.17	0.78	0.34	5.94	0.05	16.01
2050	2.45	1.88	1.87	0.39	2.10	0.75	0.34	5.74	0.04	15.56
2051	2.41	1.84	1.81	0.38	2.01	0.73	0.33	5.55	0.04	15.12
2052	2.37	1.82	1.77	0.37	1.96	0.72	0.33	5.40	0.04	14.76
2053	2.33	1.79	1.71	0.36	1.93	0.70	0.31	5.27	0.04	14.43
2054	2.29	1.76	1.65	0.35	1.88	0.67	0.29	5.23	0.04	14.17
2055	2.25	1.72	1.61	0.34	1.85	0.65	0.28	5.20	0.04	13.93
2056	2.22	1.69	1.56	0.32	1.82	0.62	0.26	5.11	0.04	13.64
2057	2.18	1.66	1.50	0.30	1.80	0.59	0.24	5.09	0.04	13.41
2058	2.15	1.63	1.45	0.28	1.78	0.56	0.23	5.08	0.04	13.19
2059	2.12	1.60	1.40	0.27	1.73	0.54	0.21	4.98	0.04	12.87
2060	2.09	1.58	1.34	0.25	1.68	0.51	0.19	4.91	0.04	12.59
2061	2.06	1.56	1.29	0.23	1.67	0.48	0.17	4.85	0.03	12.35
2062	2.04	1.55	1.22	0.22	1.66	0.46	0.16	4.70	0.03	12.03
2063	2.01	1.54	1.17	0.20	1.61	0.43	0.15	4.57	0.03	11.71
2064	1.99	1.52	1.11	0.19	1.59	0.40	0.14	4.43	0.03	11.41
2065	1.96	1.51	1.05	0.17	1.58	0.38	0.14	4.30	0.03	11.13
2066	1.94	1.50	1.00	0.16	1.55	0.36	0.14	4.22	0.03	10.89
2067	1.92	1.48	0.96	0.15	1.50	0.34	0.14	4.10	0.03	10.61
2068	1.90	1.46	0.92	0.14	1.47	0.32	0.14	3.97	0.03	10.33
2069	1.88	1.44	0.87	0.12	1.44	0.30	0.14	3.86	0.03	10.08
2070	1.86	1.42	0.82	0.11	1.41	0.28	0.14	3.70	0.03	9.76
2071	1.84	1.40	0.78	0.10	1.37	0.26	0.13	3.54	0.03	9.45
2072	1.82	1.39	0.74	0.09	1.36	0.24	0.13	3.43	0.03	9.23
2073	1.81	1.37	0.72	0.08	1.35	0.22	0.13	3.30	0.03	9.01
2074	1.80	1.35	0.71	0.07	1.33	0.21	0.13	3.18	0.03	8.80
2075	1.79	1.33	0.69	0.06	1.31	0.19	0.13	3.08	0.03	8.61
2076	1.78	1.31	0.67	0.06	1.28	0.18	0.12	3.00	0.03	8.43
2077	1.77	1.29	0.66	0.05	1.24	0.17	0.12	2.93	0.02	8.25
2078	1.76	1.27	0.63	0.04	1.22	0.15	0.11	2.86	0.02	8.08
2079	1.76	1.26	0.62	0.04	1.19	0.14	0.11	2.82	0.02	7.95
2080	1.76	1.24	0.61	0.03	1.17	0.13	0.10	2.79	0.02	7.85
2081	1.75	1.22	0.60	0.03	1.16	0.11	0.10	2.72	0.02	7.73
2082	1.75	1.20	0.59	0.03	1.16	0.10	0.09	2.67	0.02	7.63
2083	1.75	1.19	0.58	0.02	1.14	0.09	0.10	2.63	0.02	7.53
2084	1.75	1.17	0.56	0.02	1.12	0.08	0.10	2.56	0.02	7.38
2085	1.75	1.15	0.53	0.02	1.09	0.07	0.10	2.49	0.02	7.23
2086	1.75	1.13	0.50	0.01	1.07	0.07	0.10	2.43	0.02	7.09
2087	1.75	1.11	0.48	0.01	1.04	0.06	0.10	2.33	0.02	6.92
2088	1.75	1.10	0.47	0.01	1.02	0.05	0.10	2.26	0.02	6.78
2089	1.75	1.08	0.46	0.01	0.99	0.05	0.10	2.20	0.02	6.66
2090	1.75	1.06	0.45	0.01	0.96	0.04	0.10	2.11	0.02	6.51
2091	1.75	1.05	0.44	0.01	0.95	0.04	0.10	2.05	0.02	6.39
2092	1.75	1.03	0.42	0.00	0.94	0.03	0.09	1.99	0.02	6.28
2093	1.75	1.02	0.40	0.00	0.91	0.03	0.09	1.91	0.02	6.13
2094	1.75	1.00	0.37	0.00	0.88	0.03	0.09	1.83	0.02	5.98
2095	1.75	0.98	0.35	0.00	0.86	0.03	0.09	1.76	0.02	5.84
2096	1.75	0.97	0.34	0.00	0.82	0.02	0.09	1.65	0.02	5.65
2097	1.75	0.95	0.32	0.00	0.79	0.02	0.08	1.54	0.02	5.47
2098	1.75	0.94	0.31	0.00	0.77	0.02	0.08	1.43	0.02	5.31
2099	1.75	0.92	0.30	0.00	0.71	0.01	0.08	1.32	0.02	5.11
2100	1.75	0.91	0.29	0.00	0.66	0.01	0.08	1.22	0.02	4.93

Notes: Actual—actual annual production; Predicted—predicted annual production; ME—Middle East; Other—miscellaneous sources of oil not captured in this analysis; Pred Prod—predicted annual production; Conven—conventional oil (excluding deep water).

(continued)

Table 13.2 Aggregate conventional oil production, gigabarrels

Year	SD	CD	2 1yr SCD	Years lag	Raw pred CP	3yr smth pred SCP	SCP	Raw pred P	Actual P
1870	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00
1871	0.03	0.03	0.03	10.00	0.00	0.00	0.00	0.00	0.00
1872	0.06	0.09	0.09	19.00	0.00	0.00	0.00	0.00	0.00
1873	0.09	0.17	0.17	24.00	0.00	0.00	0.01	0.00	0.00
1874	0.12	0.29	0.29	26.00	0.00	0.00	0.01	0.00	0.00
1875	0.30	0.44	0.59	27.00	0.00	0.00	0.01	0.00	0.00
1876	0.26	0.61	0.86	27.00	0.00	0.00	0.01	0.00	0.00
1877	0.31	0.81	1.17	28.00	0.00	0.00	0.01	0.00	0.00
1878	0.35	1.04	1.51	28.00	0.00	0.00	0.02	0.00	0.00
1879	0.39	1.31	1.91	29.00	0.00	0.00	0.02	0.00	0.00
1880	0.43	1.75	2.34	30.00	0.00	0.00	0.02	0.00	0.00
1881	0.36	2.12	2.70	30.00	0.00	0.00	0.03	0.00	0.00
1882	0.39	2.51	3.08	30.00	0.00	0.00	0.03	0.00	0.00
1883	0.42	2.93	3.50	31.00	0.00	0.00	0.04	0.00	0.01
1884	0.45	3.39	3.96	31.00	0.01	0.01	0.04	0.01	0.01
1885	0.49	3.87	4.44	31.00	0.02	0.02	0.05	0.01	0.01
1886	0.52	4.39	4.96	31.00	0.04	0.04	0.05	0.01	0.01
1887	0.55	4.94	5.52	31.00	0.05	0.05	0.06	0.01	0.01
1888	0.59	5.52	6.10	31.00	0.07	0.06	0.07	0.01	0.01
1889	0.62	6.14	6.72	31.00	0.07	0.07	0.07	0.01	0.01
1890	0.69	6.79	7.41	31.00	0.08	0.08	0.08	0.01	0.01
1891	0.76	7.47	8.17	31.00	0.09	0.09	0.09	0.01	0.01
1892	0.82	8.18	8.99	31.00	0.10	0.10	0.10	0.01	0.01
1893	0.91	8.92	9.90	31.00	0.11	0.11	0.11	0.01	0.01
1894	0.96	9.70	10.86	31.00	0.12	0.12	0.12	0.01	0.01
1895	1.01	10.51	11.87	31.00	0.13	0.14	0.13	0.02	0.01
1896	1.07	11.35	12.94	31.00	0.16	0.16	0.15	0.02	0.02
1897	1.14	12.23	14.08	30.00	0.18	0.19	0.18	0.03	0.03
1898	1.22	13.11	15.30	30.00	0.22	0.22	0.21	0.04	0.04
1899	1.32	14.05	16.62	30.00	0.27	0.27	0.26	0.05	0.04
1900	1.44	15.78	18.05	30.00	0.32	0.33	0.31	0.06	0.06
1901	1.57	17.61	19.62	30.00	0.39	0.40	0.38	0.07	0.07
1902	1.69	19.37	21.32	30.00	0.48	0.48	0.46	0.09	0.08
1903	1.85	21.56	23.16	31.00	0.58	0.59	0.57	0.10	0.10
1904	1.97	23.18	25.13	31.00	0.70	0.71	0.69	0.12	0.12
1905	2.10	24.66	27.23	31.00	0.84	0.85	0.83	0.14	0.14
1906	2.24	26.29	29.47	30.00	1.00	1.01	0.99	0.16	0.16
1907	2.41	28.36	31.89	31.00	1.18	1.19	1.17	0.18	0.18
1908	2.60	30.52	34.49	31.00	1.38	1.39	1.37	0.20	0.20
1909	2.79	33.17	37.28	31.00	1.60	1.60	1.59	0.22	0.22
1910	3.00	36.32	40.28	31.00	1.83	1.86	1.84	0.26	0.24
1911	3.18	39.74	43.47	32.00	2.15	2.15	2.10	0.29	0.27
1912	3.36	43.01	46.82	32.00	2.46	2.47	2.39	0.32	0.29
1913	3.53	46.93	50.35	33.00	2.79	2.81	2.69	0.34	0.31
1914	3.75	50.29	54.09	33.00	3.17	3.18	3.02	0.38	0.33
1915	4.00	53.83	58.09	33.00	3.59	3.58	3.38	0.40	0.36
1916	4.56	57.56	62.65	33.00	3.98	3.99	3.78	0.41	0.40
1917	4.85	62.02	67.50	33.00	4.41	4.42	4.22	0.42	0.44
1918	5.63	66.88	73.13	33.00	4.86	4.88	4.72	0.47	0.50
1919	6.11	71.77	79.24	33.00	5.38	5.40	5.27	0.51	0.55
1920	7.03	77.05	86.27	34.00	5.95	6.00	5.87	0.60	0.61
1921	7.40	82.65	93.67	34.00	6.67	6.68	6.54	0.68	0.66
1922	7.77	88.09	101.44	34.00	7.42	7.44	7.26	0.76	0.73
1923	8.27	93.40	109.71	34.00	8.23	8.27	8.05	0.83	0.79
1924	8.72	100.20	118.43	34.00	9.16	9.16	8.92	0.89	0.87
1925	9.29	107.20	127.72	34.00	10.08	10.11	9.85	0.95	0.93
1926	9.93	120.37	137.66	34.00	11.08	11.08	10.85	0.97	0.99
1927	10.67	128.05	148.33	34.00	12.07	12.10	11.91	1.02	1.07
1928	11.32	146.64	159.65	35.00	13.15	13.15	13.06	1.05	1.15
1929	11.90	158.80	171.55	35.00	14.22	14.26	14.30	1.11	1.24
1930	12.46	180.91	184.01	36.00	15.40	15.41	15.67	1.16	1.38
1931	13.11	191.77	197.12	36.00	16.63	16.77	17.12	1.36	1.45
1932	13.66	202.87	210.78	36.00	18.28	18.31	18.65	1.54	1.52
1933	14.22	216.62	225.00	36.00	20.03	20.05	20.22	1.74	1.58
1934	14.77	230.04	239.76	36.00	21.85	21.89	21.86	1.83	1.64
1935	15.37	245.43	255.14	36.00	23.78	23.82	23.57	1.93	1.71
1936	15.90	262.42	271.03	36.00	25.82	25.74	25.35	1.92	1.78
1937	16.14	281.70	287.17	36.00	27.61	27.59	27.22	1.86	1.87
1938	17.35	299.75	304.52	36.00	29.35	29.38	29.17	1.78	1.95
1939	17.59	316.77	322.11	36.00	31.17	31.22	31.22	1.84	2.05
1940	18.19	333.38	340.30	35.00	33.13	33.16	33.34	1.94	2.12
1941	18.45	352.41	358.75	35.00	35.18	35.25	35.52	2.09	2.18
1942	19.25	369.46	377.99	35.00	37.43	37.51	37.75	2.26	2.23
1943	20.19	386.72	398.18	35.00	39.91	39.95	40.09	2.44	2.34
1944	21.10	403.49	419.29	34.00	42.50	42.55	42.52	2.60	2.43
1945	22.26	423.04	441.54	35.00	45.23	45.34	45.07	2.79	2.55
1946	23.09	441.01	464.63	34.00	48.28	48.34	47.78	3.00	2.71
1947	24.29	459.26	488.93	34.00	51.50	51.57	50.72	3.23	2.94
1948	25.03	492.34	513.95	35.00	54.93	55.01	53.95	3.44	3.22
1949	25.85	516.03	539.81	35.00	58.61	58.73	57.48	3.72	3.53
1950	27.67	540.85	567.48	36.00	62.65	62.74	61.30	4.01	3.81

(continued)

Table 13.2 Aggregate conventional oil production, gigabarrels (continued)

Year	SD	CD	2 Yr SCD	Years lag	Raw pred CP	3yr smth pred SCP	SCP	Raw pred P	Actual P
1951	28.87	568.31	596.34	36.00	66.96	67.04	65.37	4.29	4.08
1952	30.36	595.94	626.70	36.00	71.50	71.58	69.72	4.54	4.34
1953	31.30	626.83	658.00	36.00	76.28	76.31	74.33	4.74	4.62
1954	32.36	659.80	690.36	37.00	81.17	81.25	79.31	4.94	4.98
1955	33.31	697.46	723.67	38.00	86.31	86.43	84.68	5.18	5.37
1956	34.40	730.33	758.07	38.00	91.83	91.89	90.42	5.45	5.74
1957	35.29	772.58	793.36	39.00	97.52	97.77	96.50	5.88	6.08
1958	36.17	807.25	829.54	40.00	103.96	104.22	102.95	6.45	6.45
1959	36.24	842.67	865.78	40.00	111.17	111.30	109.90	7.08	6.95
1960	36.91	897.86	902.69	41.00	118.75	119.06	117.43	7.77	7.53
1961	37.44	939.60	940.13	42.00	127.26	127.53	125.59	8.47	8.16
1962	37.63	989.97	977.76	43.00	136.57	136.55	134.32	9.02	8.73
1963	37.72	1 026.67	1 015.48	44.00	145.82	146.03	143.70	9.48	9.38
1964	37.68	1 066.24	1 053.16	44.00	155.71	156.06	153.77	10.02	10.07
1965	37.40	1 102.95	1 090.56	45.00	166.65	166.96	164.62	10.90	10.85
1966	36.95	1 145.54	1 127.51	46.00	178.53	178.76	176.27	11.80	11.65
1967	36.55	1 182.18	1 164.06	46.00	191.12	191.39	188.81	12.63	12.53
1968	35.83	1 218.86	1 199.90	47.00	204.53	205.11	202.39	13.72	13.58
1969	35.21	1 253.43	1 235.11	47.00	219.69	219.91	217.16	14.80	14.77
1970	34.55	1 291.16	1 269.66	48.00	235.51	235.79	233.08	15.88	15.92
1971	33.05	1 327.12	1 302.71	49.00	252.17	252.75	249.98	16.96	16.90
1972	32.40	1 358.61	1 335.11	49.00	270.58	270.57	267.98	17.81	18.00
1973	30.94	1 388.03	1 366.05	50.00	288.95	288.96	287.03	18.40	19.05
1974	30.16	1 418.03	1 396.21	51.00	307.35	307.54	306.64	18.58	19.61
1975	29.29	1 445.19	1 425.50	51.00	326.32	326.49	326.77	18.95	20.13
1976	28.57	1 473.49	1 454.07	52.00	345.80	346.17	347.42	19.68	20.64
1977	27.41	1 497.94	1 481.49	52.00	366.41	366.42	368.81	20.25	21.40
1978	26.47	1 525.01	1 507.96	53.00	387.06	387.32	390.69	20.90	21.87
1979	25.55	1 546.66	1 533.51	53.00	408.48	408.52	412.57	21.21	21.88
1980	24.64	1 568.26	1 558.14	53.00	430.03	429.80	434.19	21.28	21.62
1981	23.49	1 592.02	1 581.63	54.00	450.90	450.83	454.89	21.02	20.71
1982	22.39	1 619.97	1 604.03	54.00	471.55	471.45	474.79	20.63	19.90
1983	21.49	1 639.70	1 625.52	55.00	491.91	491.64	494.18	20.19	19.39
1984	20.68	1 660.12	1 646.19	55.00	511.46	511.79	513.52	20.15	19.34
1985	19.79	1 681.27	1 665.99	56.00	532.01	532.25	533.10	20.46	19.57
1986	19.04	1 702.94	1 685.02	56.00	553.28	553.11	552.93	20.86	19.83
1987	18.21	1 721.21	1 703.23	56.00	574.04	574.57	573.24	21.45	20.31
1988	17.57	1 738.14	1 720.80	57.00	596.37	596.31	594.11	21.74	20.87
1989	16.78	1 755.38	1 737.58	57.00	618.51	618.31	615.77	22.01	21.66
1990	16.26	1 770.77	1 753.84	57.00	640.06	640.14	637.95	21.82	22.19
1991	15.73	1 784.43	1 769.58	57.00	661.84	661.80	660.16	21.66	22.20
1992	15.06	1 797.38	1 784.63	58.00	683.49	683.43	682.10	21.63	21.94
1993	14.12	1 809.92	1 798.75	58.00	704.95	705.15	703.86	21.72	21.76
1994	13.62	1 822.22	1 812.37	58.00	727.00	727.05	725.75	21.90	21.89
1995	13.05	1 833.70	1 825.42	58.00	749.20	749.34	747.91	22.30	22.16
1996	12.43	1 844.93	1 837.85	58.00	771.83	772.17	770.46	22.83	22.55
1997	11.78	1 855.88	1 849.63	58.00	795.48	795.50	793.31	23.33	22.85
1998	11.29	1 866.90	1 860.92	58.00	819.19	819.13	816.25	23.63	22.94
1999	10.85	1 877.46	1 871.77	59.00	842.73	842.65	839.29	23.52	23.04
2000	10.39	1 888.15	1 882.16	59.00	866.04	866.02	862.94	23.37	23.65
2001	9.98	1 898.62	1 892.14	59.00	889.29	889.50	886.21	23.48	23.27
2002	9.65	1 908.18	1 901.78	59.00	913.16	913.19	909.66	23.70	23.45
2003	9.34	1 916.46	1 911.12	59.00	937.13	937.25	933.21	24.06	23.55
2004	9.05	1 925.76	1 920.17	59.00	961.47	961.68	957.25	24.43	24.04
2005	8.76	1 934.10	1 928.92	59.00	986.45	986.44	981.96	24.76	24.71
2006	8.50	1 942.27	1 937.42	59.00	1 011.40	1 011.21	1 006.11	24.77	24.14
2007	8.24	1 950.34	1 945.66	59.00	1 035.77	1 035.59		24.38	
2008	8.00	1 958.30	1 953.66	59.00	1 059.60	1 059.52		23.93	
2009	7.74	1 966.08	1 961.39	59.00	1 083.19	1 083.08		23.56	
2010	7.49	1 973.48	1 968.88	59.00	1 106.45	1 106.37		23.29	
2011	7.23	1 980.31	1 976.12	60.00	1 129.47	1 129.41		23.04	
2012	6.98	1 987.00	1 983.09	60.00	1 152.31	1 152.41		23.01	
2013	6.76	1 993.50	1 989.85	60.00	1 175.46	1 175.43		23.01	
2014	6.59	1 999.89	1 996.44	60.00	1 198.51	1 198.36		22.93	
2015	6.37	2 006.10	2 002.82	60.00	1 221.10	1 220.90		22.54	
2016	6.19	2 012.15	2 009.01	60.00	1 243.09	1 243.07		22.17	
2017	6.01	2 018.04	2 015.01	60.00	1 265.01	1 265.02		21.96	
2018	5.82	2 023.77	2 020.84	60.00	1 286.97	1 286.76		21.73	
2019	5.64	2 029.33	2 026.48	60.00	1 308.29	1 308.09		21.33	
2020	5.46	2 034.75	2 031.93	60.00	1 329.00	1 328.89		20.81	
2021	5.28	2 040.01	2 037.22	61.00	1 349.39	1 349.14		20.25	
2022	5.13	2 045.13	2 042.35	61.00	1 369.04	1 368.74		19.60	
2023	4.98	2 050.10	2 047.33	61.00	1 387.79	1 387.73		18.99	
2024	4.83	2 054.91	2 052.16	61.00	1 406.36	1 406.42		18.69	
2025	4.68	2 059.57	2 056.84	61.00	1 425.11	1 424.98		18.55	
2026	4.53	2 064.08	2 061.37	61.00	1 443.45	1 443.35		18.38	
2027	4.38	2 068.44	2 065.75	61.00	1 461.50	1 461.50		18.14	
2028	4.23	2 072.66	2 069.98	61.00	1 479.55	1 479.43		17.94	
2029	4.09	2 076.73	2 074.07	61.00	1 497.26	1 497.05		17.62	
2030	3.94	2 080.66	2 078.02	61.00	1 514.34	1 514.24		17.19	
2031	3.80	2 084.44	2 081.82	61.00	1 531.11	1 531.12		16.88	

Table 13.2 Aggregate conventional oil production, gigabarrels (continued)

Year	SD	CD	2 1yr SCD	Years lag	Raw pred CP	3yr smth pred SCP	SCP	Raw pred P	Actual P
2032	3.66	2 088.07	2 085.48	62.00	1 547.89	1 547.83		16.72	
2033	3.52	2 091.57	2 089.00	62.00	1 564.49	1 564.32		16.49	
2034	3.38	2 094.93	2 092.38	62.00	1 580.57	1 580.49		16.18	
2035	3.24	2 098.15	2 095.61	62.00	1 596.42	1 596.42		15.92	
2036	3.10	2 101.22	2 098.72	62.00	1 612.26	1 612.20		15.78	
2037	2.97	2 104.16	2 101.69	62.00	1 627.92	1 627.83		15.62	
2038	2.84	2 106.96	2 104.53	62.00	1 643.30	1 643.21		15.38	
2039	2.71	2 109.63	2 107.24		1 658.39	1 658.29		15.08	
2040	2.59	2 112.16	2 109.83		1 673.17	1 673.03		14.75	
2041	2.46	2 114.59	2 112.29		1 687.53	1 687.42		14.38	
2042	2.34	2 116.89	2 114.63		1 701.54	1 701.41		14.00	
2043	2.22	2 119.03	2 116.85		1 715.16	1 715.04		13.63	
2044	2.11	2 121.06	2 118.96		1 728.42	1 728.40		13.36	
2045	2.00	2 122.93	2 120.96		1 741.61	1 741.45		13.05	
2046	1.89	2 124.75	2 122.85		1 754.30	1 754.18		12.74	
2047	1.78	2 126.47	2 124.63		1 766.64	1 766.53		12.34	
2048	1.68	2 128.09	2 126.31		1 778.63	1 778.50		11.97	
2049	1.59	2 129.61	2 127.90		1 790.22	1 790.00		11.50	
2050	1.49	2 131.03	2 129.39		1 801.14	1 801.07		11.07	
2051	1.40	2 132.36	2 130.79		1 811.85	1 811.83		10.76	
2052	1.31	2 133.61	2 132.11		1 822.50	1 822.40		10.58	
2053	1.23	2 134.77	2 133.34		1 832.87	1 832.83		10.43	
2054	1.15	2 135.85	2 134.49		1 843.12	1 843.06		10.23	
2055	1.08	2 136.86	2 135.57		1 853.18	1 853.12		10.06	
2056	1.01	2 137.79	2 136.59		1 863.05	1 862.99		9.87	
2057	0.94	2 138.67	2 137.53		1 872.73	1 872.60		9.61	
2058	0.88	2 139.49	2 138.41		1 882.00	1 881.98		9.38	
2059	0.82	2 140.25	2 139.23		1 891.21	1 891.21		9.23	
2060	0.76	2 140.96	2 139.99		1 900.42	1 900.25		9.04	
2061	0.71	2 141.61	2 140.70		1 909.12	1 908.92		8.67	
2062	0.66	2 142.21	2 141.36		1 917.23	1 917.30		8.38	
2063	0.61	2 142.76	2 141.96		1 925.56	1 925.48		8.17	
2064	0.56	2 143.27	2 142.53		1 933.64	1 933.44		7.97	
2065	0.52	2 143.74	2 143.05		1 941.13	1 941.16		7.72	
2066	0.48	2 144.18	2 143.53		1 948.71	1 948.73		7.57	
2067	0.44	2 144.58	2 143.97		1 956.33	1 956.16		7.43	
2068	0.40	2 144.96	2 144.37		1 963.42	1 963.34		7.18	
2069	0.37	2 145.29	2 144.74		1 970.27	1 970.25		6.90	
2070	0.34	2 145.61	2 145.08		1 977.04	1 976.88		6.64	
2071	0.31	2 145.89	2 145.39		1 983.33	1 983.26		6.38	
2072	0.28	2 146.14	2 145.67		1 989.41	1 989.40		6.14	
2073	0.26	2 146.37	2 145.93		1 995.46	1 995.35		5.95	
2074	0.23	2 146.58	2 146.16		2 001.20	2 001.16		5.81	
2075	0.21	2 146.76	2 146.37		2 006.84	2 006.80		5.64	
2076	0.19	2 146.92	2 146.56		2 012.37	2 012.28		5.48	
2077	0.17	2 147.05	2 146.73		2 017.64	2 017.58		5.30	
2078	0.15	2 147.17	2 146.88		2 022.73	2 022.71		5.14	
2079	0.14	2 147.27	2 147.01		2 027.77	2 027.72		5.01	
2080	0.12	2 147.37	2 147.14		2 032.66	2 032.70		4.98	
2081	0.11	2 147.45	2 147.24		2 037.66	2 037.64		4.94	
2082	0.09	2 147.51	2 147.34		2 042.59	2 042.49		4.85	
2083	0.08	2 147.57	2 147.42		2 047.22	2 047.21		4.72	
2084	0.07	2 147.62	2 147.49		2 051.81	2 051.77		4.56	
2085	0.06	2 147.67	2 147.56		2 056.26	2 056.18		4.41	
2086	0.06	2 147.71	2 147.62		2 060.46	2 060.45		4.27	
2087	0.05	2 147.75	2 147.67		2 064.62	2 064.58		4.14	
2088	0.04	2 147.78	2 147.71		2 068.67	2 068.60		4.02	
2089	0.04	2 147.81	2 147.75		2 072.52	2 072.51		3.91	
2090	0.03	2 147.84	2 147.78		2 076.34	2 076.29		3.78	
2091	0.08	2 147.86	2 147.86		2 080.02	2 079.95		3.65	
2092	0.02	2 147.88	2 147.88		2 083.47	2 083.50		3.55	
2093	0.02	2 147.90	2 147.90		2 086.99	2 086.95		3.45	
2094	0.02	2 147.91	2 147.91		2 090.38	2 090.28		3.33	
2095	0.02	2 147.93	2 147.93		2 093.47	2 093.44		3.16	
2096	0.01	2 147.94	2 147.94		2 096.45	2 096.40		2.97	
2097	0.01	2 147.96	2 147.96		2 099.28	2 099.20		2.80	
2098	0.01	2 147.97	2 147.97		2 101.87	2 101.85		2.65	
2099	0.00	2 147.97	2 147.97		2 104.41	2 104.37		2.51	
2100	0.00	2 147.97	2 147.97		2 106.82	2 106.71		2.34	

Notes: D—discovery; CD—cumulative discovery; SCD—smoothed cumulative discovery (years = number of years centred moving average); adj—adjusted (to match cumulative production maximum); predlag—predicted lag between cumulative discovery and cumulative production; raw Pred CP—prediction using direct lag of cumulative discovery by predicted lag years; Pred SCP—raw predicted CP smoothed (with years = number of years centred moving average); SCP—smoothed actual cumulative production (years = number of years centred moving average); raw Pred P—one year change in predicted smoothed cumulative production; Pred SP—smoothed raw Pred P (years = number of years centred moving average); Actual P—actual annual oil production. Shaded numbers are interpolations, extrapolations or forecasts.

(continued)

Table 13.3 World crude predicted

World crude actual

Year	World conv	World deep	World heavy	World crude	Year	World conv	World deep	World heavy	World crude
(gigabarrels)									
1870	0.00	0.00	0.00	0.00	1870	0.00	0.00	0.00	0.00
1871	0.00	0.00	0.00	0.00	1871	0.00	0.00	0.00	0.00
1872	0.00	0.00	0.00	0.00	1872	0.00	0.00	0.00	0.00
1873	0.00	0.00	0.00	0.00	1873	0.00	0.00	0.00	0.00
1874	0.00	0.00	0.00	0.00	1874	0.00	0.00	0.00	0.00
1875	0.00	0.00	0.00	0.00	1875	0.00	0.00	0.00	0.00
1876	0.00	0.00	0.00	0.00	1876	0.00	0.00	0.00	0.00
1877	0.00	0.00	0.00	0.00	1877	0.00	0.00	0.00	0.00
1878	0.00	0.00	0.00	0.00	1878	0.00	0.00	0.00	0.00
1879	0.00	0.00	0.00	0.00	1879	0.00	0.00	0.00	0.00
1880	0.00	0.00	0.00	0.00	1880	0.00	0.00	0.00	0.00
1881	0.00	0.00	0.00	0.00	1881	0.00	0.00	0.00	0.00
1882	0.00	0.00	0.00	0.00	1882	0.00	0.00	0.00	0.00
1883	0.00	0.00	0.00	0.00	1883	0.01	0.00	0.00	0.01
1884	0.01	0.00	0.00	0.01	1884	0.01	0.00	0.00	0.01
1885	0.01	0.00	0.00	0.01	1885	0.01	0.00	0.00	0.01
1886	0.01	0.00	0.00	0.01	1886	0.01	0.00	0.00	0.01
1887	0.01	0.00	0.00	0.01	1887	0.01	0.00	0.00	0.01
1888	0.01	0.00	0.00	0.01	1888	0.01	0.00	0.00	0.01
1889	0.01	0.00	0.00	0.01	1889	0.01	0.00	0.00	0.01
1890	0.01	0.00	0.00	0.01	1890	0.01	0.00	0.00	0.01
1891	0.01	0.00	0.00	0.01	1891	0.01	0.00	0.00	0.01
1892	0.01	0.00	0.00	0.01	1892	0.01	0.00	0.00	0.01
1893	0.01	0.00	0.00	0.01	1893	0.01	0.00	0.00	0.01
1894	0.01	0.00	0.00	0.01	1894	0.01	0.00	0.00	0.01
1895	0.02	0.00	0.00	0.02	1895	0.01	0.00	0.00	0.01
1896	0.02	0.00	0.00	0.02	1896	0.01	0.00	0.00	0.01
1897	0.03	0.00	0.00	0.03	1897	0.01	0.00	0.00	0.01
1898	0.04	0.00	0.00	0.04	1898	0.01	0.00	0.00	0.01
1899	0.05	0.00	0.00	0.05	1899	0.03	0.00	0.00	0.03
1900	0.06	0.00	0.00	0.06	1900	0.05	0.00	0.00	0.05
1901	0.07	0.00	0.00	0.07	1901	0.07	0.00	0.00	0.07
1902	0.09	0.00	0.00	0.09	1902	0.08	0.00	0.00	0.08
1903	0.10	0.00	0.00	0.10	1903	0.10	0.00	0.00	0.10
1904	0.12	0.00	0.00	0.12	1904	0.12	0.00	0.00	0.12
1905	0.14	0.00	0.00	0.14	1905	0.13	0.00	0.00	0.13
1906	0.16	0.00	0.00	0.16	1906	0.14	0.00	0.00	0.14
1907	0.18	0.00	0.00	0.18	1907	0.18	0.00	0.00	0.18
1908	0.20	0.00	0.00	0.20	1908	0.20	0.00	0.00	0.20
1909	0.23	0.00	0.00	0.23	1909	0.22	0.00	0.00	0.22
1910	0.26	0.00	0.00	0.26	1910	0.26	0.00	0.00	0.26
1911	0.28	0.00	0.00	0.28	1911	0.26	0.00	0.00	0.26
1912	0.31	0.00	0.00	0.31	1912	0.29	0.00	0.00	0.29
1913	0.35	0.00	0.00	0.35	1913	0.31	0.00	0.00	0.31
1914	0.37	0.00	0.00	0.37	1914	0.33	0.00	0.00	0.33
1915	0.39	0.00	0.00	0.39	1915	0.35	0.00	0.00	0.35
1916	0.41	0.00	0.00	0.41	1916	0.38	0.00	0.00	0.38
1917	0.43	0.00	0.00	0.43	1917	0.39	0.00	0.00	0.39
1918	0.48	0.00	0.00	0.48	1918	0.41	0.00	0.00	0.41
1919	0.53	0.00	0.00	0.53	1919	0.50	0.00	0.00	0.50
1920	0.59	0.00	0.00	0.59	1920	0.60	0.00	0.00	0.60
1921	0.66	0.00	0.00	0.66	1921	0.63	0.00	0.00	0.63
1922	0.75	0.00	0.00	0.75	1922	0.69	0.00	0.00	0.69
1923	0.82	0.00	0.00	0.82	1923	0.90	0.00	0.00	0.90
1924	0.88	0.00	0.00	0.88	1924	0.90	0.00	0.00	0.90
1925	0.94	0.00	0.00	0.94	1925	0.97	0.00	0.00	0.97
1926	1.00	0.00	0.00	1.00	1926	1.00	0.00	0.00	1.00
1927	1.02	0.00	0.00	1.02	1927	1.13	0.00	0.00	1.13
1928	1.07	0.00	0.00	1.07	1928	1.18	0.00	0.00	1.18
1929	1.13	0.00	0.00	1.13	1929	1.34	0.00	0.00	1.34
1930	1.25	0.00	0.00	1.25	1930	1.32	0.00	0.00	1.32
1931	1.38	0.00	0.00	1.38	1931	1.41	0.00	0.00	1.41
1932	1.53	0.00	0.00	1.53	1932	1.46	0.00	0.00	1.46
1933	1.69	0.00	0.00	1.69	1933	1.54	0.00	0.00	1.54
1934	1.83	0.00	0.00	1.83	1934	1.63	0.00	0.00	1.63
1935	1.86	0.00	0.00	1.86	1935	1.69	0.00	0.00	1.69
1936	1.87	0.00	0.00	1.87	1936	1.78	0.00	0.00	1.78
1937	1.87	0.00	0.00	1.87	1937	1.88	0.00	0.00	1.88
1938	1.88	0.00	0.00	1.88	1938	1.96	0.00	0.00	1.96
1939	1.89	0.00	0.00	1.89	1939	2.07	0.00	0.00	2.07
1940	2.00	0.00	0.00	2.00	1940	2.11	0.00	0.00	2.11
1941	2.15	0.00	0.00	2.15	1941	2.17	0.00	0.00	2.17
1942	2.30	0.00	0.00	2.30	1942	2.08	0.00	0.00	2.08
1943	2.47	0.00	0.00	2.47	1943	2.20	0.00	0.00	2.20
1944	2.65	0.00	0.00	2.65	1944	2.48	0.00	0.00	2.48
1945	2.84	0.00	0.01	2.85	1945	2.56	0.00	0.01	2.57
1946	3.03	0.00	0.02	3.05	1946	2.66	0.00	0.02	2.68
1947	3.25	0.00	0.03	3.28	1947	2.97	0.00	0.03	3.00
1948	3.51	0.00	0.04	3.55	1948	3.33	0.00	0.04	3.37

(continued)

Table 13.3 World crude predicted

World crude actual (continued)

Year	World conv	World deep	World heavy	World crude	Year	World conv	World deep	World heavy	World crude
(gigabarrels)									
1949	3.76	0.00	0.05	3.81	1949	3.34	0.00	0.05	3.39
1950	4.03	0.00	0.06	4.09	1950	3.81	0.00	0.06	3.87
1951	4.28	0.00	0.07	4.35	1951	4.18	0.00	0.07	4.25
1952	4.53	0.00	0.08	4.61	1952	4.41	0.00	0.08	4.49
1953	4.75	0.00	0.09	4.84	1953	4.77	0.00	0.09	4.86
1954	4.98	0.00	0.10	5.08	1954	4.88	0.00	0.10	4.98
1955	5.24	0.00	0.11	5.35	1955	5.50	0.00	0.11	5.61
1956	5.57	0.00	0.12	5.69	1956	5.92	0.00	0.12	6.04
1957	6.00	0.00	0.13	6.13	1957	6.27	0.00	0.13	6.40
1958	6.53	0.00	0.14	6.67	1958	6.43	0.00	0.14	6.57
1959	7.10	0.00	0.15	7.25	1959	6.92	0.00	0.15	7.07
1960	7.76	0.00	0.16	7.92	1960	7.60	0.00	0.16	7.76
1961	8.38	0.00	0.16	8.54	1961	8.10	0.00	0.16	8.26
1962	8.99	0.00	0.18	9.16	1962	8.78	0.00	0.18	8.95
1963	9.66	0.00	0.19	9.85	1963	9.35	0.00	0.19	9.54
1964	10.35	0.00	0.19	10.54	1964	10.11	0.00	0.19	10.30
1965	11.03	0.00	0.20	11.22	1965	10.79	0.00	0.20	10.99
1966	11.83	0.00	0.18	12.01	1966	11.68	0.00	0.18	11.87
1967	12.81	0.00	0.19	13.01	1967	12.57	0.00	0.19	12.76
1968	13.81	0.00	0.19	14.01	1968	13.75	0.00	0.19	13.94
1969	14.85	0.00	0.20	15.06	1969	14.88	0.00	0.20	15.08
1970	15.87	0.00	0.22	16.09	1970	16.45	0.00	0.22	16.67
1971	16.83	0.00	0.20	17.02	1971	17.45	0.00	0.20	17.64
1972	17.56	0.00	0.19	17.75	1972	18.01	0.00	0.19	18.20
1973	18.17	0.00	0.21	18.38	1973	20.18	0.00	0.21	20.39
1974	18.59	0.00	0.17	18.77	1974	20.46	0.00	0.17	20.64
1975	19.08	0.00	0.16	19.24	1975	19.49	0.00	0.16	19.65
1976	19.67	0.00	0.16	19.83	1976	20.87	0.00	0.16	21.03
1977	20.25	0.00	0.16	20.41	1977	21.60	0.00	0.16	21.76
1978	20.62	0.00	0.18	20.80	1978	21.77	0.00	0.18	21.94
1979	21.04	0.00	0.20	21.24	1979	22.73	0.00	0.20	22.93
1980	21.29	0.00	0.19	21.48	1980	21.37	0.00	0.19	21.56
1981	21.14	0.00	0.19	21.34	1981	20.27	0.00	0.19	20.47
1982	20.66	0.00	0.21	20.87	1982	19.40	0.00	0.21	19.61
1983	20.51	0.00	0.20	20.71	1983	19.35	0.00	0.20	19.55
1984	20.67	0.00	0.21	20.88	1984	19.64	0.00	0.21	19.85
1985	20.61	0.00	0.20	20.81	1985	19.69	0.00	0.20	19.89
1986	20.90	0.00	0.25	21.16	1986	20.37	0.00	0.25	20.62
1987	21.59	0.01	0.26	21.86	1987	20.34	0.01	0.26	20.61
1988	21.79	0.01	0.30	22.11	1988	21.00	0.01	0.30	21.31
1989	21.72	0.02	0.28	22.02	1989	21.69	0.02	0.28	21.99
1990	21.96	0.02	0.29	22.27	1990	22.20	0.02	0.29	22.51
1991	21.96	0.03	0.27	22.27	1991	21.79	0.03	0.27	22.09
1992	21.79	0.04	0.29	22.12	1992	21.86	0.04	0.29	22.19
1993	21.86	0.06	0.32	22.24	1993	21.74	0.06	0.32	22.11
1994	22.12	0.09	0.33	22.54	1994	21.82	0.09	0.33	22.24
1995	22.32	0.13	0.36	22.81	1995	22.27	0.13	0.36	22.77
1996	22.75	0.18	0.35	23.29	1996	22.65	0.18	0.35	23.18
1997	23.15	0.25	0.41	23.80	1997	23.37	0.25	0.41	24.02
1998	23.47	0.33	0.42	24.22	1998	23.66	0.33	0.42	24.40
1999	23.59	0.44	0.39	24.42	1999	23.04	0.44	0.39	23.87
2000	23.64	0.56	0.48	24.68	2000	23.52	0.56	0.48	24.56
2001	23.73	0.69	0.50	24.92	2001	23.49	0.69	0.50	24.68
2002	23.88	0.84	0.59	25.31	2002	22.81	0.84	0.59	24.24
2003	24.13	1.01	0.66	25.79	2003	23.49	1.01	0.66	25.12
2004	24.34	1.16	0.73	26.23	2004	24.37	1.16	0.73	26.25
2005	24.46	1.34	0.73	26.53	2005	24.57	1.34	0.73	26.64
2006	24.50	1.71	0.80	27.00	2006	24.34	1.71	0.80	26.85
2007	24.41	1.95	0.91	27.27					
2008	24.12	2.19	1.02	27.32					
2009	23.82	2.35	1.13	27.29					
2010	23.50	2.49	1.24	27.23					
2011	23.28	2.60	1.36	27.23					
2012	23.18	2.72	1.48	27.37					
2013	23.09	2.84	1.60	27.53					
2014	22.94	2.97	1.72	27.63					
2015	22.82	3.10	1.84	27.75					
2016	22.61	3.23	1.89	27.73					
2017	22.26	3.34	1.95	27.55					
2018	21.82	3.43	2.01	27.27					
2019	21.39	3.48	2.07	26.95					
2020	20.88	3.55	2.13	26.56					
2021	20.27	3.63	2.18	26.07					
2022	19.79	3.70	2.23	25.72					
2023	19.47	3.77	2.28	25.52					
2024	19.08	3.89	2.33	25.30					
2025	18.71	3.95	2.38	25.04					
2026	18.49	3.97	2.43	24.89					
2027	18.27	3.95	2.48	24.69					

Table 13.3 World crude predicted

World crude actual (continued)

Year	World conv	World deep	World heavy	World crude	Year	World conv	World deep	World heavy	World crude
(gigabarrels)									
2028	17.94	3.90	2.53	24.36					
2029	17.63	3.80	2.54	23.96					
2030	17.38	3.71	2.55	23.64					
2031	17.15	3.60	2.55	23.30					
2032	16.89	3.48	2.55	22.92					
2033	16.68	3.34	2.55	22.57					
2034	16.51	3.19	2.55	22.24					
2035	16.26	3.00	2.55	21.81					
2036	15.97	2.84	2.55	21.36					
2037	15.70	2.71	2.55	20.96					
2038	15.44	2.60	2.55	20.59					
2039	15.18	2.52	2.55	20.25					
2040	14.86	2.47	2.55	19.87					
2041	14.52	2.40	2.55	19.48					
2042	14.23	2.33	2.55	19.11					
2043	13.85	2.26	2.55	18.66					
2044	13.46	2.18	2.55	18.20					
2045	13.14	2.11	2.55	17.80					
2046	12.81	2.04	2.55	17.40					
2047	12.39	1.97	2.55	16.90					
2048	12.00	1.90	2.55	16.44					
2049	11.64	1.82	2.55	16.01					
2050	11.26	1.75	2.55	15.56					
2051	10.89	1.68	2.55	15.12					
2052	10.60	1.61	2.55	14.76					
2053	10.34	1.54	2.55	14.43					
2054	10.16	1.46	2.55	14.17					
2055	9.99	1.39	2.55	13.93					
2056	9.77	1.32	2.55	13.64					
2057	9.61	1.25	2.55	13.41					
2058	9.46	1.18	2.55	13.19					
2059	9.21	1.11	2.55	12.87					
2060	9.00	1.04	2.55	12.59					
2061	8.83	0.97	2.55	12.35					
2062	8.57	0.91	2.55	12.03					
2063	8.31	0.85	2.55	11.71					
2064	8.07	0.79	2.55	11.41					
2065	7.85	0.73	2.55	11.13					
2066	7.67	0.68	2.55	10.89					
2067	7.44	0.62	2.55	10.61					
2068	7.20	0.58	2.55	10.33					
2069	7.00	0.53	2.55	10.08					
2070	6.72	0.49	2.55	9.76					
2071	6.45	0.45	2.55	9.45					
2072	6.27	0.41	2.55	9.23					
2073	6.08	0.38	2.55	9.01					
2074	5.90	0.35	2.55	8.80					
2075	5.73	0.33	2.55	8.61					
2076	5.57	0.31	2.55	8.43					
2077	5.41	0.29	2.55	8.25					
2078	5.26	0.27	2.55	8.08					
2079	5.14	0.26	2.55	7.95					
2080	5.05	0.25	2.55	7.85					
2081	4.95	0.24	2.55	7.73					
2082	4.85	0.22	2.55	7.63					
2083	4.76	0.21	2.55	7.53					
2084	4.63	0.20	2.55	7.38					
2085	4.49	0.19	2.55	7.23					
2086	4.35	0.18	2.55	7.09					
2087	4.20	0.17	2.55	6.92					
2088	4.06	0.16	2.55	6.78					
2089	3.95	0.15	2.55	6.66					
2090	3.82	0.14	2.55	6.51					
2091	3.71	0.13	2.55	6.39					
2092	3.61	0.12	2.55	6.28					
2093	3.47	0.11	2.55	6.13					
2094	3.32	0.10	2.55	5.98					
2095	3.20	0.09	2.55	5.84					
2096	3.02	0.08	2.55	5.65					
2097	2.85	0.07	2.55	5.47					
2098	2.70	0.06	2.55	5.31					
2099	2.51	0.05	2.55	5.11					
2100	2.34	0.04	2.55	4.93					

Notes: Crude pred—predicted annual production of crude oils; Conv—conventional oil (excluding deep water).

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Chapter 14

World liquids



Chapter 14 World liquids

The Energy Information Administration (EIA) of the US Department of Energy compiles energy statistics from around the world. The EIA accounts for what they call total liquids, defined as crude oil and condensate (what we have been examining so far), natural gas plant liquids, refinery gains, and 'other liquids'. All of these can supply transport with fuels.

Natural gas plant liquids are by-products of the processing of natural gas, the principal one of which is Liquefied Petroleum Gas (LPG) or, as known in the US, Propane.

Refinery gains are basically the expansion of the volume of products that are derived from oil, compared to the initial volume of raw oil going into the refineries.

'Other' liquids comprise biofuels (most of the category) and 'minor liquids' (with highly technical names and acronyms).

The following chapter will examine each of these categories and derive forecasts for them. Combining these forecasts with Chapter 13's forecasts for crude oil will allow a forecast for world liquids as defined by the EIA.

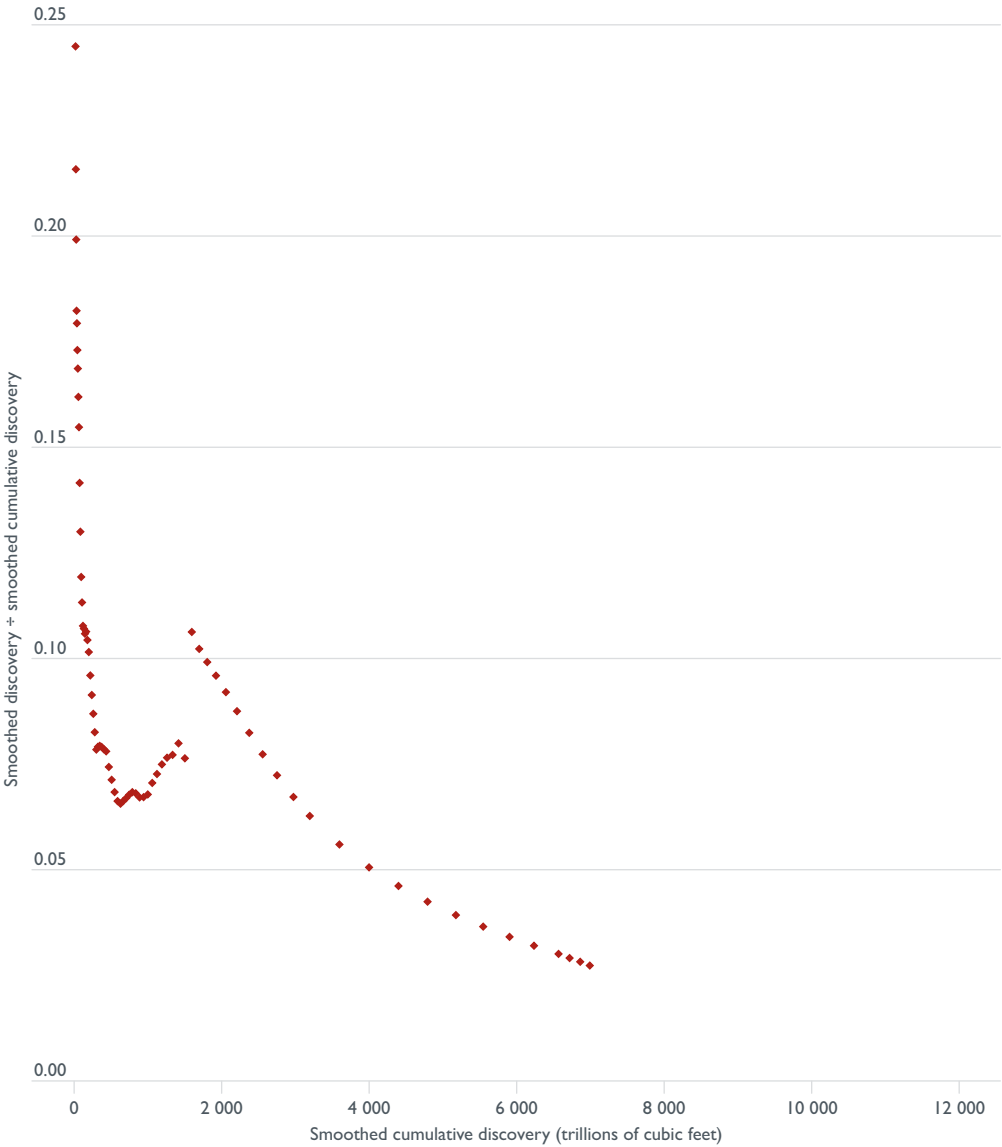
Natural gas plant liquids

As Natural Gas Plant Liquids (NGPLs) are derived during the processing of natural gas, any forecasting of their volumes involves forecasting the future world production of natural gas. This section does that—for both conventional and non-conventional gas—and then assumes NGPLs are a set fraction of the forecast volumes of gas production.

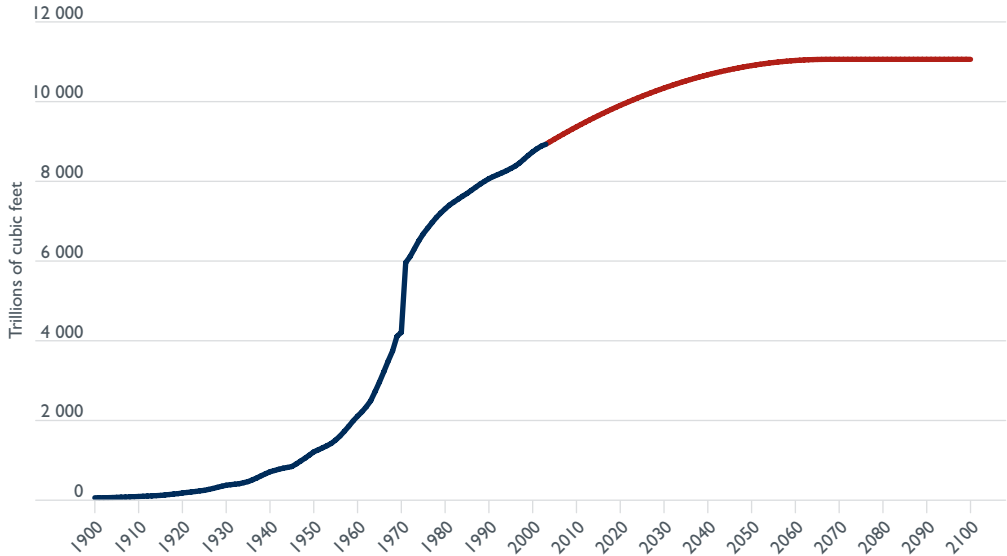
Table 14.1 sets out the calculations from the eight steps to a forecast of production of world conventional natural gas production.

1. An estimate is made of an ultimate cumulative production (U). In this case, it is 16 400 trillion cubic feet (Tcf), based on an estimate by the German Federal Institute for Geosciences and Natural Resources (BGR 2005).
2. Discovery (D) is smoothed with a 31 year moving average and cumulative discovery (CD) is smoothed with a 9 year moving average.
3. The fractional growth in discovery (SD/SCD) is calculated and plotted against last year's smoothed cumulative discovery. This plot is shown in Figure 14.1.

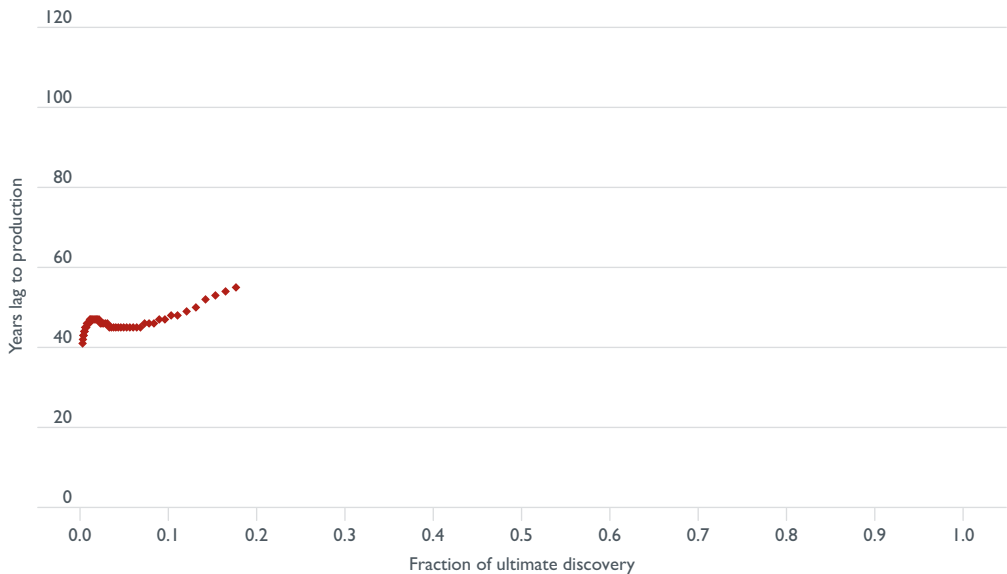
Figure 14.1 World natural gas cumulative discovery growth curve



4. The plot is examined and a best guess at an ultimate discovery (UD) is made. In this case it is 11 000 Tcf.
5. Cumulative discovery in 2006 is then projected to UD by bringing SD estimated for 2006 to zero in 2070. For natural gas, the projection of the cumulative discovery curve is shown in Figure 14.2.
6. Next, the height of the cumulative discovery curve has to be adjusted to equal the cumulative production estimate. In this case, the adjustment is upward, amounting to multiplying by 16 400/11 000.

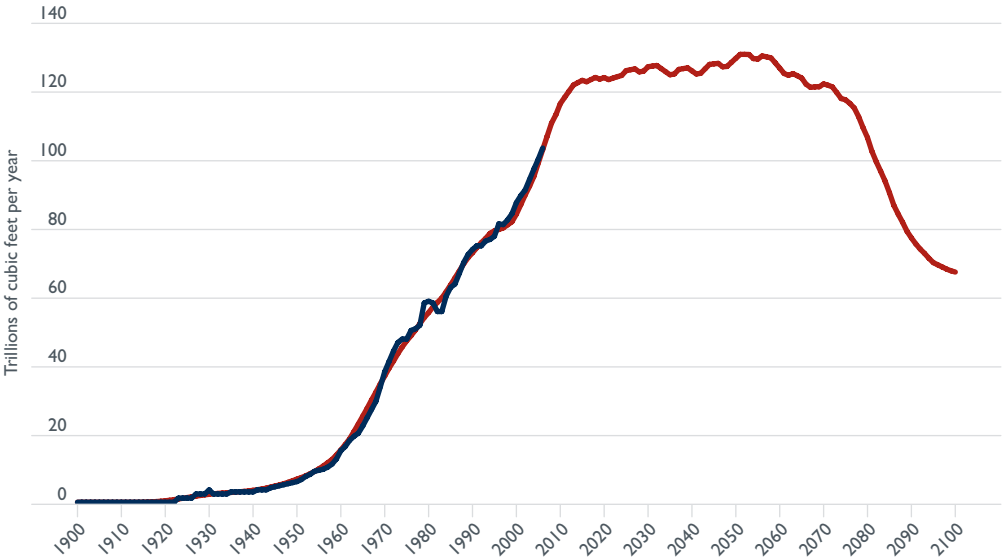
Figure 14.2 World natural gas cumulative discovery projection

- Next, the historical stretch lag between the cumulative discovery and production curves is calculated, and plotted against the fraction of cumulative discovery. This plot for world natural gas is shown in Figure 14.3. It is apparent that there is a regular relationship. After some noise in the range of zero to 0.1, the stretch lag exhibits a steady rise. Extrapolating the trend to 84 years at 1.0 allows the rest of the cumulative production curve to be forecast from the extrapolated discovery curve and the predicted lags.

Figure 14.3 World natural gas stretch lag curve

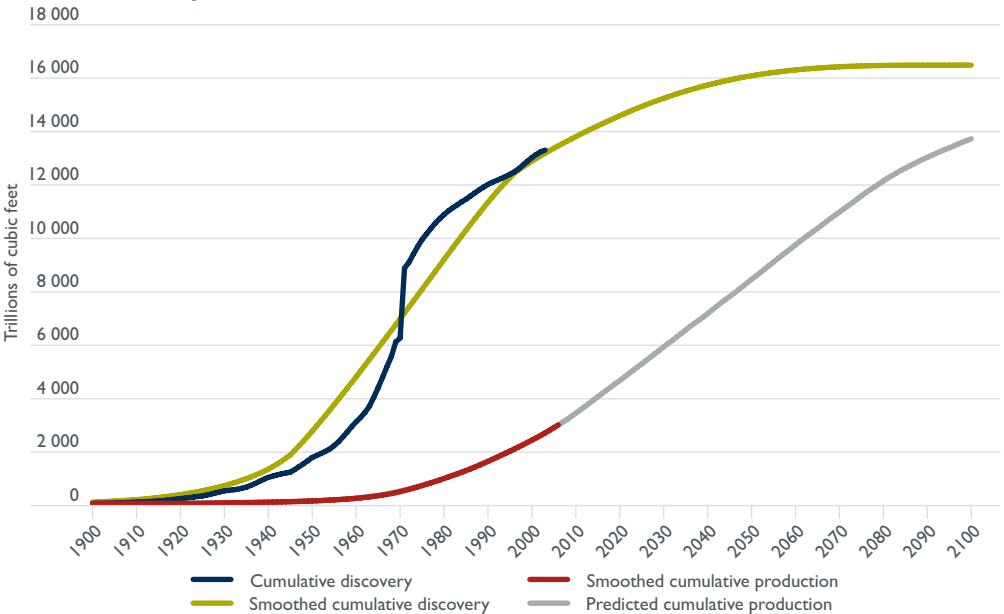
8. The predicted cumulative production curve is smoothed with an 11 year average and then differenced to give a raw predicted annual production. This is then averaged over nine years to give a final annual production forecast. This is shown in Figure 14.4. Under the calculations conventional gas production should itself enter onto an extended plateau by 2017.

Figure 14.4 Actual and predicted conventional natural gas production



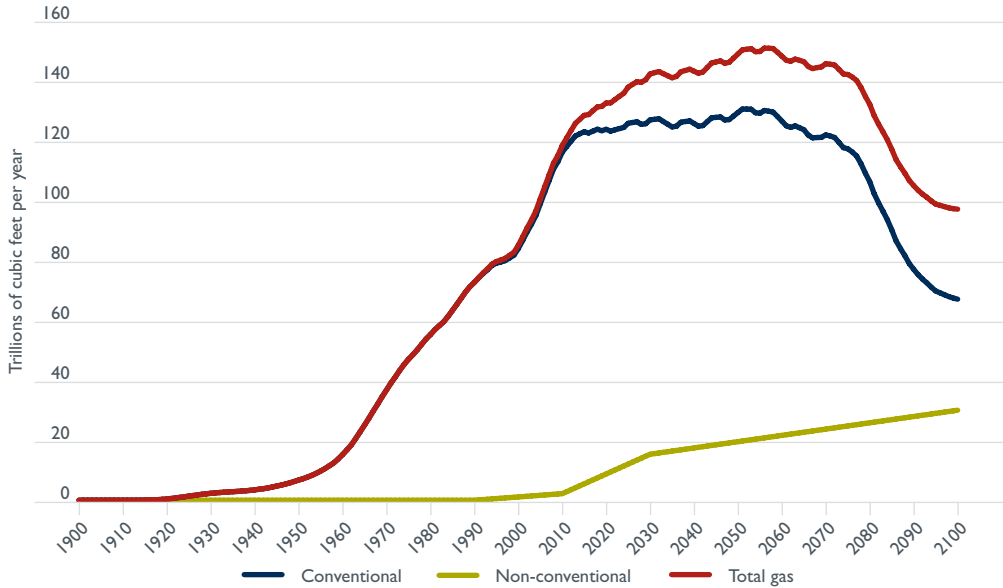
9. Finally the cumulative discovery and production curves (actual and forecast) are plotted in Figure 14.5. This allows a spatial understanding of the relationship between production and discovery.

Figure 14.5 World natural gas cumulative discovery and cumulative production curves



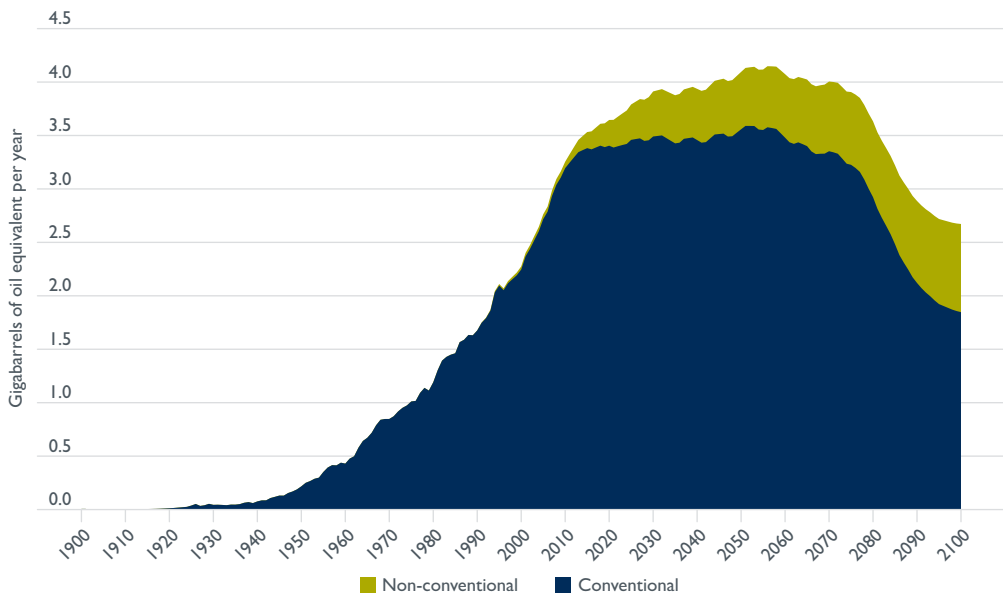
World production of non-conventional gas (from stranded pockets, gas held tightly in substrata, in geo-pressurised aquifers, gas shales and coal seam methane) is here simply projected roughly. Figure 14.6 shows the extra expected once these reserves have been mobilised.

Figure 14.6 Total world natural gas, including non-conventional



As can be seen, adding non-conventional sources in the amounts assumed serve to raise peak production and delay the plateau in production until about 2030. In addition, they should be an important cushion to gas production later in the century.

Figure 14.7 Natural gas plant liquid production

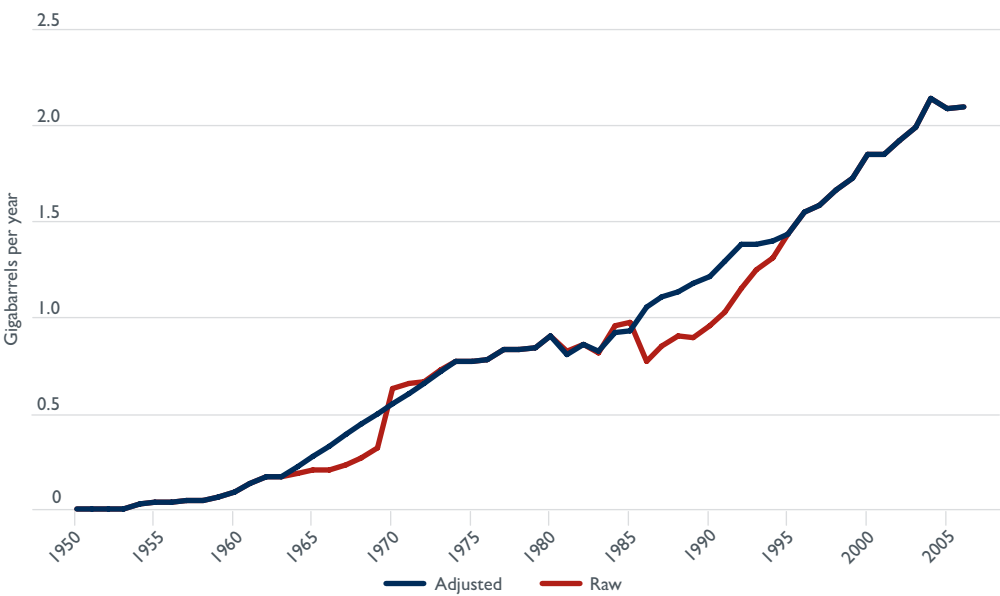


Finally to get forecasts of natural gas plant liquids a ratio of 0.0275 is used to convert trillions of cubic feet of gas to gigabarrels of NGPL oil equivalents. Figure 14.7 shows the likely path of production of NGPL associated with gas production. The data is presented in Table 14.2.

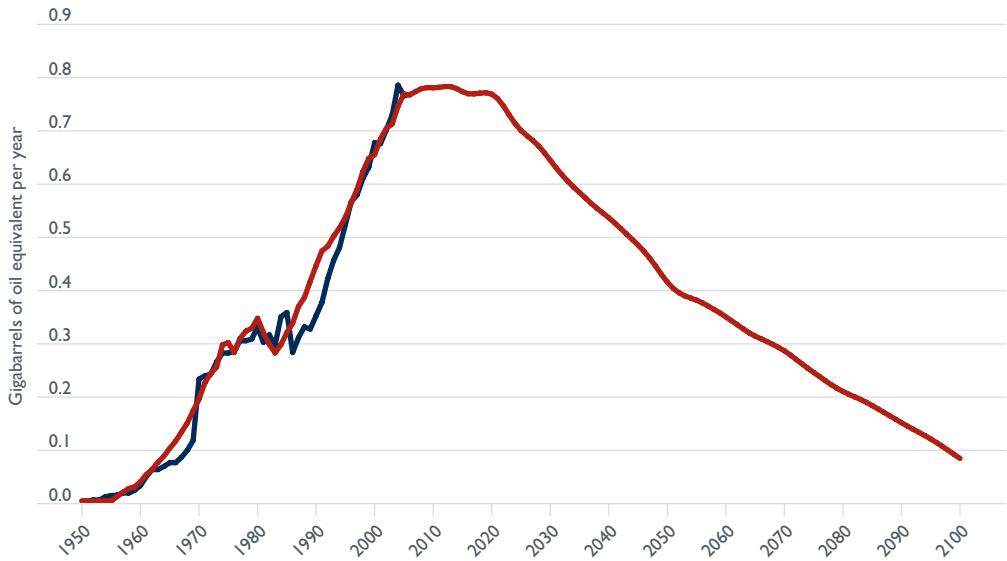
Refinery gains

The data on world refinery gains is very poor. Figure 14.8 shows the raw data and an attempt to roughly correct it for two episodes. The first is a huge jump in 1970 and the second is a slump when the former Soviet Union entered the statistics with a negative value.

Figure 14.8 Raw and corrected refinery gain data

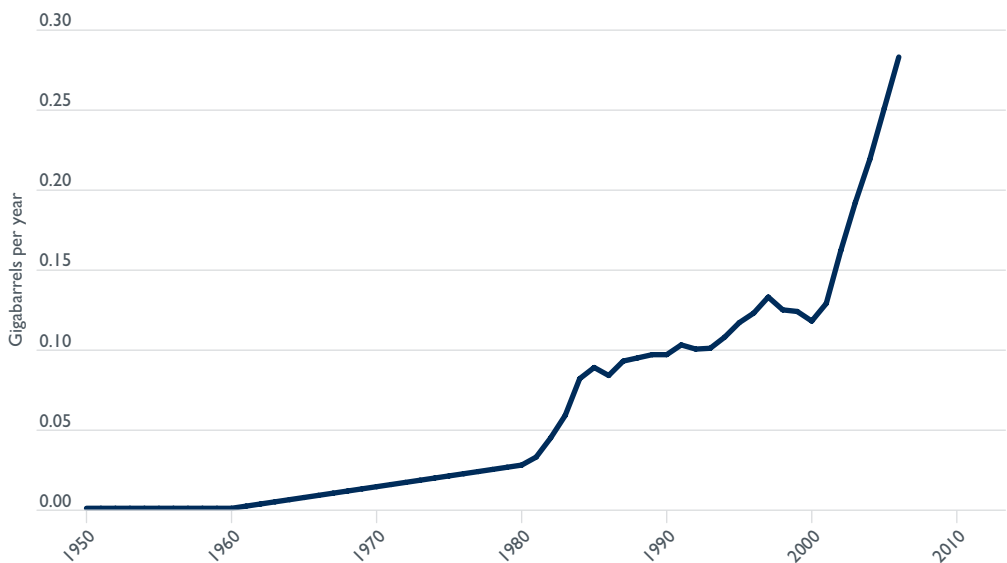


Using the rough correction, a relationship with world crude production and a time trend from 1984 to 2004 was obtained. Keeping the relationship between refinery gains and crude production constant, and using the forecasts of world crude from Chapter 13, a forecast of world refinery gains is derived, as shown in Figure 14.9.

Figure 14.9 World refinery gains

Biofuels

Biofuels, including ethanol and biodiesel, are currently made from crops, and as such compete with food production. Figure 14.10 shows the growth in world biofuel production.

Figure 14.10 World biofuel production

The projection of biofuels assumes that production grows at 7 per cent per year until 2040, at which time production will be 10 times current volumes (about equivalent to 1/10th of today’s crude oil production).

Although the potential for biofuel production from non-conventional sources is beyond the scope of the present forecasting exercise, it is assumed that they will comprise a large proportion of the expanded production. There are currently plants being constructed that use cellulose from plant wastes or woody materials, or use algae that can be scaled up to factory production.

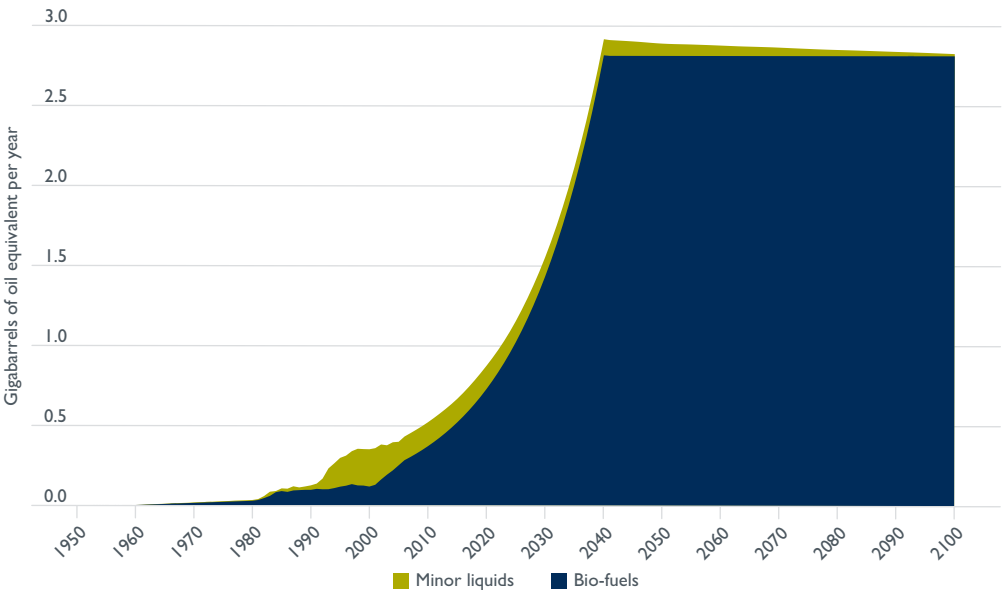
Minor liquids

Minor liquids are associated with crude oil production, and their production level is assumed to move in line with crude oil production.

No account will be taken here of liquids from coal or gas. Minor at the moment, they have the potential to expand greatly. A subsequent publication will look at various technological options to basically replace, or do away with some of the need for, petroleum fuels.

Figure 14.11 shows how the production of ‘other liquids’ (biofuels and minor liquids) is assumed to grow.

Figure 14.11 Projected production of ‘other liquids’

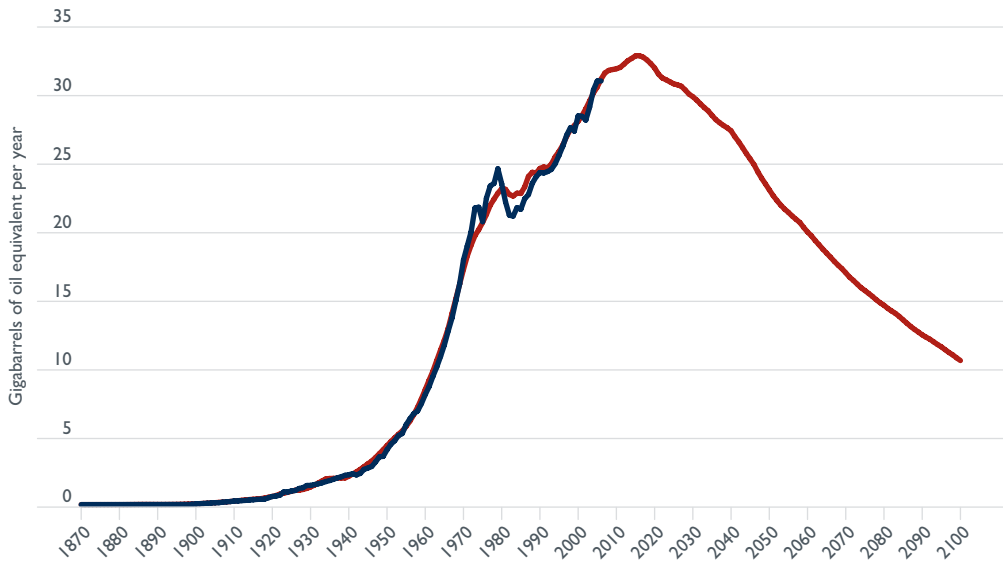


Total liquids

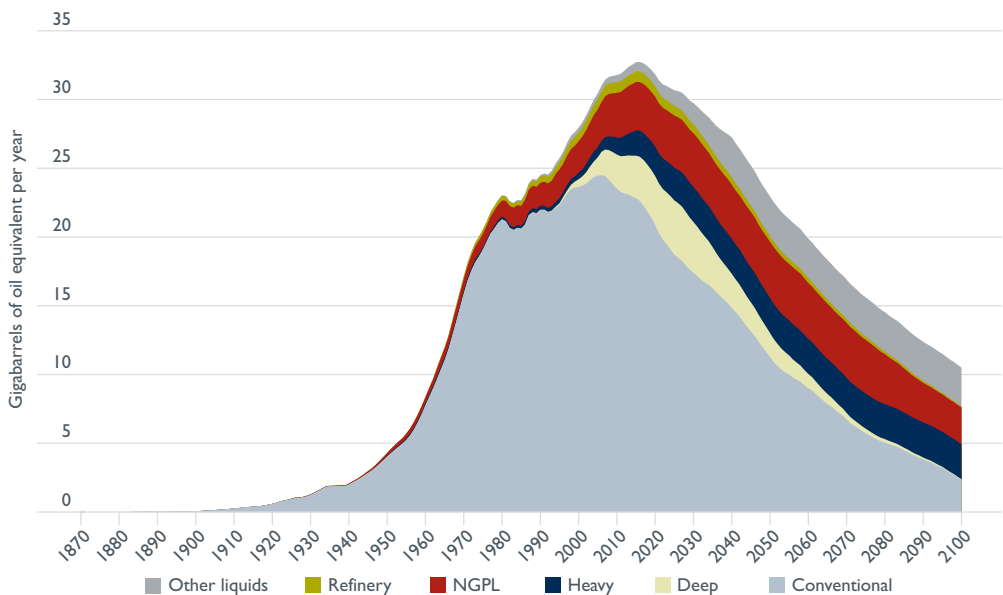
Table 14.3 sets out the numerical results of the overall analysis of world liquids.

Once the forecasts of crude oil are combined with forecasts of liquids derived above, the result is a prolongation of the plateau of the crude oil production diagram.

Figure 14.12 shows that the plateau of liquids is expected to last until about 2016, with a steady decline in production expected thereafter.

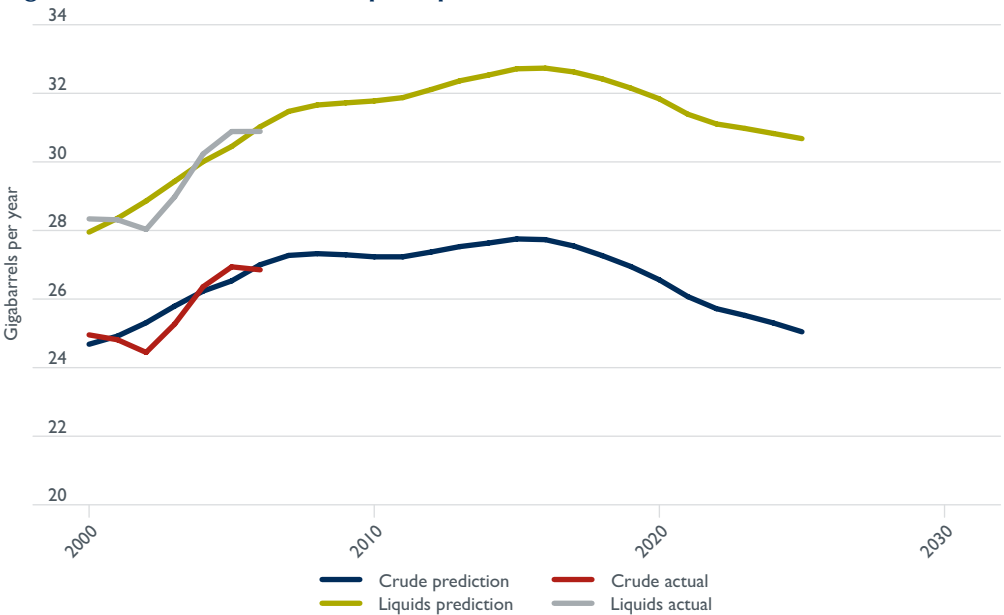
Figure 14.12 World production of total liquids

The composition of the total is shown in Figure 14.13. Basically, the decline of refinery gains and minor liquids (with declining oil) is tempered by the expected expansion of biofuels and NGPL, but the total is still not able to arrest the decline in total liquids once conventional oil starts downward in earnest after 2017. Moreover, after 2040 the downtrend in the production of total liquids is on the same path as that for crude oil alone.

Figure 14.13 Components of world total liquids production

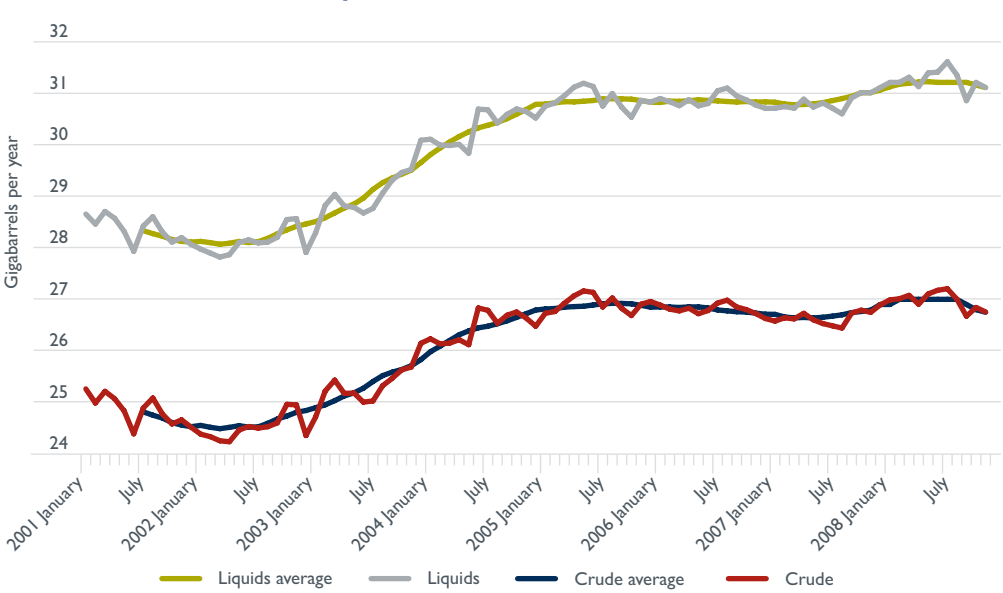
Looking more closely at the forecast plateau area, a period of flat production is indicated, followed by slight increases in the period 2012 to 2016, as the farther ‘lip’ of the plateau is cleared.

Figure 14.14 Crude and Liquids production, 2000–2025



The data coming out of the Energy Information Administration on world crude oil and liquids production is consistent with an entry onto the plateau of production in 2005–06 (see Figure 14.15).

Figure 14.15 Seasonally adjusted and trend world monthly production of crude and liquids to November 2008



However, it should be noted that this report concentrates on the *long-run potential supply* of conventional petroleum liquids. In order to understand the dynamics of the oil market, not only potential supply but also demand and price need to be considered. In short run, the effects of the global economic slow-down are likely to mean that lower demand, not limits on potential supply, will be the limiting factor for oil production.

Table 14.1 World conventional natural gas

Year	Tcf D	CD	9yr SCD	Adj SCD	Predlag	Raw pred CP	1 lyr smth pred SCP	SCP	Raw pred P	9yr smth pred SP	Actual P
1900	0.0	0.0	32.2	48.0	41		0.0	0.0	0.0	0.0	0.0
1901	0.0	0.0	36.3	54.1	42		0.0	0.0	0.0	0.0	0.0
1902	0.0	0.0	40.9	60.9	43		0.0	0.0	0.0	0.0	0.0
1903	3.0	3.0	46.0	68.6	43		0.0	0.0	0.0	0.0	0.0
1904	3.0	6.0	51.7	77.1	44		0.0	0.0	0.0	0.0	0.0
1905	4.8	10.8	57.8	86.2	44		0.0	0.0	0.0	0.0	0.0
1906	4.8	15.6	64.3	95.8	45		0.0	0.0	0.0	0.0	0.0
1907	1.8	17.4	71.0	105.8	45		0.0	0.0	0.0	0.0	0.0
1908	4.8	22.2	77.9	116.1	45		0.0	0.0	0.0	0.0	0.0
1909	4.8	27.0	85.3	127.2	46		0.0	0.0	0.0	0.0	0.0
1910	5.4	32.4	93.2	139.0	46		0.0	0.0	0.0	0.0	0.0
1911	5.4	37.8	102.1	152.2	46		0.0	0.0	0.0	0.0	0.0
1912	5.4	43.2	111.8	166.7	46		0.0	0.0	0.0	0.0	0.0
1913	4.2	47.4	122.7	182.9	47		0.0	0.0	0.0	0.0	0.0
1914	6.0	53.4	134.5	200.6	47		0.0	0.0	0.0	0.0	0.0
1915	6.0	59.4	147.3	219.6	47		0.0	0.0	0.0	0.0	0.0
1916	10.8	70.2	160.7	239.6	47		0.0	0.0	0.0	0.1	0.0
1917	10.8	81.0	174.7	260.5	47		0.0	0.0	0.0	0.1	0.0
1918	13.2	94.2	189.3	282.2	47		0.1	0.0	0.1	0.2	0.0
1919	9.6	103.8	204.2	304.4	47		0.3	0.0	0.2	0.3	0.0
1920	16.2	120.0	219.6	327.3	47		0.7	0.0	0.3	0.4	0.0
1921	12.6	132.6	236.2	352.2	47		1.1	0.0	0.5	0.6	0.0
1922	12.6	145.2	254.3	379.1	46		1.8	0.4	0.7	0.8	0.0
1923	12.6	157.8	273.7	408.1	46	1.2	2.7	1.2	0.9	0.9	1.2
1924	16.2	174.0	294.7	439.4	46	2.4	3.8	2.4	1.1	1.2	1.2
1925	12.0	186.0	317.3	473.1	46	3.6	5.2	3.6	1.4	1.4	1.2
1926	24.0	210.0	340.9	508.2	46	5.2	6.8	5.2	1.6	1.6	1.2
1927	24.0	234.0	365.4	544.8	45	7.2	8.7	7.2	1.9	1.8	2.4
1928	28.2	262.2	391.0	583.0	45	9.6	10.7	9.6	2.1	2.0	2.4
1929	27.0	289.2	417.7	622.8	45	12.4	12.9	12.4	2.2	2.2	2.4
1930	25.2	314.4	446.0	665.0	45	15.2	15.3	15.2	2.3	2.3	3.6
1931	13.2	327.6	476.2	709.9	45	18.0	17.8	18.0	2.5	2.4	2.4
1932	13.2	340.8	508.6	758.2	45	20.4	20.4	20.4	2.6	2.6	2.4
1933	12.0	352.8	543.4	810.2	45	22.8	23.1	22.8	2.7	2.7	2.4
1934	25.8	378.6	580.8	866.0	45	25.4	25.9	25.4	2.8	2.8	2.4
1935	27.0	405.6	620.4	925.0	45	28.2	28.7	28.2	2.8	2.9	3.0
1936	45.0	450.6	662.1	987.1	45	31.2	31.7	31.2	3.0	2.9	3.0
1937	46.8	497.4	706.1	1052.7	45	34.2	34.7	34.2	3.0	3.0	3.0
1938	55.2	552.6	752.9	1222.6	45	37.2	37.8	37.2	3.1	3.2	3.0
1939	51.6	604.2	804.2	1399.0	46	40.2	40.9	40.2	3.2	3.3	3.0
1940	48.0	652.2	860.0	1582.3	46	43.4	44.2	43.4	3.2	3.5	3.0
1941	31.2	683.4	920.9	1773.0	46	48.0	47.8	46.8	3.7	3.7	3.6
1942	31.2	714.6	986.8	1971.2	47	51.0	51.6	50.4	3.8	3.8	3.6
1943	27.0	741.6	1057.4	2176.5	47	54.1	55.5	54.2	3.9	4.1	3.6
1944	19.8	761.4	1135.0	2392.1	48	57.5	60.0	58.3	4.5	4.4	4.2
1945	22.2	783.6	1214.3	2610.4	48	60.9	64.6	62.8	4.6	4.7	4.5
1946	65.4	849.0	1327.6	2897.4	49	68.6	69.4	67.6	4.8	5.0	4.8
1947	72.0	921.0	1443.7	3152.4	50	72.8	74.6	72.7	5.3	5.4	5.1
1948	72.0	993.0	1563.4	3430.9	52	77.1	80.5	78.1	5.9	5.8	5.4
1949	78.0	1071.0	1686.8	3714.8	53	86.2	86.7	83.8	6.1	6.3	5.7
1950	81.0	1152.0	1813.2	4003.3	54	91.0	93.0	89.9	6.3	6.7	6.0
1951	49.2	1201.2	1942.1	4295.5	55	95.8	100.1	96.6	7.1	7.2	6.6
1952	52.2	1253.4	2073.3	4591.1	56	105.8	107.7	104.0	7.6	7.7	7.5
1953	51.6	1305.0	2206.6	4889.8	56	116.1	116.3	112.2	8.5	8.3	8.1
1954	58.8	1363.8	2341.6	5191.0	57	121.6	125.1	121.0	8.9	9.0	9.0
1955	85.2	1449.0	2478.0	5494.5	58	127.2	133.9	130.3	8.8	9.7	9.3
1956	100.2	1549.2	2615.8	5800.0	58	139.0	143.9	140.0	10.0	10.5	9.6
1957	118.8	1668.0	2754.9	6107.3	59	152.2	155.1	150.3	11.3	11.5	10.2
1958	127.2	1795.2	2895.2	6416.4	60	166.7	167.3	161.6	12.2	12.4	11.1
1959	133.8	1929.0	3036.6	6727.3	60	174.8	180.4	174.5	13.1	13.7	12.6
1960	118.2	2047.2	3178.9	7039.4	61	182.9	195.0	189.1	14.6	15.2	15.0
1961	108.0	2155.2	3322.2	7353.1	62	200.6	211.1	205.5	16.1	16.8	16.2
1962	127.2	2282.4	3466.1	7667.7	63	219.6	228.3	223.3	17.1	18.5	18.0
1963	151.2	2433.6	3610.7	8033.2	63	239.6	248.9	242.4	20.6	20.6	19.2
1964	228.0	2661.6	3755.5	8599.1	64	260.5	270.8	262.9	21.9	22.8	20.1
1965	240.0	2901.6	3900.6	9155.5	65	282.2	294.9	285.2	24.1	25.0	22.2
1966	261.0	3162.6	4045.8	9730.0	65	304.4	321.3	309.8	26.4	27.3	24.6
1967	268.2	3430.8	4191.4	10249.0	66	327.3	352.6	336.8	31.3	29.8	27.0
1968	252.0	3682.8	4337.3	10666.5	67	379.1	385.6	366.8	33.0	32.1	29.4
1969	367.2	4050.0	4483.6	11184.6	68	408.1	420.4	400.5	34.8	34.5	33.6
1970	100.0	4150.0	4630.6	11703.9	68	439.4	457.2	438.0	36.8	36.7	38.0
1971	1750.0	5900.0	4778.4	12242.2	69	473.1	496.1	479.0	38.9	39.0	41.0
1972	150.0	6050.0	4926.5	12734.9	70	544.8	537.3	522.8	41.3	41.1	44.0
1973	200.0	6250.0	5075.0	13266.3	71	583.0	581.2	568.8	43.9	43.3	46.5
1974	200.0	6450.0	5223.9	13788.4	71	622.8	625.5	616.0	44.3	45.2	47.5
1975	171.0	6621.0	5373.1	14310.8	72	665.0	672.5	664.3	47.0	47.0	47.5
1976	141.0	6762.0	5522.3	14833.2	73	709.9	722.3	713.7	49.8	48.5	50.0
1977	138.0	6900.0	5671.7	15356.1	74	758.2	775.0	764.3	52.7	50.1	50.5
1978	132.0	7032.0	5821.1	15878.7	74	810.2	827.5	817.7	52.5	52.0	51.5
1979	114.0	7146.0	5970.7	16401.7	75	866.0	880.0	873.7	52.5	53.7	58.0
1980	102.0	7248.0	6120.4	16924.9	76	925.0	932.4	931.8	52.4	55.2	58.5

(continued)

Table 14.1 World conventional natural gas (continued)

Year	Tcf D	CD	9yr SCD	Adj SCD	Predlag	Raw pred CP	1 lyr smth pred SCP	SCP	Raw pred P	9yr smth pred SP	Actual P
1981	96.0	7 344.0	6 269.6	9 347.5	76	987.1	988.5	989.2	56.1	56.8	58.0
1982	75.6	7 419.6	6 418.2	9 568.9	77	1 052.7	1 048.8	1 045.5	60.3	58.1	55.5
1983	74.4	7 494.0	6 565.6	9 788.7	78	1 122.6	1 109.1	1 102.5	60.3	59.4	55.5
1984	73.2	7 567.2	6 711.7	10 006.5	79	1 160.8	1 169.2	1 161.8	60.1	61.3	60.0
1985	67.2	7 634.4	6 856.3	10 222.2	79	1 199.0	1 233.8	1 223.8	64.6	63.2	62.5
1986	79.2	7 713.6	6 999.8	10 436.1	80	1 282.3	1 298.3	1 288.0	64.5	65.3	63.5
1987	78.0	7 791.6	7 142.3	10 648.5	81	1 373.0	1 362.4	1 354.7	64.1	67.3	66.6
1988	78.0	7 869.6	7 283.4	10 858.9	82	1 422.1	1 431.3	1 424.2	68.9	69.4	69.8
1989	69.0	7 938.6	7 422.6	11 066.4	82	1 471.2	1 501.5	1 496.0	70.2	71.2	72.1
1990	67.2	8 005.8	7 558.4	11 268.9	83	1 576.5	1 575.9	1 569.5	74.4	72.6	73.6
1991	52.8	8 058.6	7 690.6	11 465.9	84	1 634.3	1 654.7	1 643.8	78.8	74.1	74.8
1992	48.0	8 106.6	7 818.6	11 656.9	84	1 692.1	1 733.8	1 718.9	79.1	75.6	74.8
1993	46.8	8 153.4	7 942.4	11 841.4	85	1 810.4	1 810.1	1 794.6	76.3	76.8	76.4
1994	51.0	8 204.4	8 062.3	12 020.1	85	1 894.9	1 887.3	1 871.2	77.2	78.3	76.9
1995	56.4	8 260.8	8 175.9	12 189.5	86	1 979.4	1 965.5	1 949.5	78.1	79.0	78.0
1996	60.0	8 320.8	8 288.5	12 357.3	87	2 065.9	2 042.4	2 029.3	76.9	79.4	81.7
1997	78.0	8 398.8	8 367.7	12 475.4	87	2 152.4	2 122.4	2 110.6	80.0	79.8	81.6
1998	96.0	8 494.8	8 444.8	12 590.5	87	2 211.9	2 205.8	2 193.0	83.4	80.7	83.1
1999	96.0	8 590.8	8 519.0	12 701.0	88	2 271.4	2 287.0	2 277.4	81.2	81.6	85.0
2000	88.8	8 679.6	8 590.0	12 806.9	88	2 330.9	2 369.2	2 364.2	82.2	83.8	88.3
2001	78.0	8 757.6	8 658.6	12 909.2	88	2 422.8	2 452.5	2 453.3	83.3	86.6	90.5
2002	67.2	8 824.8	8 725.2	13 008.5	89	2 514.8	2 536.8	2 544.7	84.3	89.4	92.2
2003	43.8	8 868.6	8 789.9	13 105.0	89	2 609.0	2 622.1	2 638.7	85.3	92.0	95.4
2004	65.6	8 934.2	8 852.8	13 198.8	89	2 703.3	2 720.1	2 735.6	98.0	94.9	98.5
2005	64.5	8 998.7	8 914.3	13 290.4	90	2 799.4	2 821.8	2 835.6	101.7	98.8	101.5
2006	63.5	9 062.2	8 974.4	13 380.1	90	2 895.5	2 927.3	2 937.6	105.5	102.7	104.8
2007	62.5	9 124.7	9 033.5	13 468.1	90	2 993.3	3 033.7		106.4	106.5	
2008	61.5	9 186.2	9 091.7	13 554.9	91	3 091.1	3 140.9		107.2	110.3	
2009	60.4	9 246.7	9 149.2	13 640.6	91	3 289.8	3 258.3		117.4	112.8	
2010	59.4	9 306.1	9 205.9	13 725.1	91	3 390.4	3 376.5		118.2	116.0	
2011	58.4	9 364.5	9 261.9	13 808.6	91	3 491.0	3 495.4		118.9	117.9	
2012	57.4	9 421.8	9 317.0	13 890.8	92	3 592.8	3 615.1		119.7	119.7	
2013	56.3	9 478.2	9 371.1	13 971.5	92	3 694.5	3 735.3		120.3	121.4	
2014	55.3	9 533.5	9 424.4	14 050.9	92	3 900.0	3 865.9		130.6	122.1	
2015	54.3	9 587.8	9 476.8	14 129.0	92	4 003.6	3 988.0		122.1	122.8	
2016	53.3	9 641.1	9 528.4	14 206.0	93	4 107.3	4 110.7		122.6	122.4	
2017	52.3	9 693.3	9 579.6	14 282.3	93	4 211.9	4 233.9		123.2	123.0	
2018	51.2	9 744.6	9 630.3	14 357.9	93	4 316.4	4 357.6		123.7	123.6	
2019	50.2	9 794.8	9 680.5	14 432.8	93	4 527.3	4 481.7		124.2	123.2	
2020	49.2	9 844.0	9 730.3	14 506.9	94	4 633.4	4 597.0		115.2	123.6	
2021	48.2	9 892.1	9 779.3	14 580.1	94	4 739.4	4 722.4		125.4	123.0	
2022	47.1	9 939.2	9 827.6	14 652.1	94	4 846.2	4 848.2		125.8	123.5	
2023	46.1	9 985.3	9 874.8	14 722.5	94	4 953.1	4 974.3		126.1	123.9	
2024	45.1	10 030.4	9 920.5	14 790.6	95	5 060.4	5 100.7		126.4	124.2	
2025	44.1	10 074.5	9 964.7	14 856.4	95	5 167.7	5 217.8		117.1	125.6	
2026	43.0	10 117.5	10 007.4	14 920.1	95	5 383.2	5 345.0		127.1	125.9	
2027	42.0	10 159.5	10 049.0	14 982.1	95	5 491.1	5 472.4		127.4	126.1	
2028	41.0	10 200.5	10 089.5	15 042.5	95	5 599.1	5 599.9		127.5	125.3	
2029	40.0	10 240.4	10 129.5	15 102.1	96	5 707.3	5 727.6		127.7	125.5	
2030	38.9	10 279.4	10 168.4	15 160.1	96	5 815.5	5 855.4		127.8	126.8	
2031	37.9	10 317.3	10 206.3	15 216.7	96	6 032.0	5 983.4		128.0	127.0	
2032	36.9	10 354.2	10 243.2	15 271.6	96	6 140.5	6 101.7		118.3	127.1	
2033	35.9	10 390.0	10 279.0	15 325.1	96	6 249.0	6 230.1		128.4	126.2	
2034	34.8	10 424.9	10 313.9	15 377.0	97	6 357.7	6 358.8		128.6	125.3	
2035	33.8	10 458.7	10 347.7	15 427.5	97	6 466.5	6 487.6		128.8	124.4	
2036	32.8	10 491.5	10 380.5	15 476.3	97	6 575.5	6 616.6		129.0	124.7	
2037	31.8	10 523.2	10 412.2	15 523.7	97	6 684.6	6 735.9		119.4	126.0	
2038	30.7	10 554.0	10 443.0	15 569.5	97	6 903.9	6 855.5		119.6	126.2	
2039	29.7	10 583.7	10 472.7	15 613.8	97	7 014.0	6 975.3		119.8	126.4	
2040	28.7	10 612.4	10 501.4	15 656.6	98	7 124.2	7 105.3		130.1	125.6	
2041	27.7	10 640.0	10 529.0	15 697.8	98	7 234.5	7 235.6		130.3	124.7	
2042	26.6	10 666.7	10 555.7	15 737.5	98	7 344.9	7 366.1		130.5	124.9	
2043	25.6	10 692.3	10 581.3	15 775.7	98	7 455.6	7 496.8		130.7	126.2	
2044	24.6	10 716.9	10 605.9	15 812.4	98	7 566.3	7 617.6		120.8	127.5	
2045	23.6	10 740.4	10 629.5	15 847.7	98	7 788.4	7 738.6		121.0	127.6	
2046	22.5	10 763.0	10 652.2	15 881.5	98	7 899.6	7 859.6		121.1	127.7	
2047	21.5	10 784.5	10 673.9	15 913.8	98	8 010.8	7 990.9		131.3	126.7	
2048	20.5	10 805.0	10 694.7	15 944.9	98	8 122.0	8 122.3		131.4	126.9	
2049	19.5	10 824.4	10 714.6	15 974.5	99	8 233.2	8 253.8		131.5	128.0	
2050	18.4	10 842.9	10 733.6	16 002.9	99	8 344.6	8 385.3		131.5	129.2	
2051	17.4	10 860.3	10 751.8	16 029.9	99	8 456.1	8 506.8		121.5	130.4	
2052	16.4	10 876.7	10 769.1	16 055.7	99	8 678.7	8 638.4		131.6	130.4	
2053	15.4	10 892.0	10 785.6	16 080.3	99	8 790.2	8 770.0		131.6	130.3	
2054	14.3	10 906.4	10 801.2	16 103.7	99	8 901.7	8 901.6		131.5	129.1	
2055	13.3	10 919.7	10 816.1	16 125.9	99	9 013.3	9 033.0		131.4	129.0	
2056	12.3	10 932.0	10 830.3	16 146.9	99	9 124.9	9 164.3		131.3	129.9	
2057	11.3	10 943.3	10 843.6	16 166.9	99	9 347.5	9 295.3		131.1	129.7	
2058	10.2	10 953.5	10 856.3	16 185.8	99	9 458.2	9 416.0		129.4	129.4	
2059	9.2	10 962.7	10 868.3	16 203.6	99	9 568.9	9 546.2		130.2	127.9	
2060	8.2	10 970.9	10 879.5	16 220.4	99	9 678.8	9 676.0		129.8	126.4	
2061	7.2	10 978.1	10 890.2	16 236.2	99	9 788.7	9 805.3		129.3	124.8	

(continued)

Table 14.1 World conventional natural gas (continued)

Year	Tcf D	CD	9yr SCD	Adj SCD	Predlag	Raw pred CP	1 lyr smth pred SCP	SCP	Raw pred P	9yr smth pred SP	Actual P
2062	6.1	10 984.3	10 900.1	16 251.1	100	9 897.6	9 934.2	128.9	128.9	124.3	
2063	5.1	10 989.4	10 909.5	16 265.0	100	10 006.5	10 052.5	118.3	118.3	124.8	
2064	4.1	10 993.5	10 918.2	16 278.1	100	10 222.2	10 170.2	117.8	117.8	124.2	
2065	3.1	10 996.6	10 926.4	16 290.3	100	10 329.1	10 287.5	117.3	117.3	123.5	
2066	2.0	10 998.6	10 934.0	16 301.6	100	10 436.1	10 413.6	126.1	126.1	121.7	
2067	1.0	10 999.6	10 941.0	16 312.1	100	10 542.3	10 539.0	125.4	125.4	120.8	
2068	0.0	10 1000.0	10 947.6	16 321.9	100	10 648.5	10 663.7	124.7	124.7	120.9	
2069	0.0	10 1000.0	10 953.6	16 330.9	100	10 753.7	10 787.4	123.7	123.7	120.9	
2070	0.0	10 1000.0	10 959.2	16 339.1	100	10 858.9	10 900.5	113.1	113.1	121.8	
2071	0.0	10 1000.0	10 964.3	16 346.7	100	11 066.4	11 021.2	120.7	120.7	121.4	
2072	0.0	10 1000.0	10 968.9	16 353.6	100	11 167.7	11 140.5	119.4	119.4	120.9	
2073	0.0	10 1000.0	10 973.1	16 359.9	100	11 268.9	11 258.6	118.1	118.1	119.2	
2074	0.0	10 1000.0	10 977.0	16 365.6	100	11 367.4	11 383.3	124.7	124.7	117.5	
2075	0.0	10 1000.0	10 980.4	16 370.8	100	11 465.9	11 506.1	122.8	122.8	117.1	
2076	0.0	10 1000.0	10 983.5	16 375.4	100	11 656.9	11 627.1	121.0	121.0	116.1	
2077	0.0	10 1000.0	10 986.2	16 379.5	100	11 749.1	11 736.8	109.7	109.7	114.7	
2078	0.0	10 1000.0	10 988.6	16 383.1	100	11 841.4	11 845.0	108.2	108.2	112.2	
2079	0.0	10 1000.0	10 990.8	16 386.2	100	12 020.1	11 954.7	109.7	109.7	109.0	
2080	0.0	10 1000.0	10 992.6	16 389.0	100	12 104.8	12 065.9	111.2	111.2	106.1	
2081	0.0	10 1000.0	10 994.2	16 391.3	100	12 189.5	12 173.1	107.3	107.3	102.2	
2082	0.0	10 1000.0	10 995.5	16 393.3	100	12 273.4	12 268.0	94.9	94.9	99.1	
2083	0.0	10 1000.0	10 996.6	16 394.9	100	12 357.3	12 364.2	96.2	96.2	96.3	
2084	0.0	10 1000.0	10 997.5	16 396.3	100	12 475.4	12 461.3	97.1	97.1	93.5	
2085	0.0	10 1000.0	10 998.3	16 397.4	100	12 590.5	12 546.6	85.3	85.3	90.1	
2086	0.0	10 1000.0	10 998.8	16 398.2	100	12 645.7	12 628.7	82.2	82.2	86.4	
2087	0.0	10 1000.0	10 999.3	16 398.9	100	12 701.0	12 712.0	83.2	83.2	83.8	
2088	0.0	10 1000.0	10 999.6	16 399.3	100	12 806.9	12 796.1	84.1	84.1	81.5	
2089	0.0	10 1000.0	10 999.8	16 399.7	100	12 909.2	12 876.7	80.7	80.7	78.9	
2090	0.0	10 1000.0	10 999.9	16 399.8	100	12 958.8	12 950.8	74.1	74.1	76.9	
2091	0.0	10 1000.0	11 000.0	16 399.9	100	13 008.5	13 022.6	71.8	71.8	75.2	
2092	0.0	10 1000.0	11 000.0	16 400.0	100	13 105.0	13 097.4	74.8	74.8	73.7	
2093	0.0	10 1000.0	11 000.0	16 400.0	100	13 198.8	13 171.1	73.7	73.7	72.4	
2094	0.0	10 1000.0	11 000.0	16 400.0	100	13 244.6	13 239.1	68.0	68.0	71.0	
2095	0.0	10 1000.0	11 000.0	16 400.0	100	13 290.4	13 305.6	66.5	66.5	69.7	
2096	0.0	10 1000.0	11 000.0	16 400.0	100	13 380.1	13 375.2	69.7	69.7	69.1	
2097	0.0	10 1000.0	11 000.0	16 400.0	100	13 468.1	13 448.0	72.7	72.7	68.5	
2098	0.0	10 1000.0	11 000.0	16 400.0	100	13 511.5	13 515.7	67.7	67.7	67.9	
2099	0.0	10 1000.0	11 000.0	16 400.0	100	13 554.9	13 578.6	62.9	62.9	67.4	
2100	0.0	10 1000.0	11 000.0	16 400.0	100	13 640.6	13 644.7	66.1	66.1	67.0	

Notes: D—discovery; CD—cumulative discovery; SCD—smoothed cumulative discovery (years = number of years centred moving average); adj—adjusted (to match cumulative production maximum); predlag—predicted lag between cumulative discovery and cumulative production; raw Pred CP—prediction using direct lag of cumulative discovery by predicted lag years; Pred SCP—raw predicted CP smoothed (with years = number of years centred moving average); SCP—smoothed actual cumulative production (years = number of years centred moving average); raw Pred P—one year change in predicted smoothed cumulative production; Pred SP—smoothed raw Pred P (years = number of years centred moving average); Actual P—actual annual oil production. Shaded numbers are interpolations, extrapolations or forecasts.

Table 14.2 Natural gas plant liquids

Year	Conv gas Tcflr pred SP	Non-conv Tcflr pred non	Total gas Tcflr pred tot	NGPL ratio	Natural gas plant liquids conv gas Gboe pred SP	Non-conv Gboe pred Non	Total NGPL Gboe pred total
1900	0.00	0.00	0.00	0.000	0.00	0.00	0.00
1901	0.00	0.00	0.00	0.000	0.00	0.00	0.00
1902	0.00	0.00	0.00	0.000	0.00	0.00	0.00
1903	0.00	0.00	0.00	0.000	0.00	0.00	0.00
1904	0.00	0.00	0.00	0.000	0.00	0.00	0.00
1905	0.00	0.00	0.00	0.000	0.00	0.00	0.00
1906	0.00	0.00	0.00	0.000	0.00	0.00	0.00
1907	0.00	0.00	0.00	0.000	0.00	0.00	0.00
1908	0.00	0.00	0.00	0.000	0.00	0.00	0.00
1909	0.00	0.00	0.00	0.000	0.00	0.00	0.00
1910	0.00	0.00	0.00	0.000	0.00	0.00	0.00
1911	0.00	0.00	0.00	0.000	0.00	0.00	0.00
1912	0.00	0.00	0.00	0.000	0.00	0.00	0.00
1913	0.00	0.00	0.00	0.000	0.00	0.00	0.00
1914	0.01	0.00	0.01	0.018	0.00	0.00	0.00
1915	0.04	0.00	0.04	0.018	0.00	0.00	0.00
1916	0.07	0.00	0.07	0.018	0.00	0.00	0.00
1917	0.13	0.00	0.13	0.018	0.00	0.00	0.00
1918	0.20	0.00	0.20	0.018	0.00	0.00	0.00
1919	0.29	0.00	0.29	0.018	0.01	0.00	0.01
1920	0.42	0.00	0.42	0.018	0.01	0.00	0.01
1921	0.57	0.00	0.57	0.018	0.01	0.00	0.01
1922	0.76	0.00	0.76	0.018	0.01	0.00	0.01
1923	0.95	0.00	0.95	0.018	0.02	0.00	0.02
1924	1.16	0.00	1.16	0.018	0.02	0.00	0.02
1925	1.36	0.00	1.36	0.024	0.03	0.00	0.03
1926	1.57	0.00	1.57	0.030	0.05	0.00	0.05
1927	1.78	0.00	1.78	0.017	0.03	0.00	0.03
1928	1.97	0.00	1.97	0.018	0.04	0.00	0.04
1929	2.15	0.00	2.15	0.023	0.05	0.00	0.05
1930	2.31	0.00	2.31	0.017	0.04	0.00	0.04
1931	2.44	0.00	2.44	0.017	0.04	0.00	0.04
1932	2.56	0.00	2.56	0.015	0.04	0.00	0.04
1933	2.67	0.00	2.67	0.014	0.04	0.00	0.04
1934	2.76	0.00	2.76	0.015	0.04	0.00	0.04
1935	2.85	0.00	2.85	0.015	0.04	0.00	0.04
1936	2.93	0.00	2.93	0.016	0.05	0.00	0.05
1937	3.05	0.00	3.05	0.019	0.06	0.00	0.06
1938	3.17	0.00	3.17	0.021	0.07	0.00	0.07
1939	3.29	0.00	3.29	0.017	0.06	0.00	0.06
1940	3.47	0.00	3.47	0.021	0.07	0.00	0.07
1941	3.65	0.00	3.65	0.022	0.08	0.00	0.08
1942	3.85	0.00	3.85	0.021	0.08	0.00	0.08
1943	4.09	0.00	4.09	0.025	0.10	0.00	0.10
1944	4.40	0.00	4.40	0.026	0.11	0.00	0.11
1945	4.72	0.00	4.72	0.027	0.13	0.00	0.13
1946	5.02	0.00	5.02	0.025	0.13	0.00	0.13
1947	5.39	0.00	5.39	0.028	0.15	0.00	0.15
1948	5.80	0.00	5.80	0.028	0.16	0.00	0.16
1949	6.25	0.00	6.25	0.029	0.18	0.00	0.18
1950	6.73	0.00	6.73	0.032	0.21	0.00	0.21
1951	7.17	0.00	7.17	0.034	0.25	0.00	0.25
1952	7.69	0.00	7.69	0.034	0.26	0.00	0.26
1953	8.29	0.00	8.29	0.034	0.28	0.00	0.28
1954	8.96	0.00	8.96	0.033	0.29	0.00	0.29
1955	9.71	0.00	9.71	0.036	0.35	0.00	0.35
1956	10.55	0.00	10.55	0.037	0.39	0.00	0.39
1957	11.49	0.00	11.49	0.036	0.41	0.00	0.41
1958	12.44	0.00	12.44	0.033	0.41	0.00	0.41
1959	13.75	0.00	13.75	0.032	0.43	0.00	0.43
1960	15.21	0.00	15.21	0.028	0.43	0.00	0.43
1961	16.78	0.00	16.78	0.028	0.47	0.00	0.47
1962	18.46	0.00	18.46	0.027	0.49	0.00	0.49
1963	20.58	0.00	20.58	0.028	0.58	0.00	0.58
1964	22.80	0.00	22.80	0.028	0.64	0.00	0.64
1965	25.05	0.00	25.05	0.027	0.67	0.00	0.67
1966	27.34	0.00	27.34	0.026	0.71	0.00	0.71
1967	29.76	0.00	29.76	0.026	0.78	0.00	0.78
1968	32.05	0.00	32.05	0.026	0.84	0.00	0.84
1969	34.49	0.00	34.49	0.024	0.84	0.00	0.84
1970	36.74	0.00	36.74	0.023	0.84	0.00	0.84
1971	39.03	0.00	39.03	0.022	0.87	0.00	0.87
1972	41.08	0.00	41.08	0.022	0.91	0.00	0.91
1973	43.26	0.00	43.26	0.022	0.95	0.00	0.95
1974	45.23	0.00	45.23	0.021	0.97	0.00	0.97
1975	46.98	0.00	46.98	0.021	1.01	0.00	1.01

(continued)

Table 14.2 Natural gas plant liquids (continued)

Year	Conv gas Tcf/yr pred SP	Non-conv Tcf/yr pred non	Total gas Tcf/yr pred tot	NGPL ratio	Natural gas plant liquids conv gas Gboe pred SP	Non-conv Gboe pred Non	Total NGPL Gboe pred total
1976	48.48	0.00	48.48	0.021	1.01	0.00	1.01
1977	50.13	0.00	50.13	0.022	1.09	0.00	1.09
1978	51.95	0.00	51.95	0.022	1.13	0.00	1.13
1979	53.74	0.00	53.74	0.021	1.11	0.00	1.11
1980	55.19	0.00	55.19	0.022	1.19	0.00	1.19
1981	56.84	0.00	56.84	0.023	1.30	0.00	1.30
1982	58.15	0.00	58.15	0.024	1.39	0.00	1.39
1983	59.44	0.00	59.44	0.024	1.42	0.00	1.42
1984	61.25	0.00	61.25	0.024	1.45	0.00	1.45
1985	63.23	0.00	63.23	0.023	1.46	0.00	1.46
1986	65.27	0.00	65.27	0.024	1.56	0.00	1.56
1987	67.33	0.00	67.33	0.024	1.58	0.00	1.58
1988	69.41	0.00	69.41	0.023	1.63	0.00	1.63
1989	71.21	0.00	71.21	0.023	1.63	0.00	1.63
1990	72.61	0.00	72.61	0.023	1.67	0.00	1.67
1991	74.13	0.11	74.24	0.024	1.74	0.00	1.75
1992	75.55	0.22	75.77	0.024	1.79	0.01	1.79
1993	76.79	0.33	77.12	0.024	1.86	0.01	1.86
1994	78.25	0.44	78.69	0.026	2.03	0.01	2.04
1995	79.00	0.55	79.55	0.026	2.09	0.01	2.11
1996	79.38	0.66	80.04	0.026	2.05	0.02	2.07
1997	79.85	0.77	80.61	0.026	2.11	0.02	2.13
1998	80.74	0.88	81.62	0.027	2.15	0.02	2.17
1999	81.64	0.99	82.63	0.027	2.19	0.03	2.21
2000	83.85	1.10	84.94	0.027	2.24	0.03	2.27
2001	86.60	1.20	87.81	0.027	2.36	0.03	2.40
2002	89.43	1.31	90.74	0.027	2.43	0.04	2.47
2003	91.99	1.42	93.41	0.027	2.52	0.04	2.56
2004	94.88	1.53	96.42	0.027	2.60	0.04	2.64
2005	98.79	1.64	100.43	0.027	2.71	0.05	2.76
2006	102.67	1.75	104.42	0.027	2.78	0.05	2.83
2007	106.51	1.86	108.37	0.028	2.93	0.05	2.98
2008	110.33	1.97	112.30	0.028	3.03	0.05	3.09
2009	112.80	2.08	114.88	0.028	3.10	0.06	3.16
2010	116.01	2.19	118.20	0.028	3.19	0.06	3.25
2011	117.86	2.85	120.71	0.028	3.24	0.08	3.32
2012	119.67	3.50	123.17	0.028	3.29	0.10	3.39
2013	121.44	4.16	125.60	0.028	3.34	0.11	3.45
2014	122.14	4.82	126.96	0.028	3.36	0.13	3.49
2015	122.80	5.48	128.28	0.028	3.38	0.15	3.53
2016	122.40	6.13	128.53	0.028	3.37	0.17	3.53
2017	123.04	6.79	129.82	0.028	3.38	0.19	3.57
2018	123.65	7.45	131.10	0.028	3.40	0.20	3.61
2019	123.15	8.10	131.26	0.028	3.39	0.22	3.61
2020	123.63	8.76	132.39	0.028	3.40	0.24	3.64
2021	123.02	9.42	132.43	0.028	3.38	0.26	3.64
2022	123.46	10.07	133.53	0.028	3.40	0.28	3.67
2023	123.87	10.73	134.60	0.028	3.41	0.30	3.70
2024	124.24	11.39	135.63	0.028	3.42	0.31	3.73
2025	125.62	12.05	137.67	0.028	3.45	0.33	3.79
2026	125.89	12.70	138.59	0.028	3.46	0.35	3.81
2027	126.13	13.36	139.49	0.028	3.47	0.37	3.84
2028	125.27	14.02	139.28	0.028	3.44	0.39	3.83
2029	125.49	14.67	140.16	0.028	3.45	0.40	3.85
2030	126.77	15.33	142.10	0.028	3.49	0.42	3.91
2031	126.95	15.54	142.49	0.028	3.49	0.43	3.92
2032	127.14	15.75	142.88	0.028	3.50	0.43	3.93
2033	126.23	15.96	142.19	0.028	3.47	0.44	3.91
2034	125.32	16.17	141.49	0.028	3.45	0.44	3.89
2035	124.43	16.38	140.80	0.028	3.42	0.45	3.87
2036	124.66	16.59	141.24	0.028	3.43	0.46	3.88
2037	125.99	16.80	142.79	0.028	3.46	0.46	3.93
2038	126.22	17.01	143.22	0.028	3.47	0.47	3.94
2039	126.44	17.22	143.66	0.028	3.48	0.47	3.95
2040	125.56	17.43	142.98	0.028	3.45	0.48	3.93
2041	124.66	17.64	142.30	0.028	3.43	0.48	3.91
2042	124.86	17.84	142.70	0.028	3.43	0.49	3.92
2043	126.16	18.05	144.21	0.028	3.47	0.50	3.97
2044	127.45	18.26	145.72	0.028	3.50	0.50	4.01
2045	127.61	18.47	146.08	0.028	3.51	0.51	4.02
2046	127.75	18.68	146.43	0.028	3.51	0.51	4.03
2047	126.75	18.89	145.64	0.028	3.49	0.52	4.01
2048	126.85	19.10	145.96	0.028	3.49	0.53	4.01
2049	128.05	19.31	147.36	0.028	3.52	0.53	4.05
2050	129.22	19.52	148.74	0.028	3.55	0.54	4.09
2051	130.37	19.73	150.10	0.028	3.59	0.54	4.13

(continued)

Table 14.2 Natural gas plant liquids (continued)

Year	Conv gas Tcf/yr pred SP	Non-conv Tcf/yr pred non	Total gas Tcf/yr pred tot	NGPL ratio	Natural gas plant liquids conv gas Gboe pred SP	Non-conv Gboe pred Non	Total NGPL Gboe pred total
2052	130.37	19.94	150.31	0.028	3.59	0.55	4.13
2053	130.33	20.15	150.48	0.028	3.58	0.55	4.14
2054	129.14	20.36	149.50	0.028	3.55	0.56	4.11
2055	128.99	20.57	149.56	0.028	3.55	0.57	4.11
2056	129.91	20.78	150.68	0.028	3.57	0.57	4.14
2057	129.65	20.99	150.64	0.028	3.57	0.58	4.14
2058	129.35	21.20	150.55	0.028	3.56	0.58	4.14
2059	127.88	21.41	149.28	0.028	3.52	0.59	4.11
2060	126.36	21.62	147.98	0.028	3.47	0.59	4.07
2061	124.80	21.83	146.63	0.028	3.43	0.60	4.03
2062	124.26	22.04	146.30	0.028	3.42	0.61	4.02
2063	124.78	22.25	147.02	0.028	3.43	0.61	4.04
2064	124.16	22.46	146.62	0.028	3.41	0.62	4.03
2065	123.49	22.67	146.16	0.028	3.40	0.62	4.02
2066	121.68	22.87	144.56	0.028	3.35	0.63	3.98
2067	120.78	23.08	143.86	0.028	3.32	0.63	3.96
2068	120.90	23.29	144.19	0.028	3.32	0.64	3.97
2069	120.93	23.50	144.44	0.028	3.33	0.65	3.97
2070	121.76	23.71	145.47	0.028	3.35	0.65	4.00
2071	121.39	23.92	145.31	0.028	3.34	0.66	4.00
2072	120.90	24.13	145.03	0.028	3.32	0.66	3.99
2073	119.24	24.34	143.58	0.028	3.28	0.67	3.95
2074	117.51	24.55	142.06	0.028	3.23	0.68	3.91
2075	117.13	24.76	141.89	0.028	3.22	0.68	3.90
2076	116.08	24.97	141.05	0.028	3.19	0.69	3.88
2077	114.73	25.18	139.91	0.028	3.16	0.69	3.85
2078	112.16	25.39	137.54	0.028	3.08	0.70	3.78
2079	108.99	25.60	134.58	0.028	3.00	0.70	3.70
2080	106.12	25.81	131.93	0.028	2.92	0.71	3.63
2081	102.16	26.02	128.18	0.028	2.81	0.72	3.53
2082	99.10	26.23	125.33	0.028	2.73	0.72	3.45
2083	96.33	26.44	122.77	0.028	2.65	0.73	3.38
2084	93.49	26.65	120.14	0.028	2.57	0.73	3.30
2085	90.10	26.86	116.96	0.028	2.48	0.74	3.22
2086	86.41	27.07	113.48	0.028	2.38	0.74	3.12
2087	83.84	27.28	111.12	0.028	2.31	0.75	3.06
2088	81.47	27.49	108.95	0.028	2.24	0.76	3.00
2089	78.87	27.69	106.56	0.028	2.17	0.76	2.93
2090	76.94	27.90	104.84	0.028	2.12	0.77	2.88
2091	75.20	28.11	103.31	0.028	2.07	0.77	2.84
2092	73.69	28.32	102.02	0.028	2.03	0.78	2.81
2093	72.43	28.53	100.96	0.028	1.99	0.78	2.78
2094	70.99	28.74	99.73	0.028	1.95	0.79	2.74
2095	69.75	28.95	98.70	0.028	1.92	0.80	2.71
2096	69.12	29.16	98.28	0.028	1.90	0.80	2.70
2097	68.49	29.37	97.86	0.028	1.88	0.81	2.69
2098	67.87	29.58	97.45	0.028	1.87	0.81	2.68
2099	67.38	29.79	97.17	0.028	1.85	0.82	2.67
2100	67.01	30.00	97.01	0.028	1.84	0.83	2.67

Notes: Conv gas—annual production of conventional natural gas; Tcf/yr—trillions of cubic feet per year; Non-conv—non-conventional gas (see text); NGPL ratio—fraction for converting gas volumes in Tcf/yr into volumes of Natural Gas Plant Liquids; Gboe—Gigabarrels of oil equivalent; Pred SP—predicted smoothed annual production; Pred Non—predicted annual production of non-conventional gas and NGPLs; Pred Tot—predicted annual production of total gas and NGPLs.

Table 14.3 World liquids actual, gigabarrels per year

<i>Year</i>	<i>Actual total world crude</i>	<i>Actual total world NGLs</i>	<i>Refinery gain</i>	<i>Other liquids</i>	<i>Actual total world liquids</i>
1870	0.00	0.00	0.00	0.00	0.00
1871	0.00	0.00	0.00	0.00	0.00
1872	0.00	0.00	0.00	0.00	0.00
1873	0.00	0.00	0.00	0.00	0.00
1874	0.00	0.00	0.00	0.00	0.00
1875	0.00	0.00	0.00	0.00	0.00
1876	0.00	0.00	0.00	0.00	0.00
1877	0.00	0.00	0.00	0.00	0.00
1878	0.00	0.00	0.00	0.00	0.00
1879	0.00	0.00	0.00	0.00	0.00
1880	0.00	0.00	0.00	0.00	0.00
1881	0.00	0.00	0.00	0.00	0.00
1882	0.00	0.00	0.00	0.00	0.00
1883	0.01	0.00	0.00	0.00	0.01
1884	0.01	0.00	0.00	0.00	0.01
1885	0.01	0.00	0.00	0.00	0.01
1886	0.01	0.00	0.00	0.00	0.01
1887	0.01	0.00	0.00	0.00	0.01
1888	0.01	0.00	0.00	0.00	0.01
1889	0.01	0.00	0.00	0.00	0.01
1890	0.01	0.00	0.00	0.00	0.01
1891	0.01	0.00	0.00	0.00	0.01
1892	0.01	0.00	0.00	0.00	0.01
1893	0.01	0.00	0.00	0.00	0.01
1894	0.01	0.00	0.00	0.00	0.01
1895	0.01	0.00	0.00	0.00	0.01
1896	0.01	0.00	0.00	0.00	0.01
1897	0.01	0.00	0.00	0.00	0.01
1898	0.01	0.00	0.00	0.00	0.01
1899	0.03	0.00	0.00	0.00	0.03
1900	0.05	0.00	0.00	0.00	0.05
1901	0.07	0.00	0.00	0.00	0.07
1902	0.08	0.00	0.00	0.00	0.08
1903	0.10	0.00	0.00	0.00	0.10
1904	0.12	0.00	0.00	0.00	0.12
1905	0.13	0.00	0.00	0.00	0.13
1906	0.14	0.00	0.00	0.00	0.14
1907	0.18	0.00	0.00	0.00	0.18
1908	0.20	0.00	0.00	0.00	0.20
1909	0.22	0.00	0.00	0.00	0.22
1910	0.26	0.00	0.00	0.00	0.26
1911	0.26	0.00	0.00	0.00	0.26
1912	0.29	0.00	0.00	0.00	0.29
1913	0.31	0.00	0.00	0.00	0.31
1914	0.33	0.00	0.00	0.00	0.33
1915	0.35	0.00	0.00	0.00	0.35
1916	0.38	0.00	0.00	0.00	0.38
1917	0.39	0.00	0.00	0.00	0.39
1918	0.41	0.00	0.00	0.00	0.41
1919	0.50	0.00	0.00	0.00	0.50
1920	0.60	0.00	0.00	0.00	0.60
1921	0.63	0.00	0.00	0.00	0.63
1922	0.69	0.00	0.00	0.00	0.69
1923	0.90	0.03	0.00	0.00	0.93
1924	0.90	0.03	0.00	0.00	0.92
1925	0.97	0.03	0.00	0.00	1.00
1926	1.00	0.03	0.00	0.00	1.03
1927	1.13	0.05	0.00	0.00	1.18
1928	1.18	0.05	0.00	0.00	1.23
1929	1.34	0.05	0.00	0.00	1.40
1930	1.32	0.08	0.00	0.00	1.40
1931	1.41	0.05	0.00	0.00	1.46
1932	1.46	0.05	0.00	0.00	1.52
1933	1.54	0.05	0.00	0.00	1.59
1934	1.63	0.05	0.00	0.00	1.68
1935	1.69	0.07	0.00	0.00	1.75
1936	1.78	0.07	0.00	0.00	1.85
1937	1.88	0.07	0.00	0.00	1.95
1938	1.96	0.07	0.00	0.00	2.03
1939	2.07	0.07	0.00	0.00	2.14
1940	2.11	0.07	0.00	0.00	2.18
1941	2.17	0.08	0.00	0.00	2.25
1942	2.08	0.08	0.00	0.00	2.16
1943	2.20	0.08	0.00	0.00	2.28
1944	2.48	0.09	0.00	0.00	2.57
1945	2.57	0.10	0.00	0.00	2.67
1946	2.68	0.11	0.00	0.00	2.78
1947	3.00	0.11	0.00	0.00	3.11

(continued)

Table 14.3 World liquids actual, gigabarrels per year (continued)

<i>Year</i>	<i>Actual total world crude</i>	<i>Actual total world NGPLs</i>	<i>Refinery gain</i>	<i>Other liquids</i>	<i>Actual total world liquids</i>
1948	3.37	0.12	0.00	0.00	3.49
1949	3.39	0.13	0.00	0.00	3.52
1950	3.87	0.13	0.00	0.00	4.00
1951	4.25	0.15	0.00	0.00	4.40
1952	4.49	0.17	0.00	0.00	4.66
1953	4.86	0.18	0.00	0.00	5.04
1954	4.98	0.20	0.01	0.00	5.18
1955	5.61	0.20	0.01	0.00	5.82
1956	6.04	0.21	0.01	0.00	6.26
1957	6.40	0.22	0.01	0.00	6.64
1958	6.57	0.24	0.01	0.00	6.83
1959	7.07	0.28	0.02	0.00	7.36
1960	7.66	0.33	0.03	0.00	8.02
1961	8.19	0.36	0.05	0.00	8.60
1962	8.89	0.40	0.06	0.00	9.35
1963	9.54	0.42	0.06	0.01	10.02
1964	10.29	0.44	0.07	0.01	10.80
1965	11.07	0.49	0.07	0.01	11.64
1966	12.03	0.54	0.07	0.01	12.65
1967	12.92	0.59	0.08	0.01	13.60
1968	14.10	0.65	0.09	0.01	14.85
1969	15.22	0.74	0.11	0.01	16.09
1970	16.75	0.84	0.23	0.02	17.83
1971	17.71	0.90	0.24	0.02	18.86
1972	18.67	0.97	0.24	0.02	19.89
1973	20.32	1.02	0.26	0.02	21.63
1974	20.34	1.05	0.28	0.02	21.68
1975	19.28	1.05	0.28	0.02	20.63
1976	20.93	1.10	0.28	0.03	22.34
1977	21.79	1.11	0.30	0.03	23.23
1978	21.96	1.13	0.30	0.03	23.42
1979	22.87	1.28	0.30	0.03	24.49
1980	21.74	1.29	0.33	0.03	23.39
1981	20.46	1.28	0.30	0.04	22.07
1982	19.51	1.22	0.31	0.06	21.10
1983	19.44	1.22	0.29	0.08	21.04
1984	19.89	1.32	0.35	0.09	21.65
1985	19.70	1.38	0.35	0.11	21.53
1986	20.51	1.40	0.28	0.10	22.29
1987	20.67	1.51	0.31	0.12	22.60
1988	21.42	1.56	0.33	0.11	23.42
1989	21.82	1.64	0.32	0.12	23.90
1990	22.08	1.66	0.35	0.12	24.21
1991	21.97	1.70	0.37	0.14	24.18
1992	21.94	1.75	0.42	0.17	24.28
1993	21.96	1.79	0.45	0.23	24.44
1994	22.24	1.84	0.48	0.26	24.82
1995	22.77	1.90	0.52	0.30	25.49
1996	23.18	2.02	0.56	0.31	26.07
1997	24.02	2.05	0.57	0.34	26.98
1998	24.40	2.11	0.61	0.35	27.47
1999	23.87	2.22	0.63	0.35	27.07
2000	24.56	2.36	0.67	0.35	27.94
2001	24.68	2.47	0.67	0.36	28.18
2002	24.24	2.51	0.70	0.38	27.83
2003	25.17	2.61	0.72	0.38	28.88
2004	26.25	2.70	0.78	0.39	30.12
2005	26.64	2.79	0.76	0.40	30.59
2006	26.85	2.84	0.76	0.43	30.88

Notes: NGPLs—Natural Gas Plant Liquids; Gb/yr—Gigabarrels per year; Pred— predicted

Table 14.3 World liquids predicted, gigabarrels per year

<i>Year</i>	<i>Predicted total world crude pred</i>	<i>Predicted total world NGPL pred</i>	<i>Refinery gain pred</i>	<i>Other liquids pred</i>	<i>Predicted total world liquids pred</i>
1870	0.00	0.00	0.00	0.00	0.00
1871	0.00	0.00	0.00	0.00	0.00
1872	0.00	0.00	0.00	0.00	0.00
1873	0.00	0.00	0.00	0.00	0.00
1874	0.00	0.00	0.00	0.00	0.00
1875	0.00	0.00	0.00	0.00	0.00
1876	0.00	0.00	0.00	0.00	0.00
1877	0.00	0.00	0.00	0.00	0.00
1878	0.00	0.00	0.00	0.00	0.00
1879	0.00	0.00	0.00	0.00	0.00
1880	0.00	0.00	0.00	0.00	0.00
1881	0.00	0.00	0.00	0.00	0.00
1882	0.00	0.00	0.00	0.00	0.00
1883	0.00	0.00	0.00	0.00	0.00
1884	0.01	0.00	0.00	0.00	0.01
1885	0.01	0.00	0.00	0.00	0.01
1886	0.01	0.00	0.00	0.00	0.01
1887	0.01	0.00	0.00	0.00	0.01
1888	0.01	0.00	0.00	0.00	0.01
1889	0.01	0.00	0.00	0.00	0.01
1890	0.01	0.00	0.00	0.00	0.01
1891	0.01	0.00	0.00	0.00	0.01
1892	0.01	0.00	0.00	0.00	0.01
1893	0.01	0.00	0.00	0.00	0.01
1894	0.01	0.00	0.00	0.00	0.01
1895	0.02	0.00	0.00	0.00	0.02
1896	0.02	0.00	0.00	0.00	0.02
1897	0.03	0.00	0.00	0.00	0.03
1898	0.04	0.00	0.00	0.00	0.04
1899	0.05	0.00	0.00	0.00	0.05
1900	0.06	0.00	0.00	0.00	0.06
1901	0.07	0.00	0.00	0.00	0.07
1902	0.09	0.00	0.00	0.00	0.09
1903	0.10	0.00	0.00	0.00	0.10
1904	0.12	0.00	0.00	0.00	0.12
1905	0.14	0.00	0.00	0.00	0.14
1906	0.16	0.00	0.00	0.00	0.16
1907	0.18	0.00	0.00	0.00	0.18
1908	0.20	0.00	0.00	0.00	0.20
1909	0.23	0.00	0.00	0.00	0.23
1910	0.26	0.00	0.00	0.00	0.26
1911	0.28	0.00	0.00	0.00	0.28
1912	0.31	0.00	0.00	0.00	0.31
1913	0.35	0.00	0.00	0.00	0.35
1914	0.37	0.00	0.00	0.00	0.37
1915	0.39	0.00	0.00	0.00	0.39
1916	0.41	0.00	0.00	0.00	0.41
1917	0.43	0.00	0.00	0.00	0.44
1918	0.48	0.00	0.00	0.00	0.48
1919	0.53	0.01	0.00	0.00	0.54
1920	0.59	0.01	0.00	0.00	0.60
1921	0.66	0.01	0.00	0.00	0.67
1922	0.75	0.01	0.00	0.00	0.77
1923	0.82	0.02	0.00	0.00	0.83
1924	0.88	0.02	0.00	0.00	0.90
1925	0.94	0.03	0.00	0.00	0.97
1926	1.00	0.05	0.00	0.00	1.05
1927	1.02	0.03	0.00	0.00	1.05
1928	1.07	0.04	0.00	0.00	1.10
1929	1.13	0.05	0.00	0.00	1.18
1930	1.25	0.04	0.00	0.00	1.29
1931	1.38	0.04	0.00	0.00	1.42
1932	1.53	0.04	0.00	0.00	1.57
1933	1.69	0.04	0.00	0.00	1.72
1934	1.83	0.04	0.00	0.00	1.87
1935	1.86	0.04	0.00	0.00	1.91
1936	1.87	0.05	0.00	0.00	1.91
1937	1.87	0.06	0.00	0.00	1.93
1938	1.88	0.07	0.00	0.00	1.94
1939	1.89	0.06	0.00	0.00	1.94
1940	2.00	0.07	0.00	0.00	2.07
1941	2.15	0.08	0.00	0.00	2.23
1942	2.30	0.08	0.00	0.00	2.39
1943	2.47	0.10	0.00	0.00	2.57
1944	2.65	0.11	0.00	0.00	2.77
1945	2.85	0.13	0.00	0.00	2.98
1946	3.05	0.13	0.00	0.00	3.17
1947	3.28	0.15	0.00	0.00	3.43

(continued)

Table 14.3 World liquids predicted, gigabarrels per year (continued)

<i>Year</i>	<i>Predicted total world crude pred</i>	<i>Predicted total world NGL pred</i>	<i>Refinery gain pred</i>	<i>Other liquids pred</i>	<i>Predicted total world liquids pred</i>
1948	3.55	0.16	0.00	0.00	3.71
1949	3.81	0.18	0.00	0.00	4.00
1950	4.09	0.21	0.00	0.00	4.30
1951	4.35	0.25	0.00	0.00	4.60
1952	4.61	0.26	0.00	0.00	4.87
1953	4.84	0.28	0.00	0.00	5.13
1954	5.08	0.29	0.00	0.00	5.37
1955	5.35	0.35	0.00	0.00	5.70
1956	5.69	0.39	0.01	0.00	6.09
1957	6.13	0.41	0.02	0.00	6.56
1958	6.67	0.41	0.02	0.00	7.10
1959	7.25	0.43	0.03	0.00	7.71
1960	7.92	0.43	0.04	0.00	8.38
1961	8.54	0.47	0.05	0.00	9.07
1962	9.16	0.49	0.06	0.00	9.72
1963	9.85	0.58	0.07	0.01	10.50
1964	10.54	0.64	0.08	0.01	11.26
1965	11.22	0.67	0.10	0.01	12.00
1966	12.01	0.71	0.11	0.01	12.85
1967	13.01	0.78	0.13	0.01	13.93
1968	14.01	0.84	0.15	0.01	15.00
1969	15.06	0.84	0.17	0.01	16.08
1970	16.09	0.84	0.19	0.02	17.14
1971	17.02	0.87	0.22	0.02	18.13
1972	17.75	0.91	0.24	0.02	18.92
1973	18.38	0.95	0.25	0.02	19.60
1974	18.77	0.97	0.29	0.02	20.05
1975	19.24	1.01	0.30	0.02	20.57
1976	19.83	1.01	0.28	0.03	21.15
1977	20.41	1.09	0.31	0.03	21.83
1978	20.80	1.13	0.32	0.03	22.28
1979	21.24	1.11	0.32	0.03	22.71
1980	21.48	1.19	0.34	0.03	23.04
1981	21.34	1.30	0.32	0.04	22.99
1982	20.87	1.39	0.29	0.06	22.61
1983	20.71	1.42	0.28	0.08	22.50
1984	20.88	1.45	0.29	0.09	22.71
1985	20.81	1.46	0.32	0.11	22.68
1986	21.16	1.56	0.33	0.10	23.15
1987	21.86	1.58	0.37	0.12	23.93
1988	22.11	1.63	0.38	0.11	24.23
1989	22.02	1.63	0.41	0.12	24.17
1990	22.27	1.67	0.44	0.12	24.51
1991	22.27	1.75	0.47	0.14	24.62
1992	22.12	1.79	0.48	0.17	24.55
1993	22.24	1.86	0.50	0.23	24.83
1994	22.54	2.04	0.51	0.26	25.36
1995	22.81	2.11	0.53	0.30	25.75
1996	23.29	2.07	0.56	0.31	26.22
1997	23.80	2.13	0.59	0.34	26.85
1998	24.22	2.17	0.62	0.35	27.36
1999	24.42	2.21	0.64	0.35	27.63
2000	24.68	2.27	0.65	0.35	27.95
2001	24.92	2.40	0.68	0.36	28.36
2002	25.31	2.47	0.70	0.38	28.86
2003	25.79	2.56	0.71	0.38	29.43
2004	26.23	2.64	0.74	0.39	30.01
2005	26.53	2.76	0.76	0.40	30.45
2006	27.00	2.83	0.76	0.43	31.02
2007	27.27	2.98	0.77	0.45	31.47
2008	27.32	3.09	0.77	0.47	31.66
2009	27.29	3.16	0.78	0.49	31.72
2010	27.23	3.25	0.78	0.52	31.78
2011	27.23	3.32	0.78	0.55	31.87
2012	27.37	3.39	0.78	0.57	32.11
2013	27.53	3.45	0.78	0.60	32.36
2014	27.63	3.49	0.77	0.63	32.53
2015	27.75	3.53	0.77	0.67	32.72
2016	27.73	3.53	0.76	0.70	32.73
2017	27.55	3.57	0.76	0.74	32.62
2018	27.27	3.61	0.77	0.78	32.42
2019	26.95	3.61	0.77	0.83	32.15
2020	26.56	3.64	0.76	0.87	31.84
2021	26.07	3.64	0.76	0.92	31.39
2022	25.72	3.67	0.74	0.97	31.11
2023	25.52	3.70	0.72	1.03	30.98
2024	25.30	3.73	0.71	1.09	30.83
2025	25.04	3.79	0.70	1.15	30.68

(continued)

Table 14.3 World liquids predicted, gigabarrels per year (continued)

<i>Year</i>	<i>Predicted total world crude pred</i>	<i>Predicted total world NGPL pred</i>	<i>Refinery gain pred</i>	<i>Other liquids pred</i>	<i>Predicted total world liquids pred</i>
2026	24.89	3.81	0.69	1.22	30.61
2027	24.69	3.84	0.68	1.30	30.50
2028	24.36	3.83	0.67	1.38	30.23
2029	23.96	3.85	0.65	1.46	29.93
2030	23.64	3.91	0.64	1.55	29.74
2031	23.30	3.92	0.63	1.65	29.50
2032	22.92	3.93	0.61	1.75	29.21
2033	22.57	3.91	0.60	1.87	28.95
2034	22.24	3.89	0.59	1.99	28.71
2035	21.81	3.87	0.58	2.12	28.38
2036	21.36	3.88	0.57	2.25	28.07
2037	20.96	3.93	0.56	2.40	27.85
2038	20.59	3.94	0.55	2.56	27.64
2039	20.25	3.95	0.54	2.73	27.47
2040	19.87	3.93	0.53	2.91	27.25
2041	19.48	3.91	0.52	2.91	26.82
2042	19.11	3.92	0.51	2.91	26.45
2043	18.66	3.97	0.50	2.91	26.03
2044	18.20	4.01	0.49	2.90	25.60
2045	17.80	4.02	0.48	2.90	25.20
2046	17.40	4.03	0.47	2.90	24.79
2047	16.90	4.01	0.46	2.90	24.26
2048	16.44	4.01	0.44	2.89	23.79
2049	16.01	4.05	0.43	2.89	23.38
2050	15.56	4.09	0.41	2.89	22.95
2051	15.12	4.13	0.40	2.89	22.53
2052	14.76	4.13	0.39	2.88	22.17
2053	14.43	4.14	0.39	2.88	21.84
2054	14.17	4.11	0.38	2.88	21.54
2055	13.93	4.11	0.38	2.88	21.31
2056	13.64	4.14	0.37	2.88	21.04
2057	13.41	4.14	0.37	2.88	20.80
2058	13.19	4.14	0.36	2.88	20.57
2059	12.87	4.11	0.35	2.88	20.21
2060	12.59	4.07	0.35	2.88	19.88
2061	12.35	4.03	0.34	2.87	19.60
2062	12.03	4.02	0.33	2.87	19.26
2063	11.71	4.04	0.32	2.87	18.95
2064	11.41	4.03	0.32	2.87	18.63
2065	11.13	4.02	0.31	2.87	18.33
2066	10.89	3.98	0.30	2.87	18.04
2067	10.61	3.96	0.30	2.87	17.74
2068	10.33	3.97	0.29	2.87	17.45
2069	10.08	3.97	0.29	2.86	17.20
2070	9.76	4.00	0.28	2.86	16.90
2071	9.45	4.00	0.27	2.86	16.58
2072	9.23	3.99	0.27	2.86	16.34
2073	9.01	3.95	0.26	2.86	16.08
2074	8.80	3.91	0.25	2.86	15.81
2075	8.61	3.90	0.24	2.86	15.61
2076	8.43	3.88	0.23	2.85	15.39
2077	8.25	3.85	0.23	2.85	15.17
2078	8.08	3.78	0.22	2.85	14.93
2079	7.95	3.70	0.21	2.85	14.71
2080	7.85	3.63	0.21	2.85	14.53
2081	7.73	3.53	0.20	2.85	14.30
2082	7.63	3.45	0.20	2.85	14.12
2083	7.53	3.38	0.19	2.85	13.94
2084	7.38	3.30	0.19	2.85	13.72
2085	7.23	3.22	0.18	2.84	13.47
2086	7.09	3.12	0.17	2.84	13.22
2087	6.92	3.06	0.17	2.84	12.98
2088	6.78	3.00	0.16	2.84	12.77
2089	6.66	2.93	0.15	2.84	12.58
2090	6.51	2.88	0.15	2.84	12.38
2091	6.39	2.84	0.14	2.84	12.21
2092	6.28	2.81	0.13	2.84	12.06
2093	6.13	2.78	0.13	2.83	11.87
2094	5.98	2.74	0.12	2.83	11.67
2095	5.84	2.71	0.12	2.83	11.50
2096	5.65	2.70	0.11	2.83	11.30
2097	5.47	2.69	0.10	2.83	11.09
2098	5.31	2.68	0.09	2.83	10.91
2099	5.11	2.67	0.09	2.83	10.70
2100	4.93	2.67	0.08	2.82	10.50

Notes: NGPLs—Natural Gas Plant Liquids; Gb/yr—Gigabarrels per year; Pred—predicted.

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Chapter 15

Conclusions



Chapter 15 Conclusions

The potential oil production prospects of different countries and regions vary immensely.

However, on balance, when an aggregation is done across the globe, it is likely that that we have entered around 2006 onto a plateau in potential oil production that will last only about another eight years to 2016. After that, the modelling is forecasting what can be termed ‘the 2017 drop-off’. The outlook under a base case scenario is for a long decline in potential oil production to begin in 2017, which will stretch to the end of the century and beyond.

Because global natural gas production is expected to show slower growth after 2020, and because Natural Gas Plant Liquids are a major liquids component, the outlook is similar for ‘total liquids’ as defined by the EIA.

The outlook is not really changed much if a scenario of increased Middle East oil production is played out. The result of that scenario is that oil production continues its growth for longer and then falls far more precipitously. This could potentially be a worse scenario, as far as the world being able to cope with the transition.

So, if the prognosis for plateau and then decline of conventional petroleum liquids is accepted, the question arises as to how the world will cope with the prospect of one of its major and convenient energy sources being progressively withdrawn.

There are really three options:

1. Oil is replaced with other (equally rich and abundant) energy sources (opening the whole debate about alternative energy sources).
2. Improved energy efficiency results in energy use per unit of GDP declining markedly to match the shortfall.
3. GDP declines to match the shortfall.

The first option opens the whole debate about alternative fuel sources. For example, coal-to-liquids and gas-to-liquids production in Australia and worldwide is set to begin in earnest at about the same time as foreseen here for the beginning of the decline in conventional petroleum liquids (about 2017). How much of the constant annual decline in production foreseen can be replaced by continually ramping up production from ‘fungible’ fossil fuels? What about the greenhouse gas implications? If electric vehicles begin to make inroads, what are the infrastructure requirements and lags, and what about the greenhouse gas implications of the electricity generation energy sources—coal or renewables?

The second option leads to consideration of necessary infrastructure changes to supply and support new energy-saving technologies, and the lags involved in this. Again, greenhouse gas issues are important.

Alternatives under options 1 and 2 will be the subject of a future BITRE report.

However, it would seem that, given the magnitude of the potential supply reductions, many adaptations in many areas will be required—the so-called ‘wedges’ approach (Lovins et al 2004, Hirsch et al 2005).

It should be noted that this report concentrates on the *long-run potential supply* of conventional petroleum liquids. In order to understand the dynamics of the oil market, not only potential supply, but also demand and price need to be considered. In the short run, the effects of the global economic slow down are likely to mean that lower demand, not limits on potential supply, will be the limiting factor for oil production. Thus lower GDP growth will be running the show in the short run, and the associated lower oil prices will in fact make it harder to progress options 1 and 2 to deal with the long-run trends. World oil demand/price dynamics are the subject of a second future BITRE report.

In conclusion, this report has demonstrated that although the oil production prospects of different countries and regions vary immensely, the prospects for the potential supply of world conventional petroleum liquids can be summarised as ‘flattish to slightly up for another eight years or longer (depending on the duration of the global economic slowdown) and then down’. Such a finding poses challenges for global transport and more generally, given the magnitude of the downturn foreseen for the rest of the century, and given the inertias inherent in our energy systems and transport vehicle fleets

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Appendix A

Other forecasts

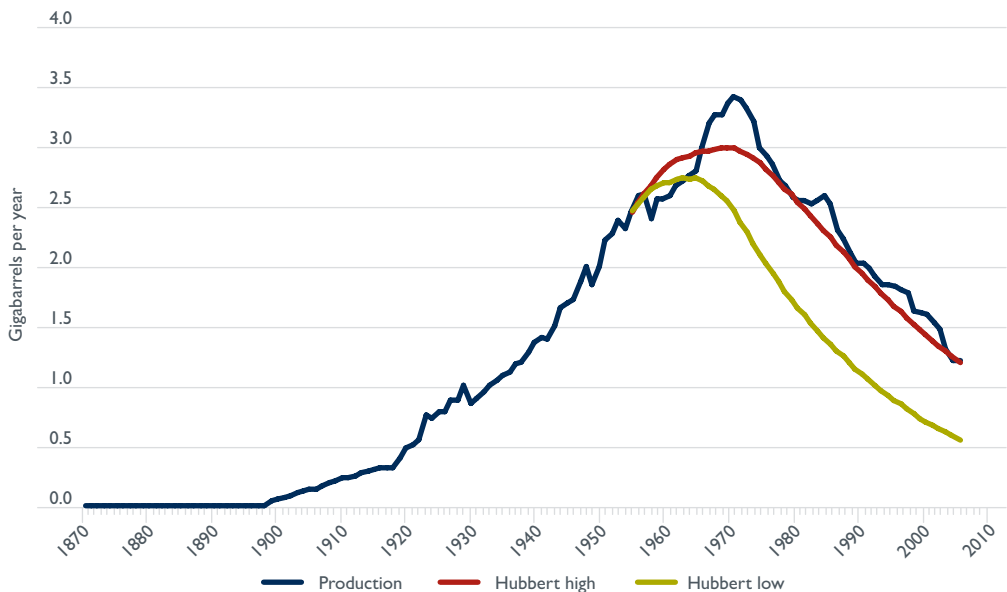


Appendix A

Other forecasts

Oil depletion forecasts have been made since the mid-1950s, starting with Hubbert forecasting the turn of production in the US lower 48 states. Figure A1 shows Hubbert's 1956 forecasts for ultimates of 150 and 200 gigabarrels, versus actual US lower 48 production to 2006. His high forecast correctly predicted the turning point (1970) and also the approximate path of production for 50 years (Hubbert would not have known about possibilities in Alaska or in the Gulf of Mexico, so his US forecast was essentially a US lower 48 forecast).

Figure A1 Hubbert's 1956 US lower 48 forecast for oil production



Early world oil forecasts

Four forecasts from the late 1970s and 1980s for world oil depletion are shown in Figure A2.

Petroconsultants in 1986 foresaw a turning point for world crude oil production in the 1990s. They would likely have used a variant of Hubbert curve methodology (see Lynch 1997).

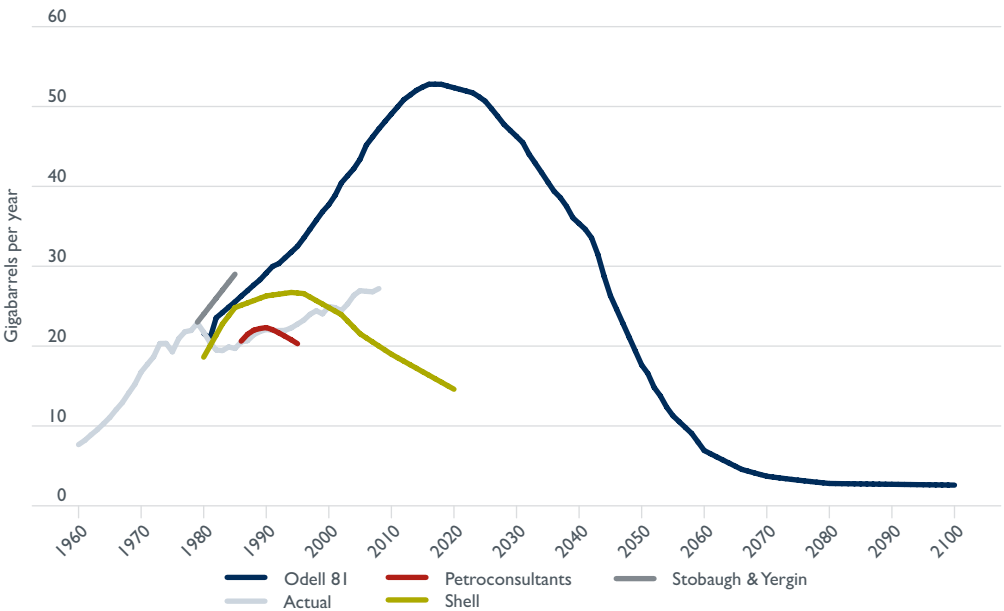
Odell, in the first of his world forecasts, saw a peak crude oil production of roughly twice 2008 actual production occurring about 2020. Odell's methodology is apparently

to continue the past trend as far as possible before dropping production sharply. His estimate of the ultimate recoverable resource was 3.7 trillion barrels for this forecast, including heavy oil. (see Odell and Rosing 1982).

Shell in 1978 forecast a peak of world oil production in 1995, at about the level actual crude production reached in 2005. (see Kasper et al, 1980).

Stobaugh and Yergin (1979) forecast that world crude oil production would reach about 29 gigabarrels per year by 1985, a level it has yet to reach 23 years later.

Figure A2 Crude oil forecasts from the 1980s



Turn of the century world oil/liquids forecasts

Various crude oil production forecasts from around the turn of the century are shown in Figure A3.

Perrodon, Laherrere and Campbell in 1998 forecast crude oil production to peak around 2005 and then decline sharply, based on an estimated ultimate recoverable resource of about 2.75 trillion barrels worldwide (including heavy oil). They used Hubbert curve analyses for multiple oil producing regions aggregated to a world total.

BITRE's current forecast is closer to that of the German Federal Institute for Geosciences and Natural Resources (BGR 2004), which has production peaking slowly above 30 gigabarrels per year around 2020. BITRE's estimate of the ultimate recoverable resource is about 3 trillion barrels (including heavy oil) versus about 3.4 for the BGR.

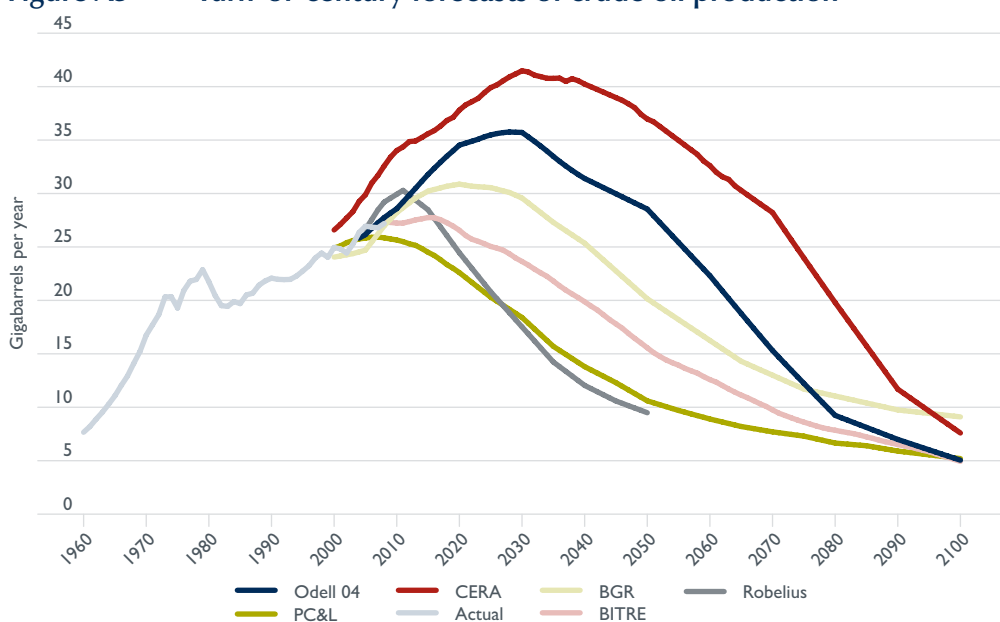
The forecast in Odell (2003) was based on 3.7 trillion barrels (including heavy oil) but, as with his earlier estimate, he continues the trend for as long as possible (2030) before dropping production sharply. Thus although his ultimate is similar to the

BGR's, his production forecast is higher in the near years and then lower heading into the next century.

Cambridge Energy Research Associates (CERA 2006) has made a forecast based on crude oil ultimate recoverable resources of 4 trillion barrels (including heavy oil). Their peak comes much later, around about 2040, but like Odell, the path of production after 2070 (when their forecast stops) will have to be quite sharply downward (indicative trend indicated in graph).

Robelius (2007) has made a forecast of crude production based on an assessment of the 40 giant oilfields in the world. His 'standard high' forecast peaks higher than Perrodon, Laherrere and Campbell and then drops below by 2050.

Figure A3 Turn-of-century forecasts of crude oil production



The issue of differing ultimate recoverable reserve assessments is well illustrated by Figure A3. The three lowest forecasts have ultimate recoverable reserves of about 2500 gigabarrels (assuming 500 gigabarrels of heavy oil). The BITRE forecast is based on about 3000 gigabarrels, and the BGR forecast on 3400. Odell's forecast is only about 250 higher than BGR at 3650, but he assumes much more is produced more quickly in the early part of the century. CERA makes the same assumption and has a higher still estimate of ultimate recoverable reserves at 4150 gigabarrels (excluding shale oil).

When attention is turned to forecasts of total liquids (see Figure A4), the CERA short-term and long-term forecasts are proving quite mistaken. According to CERA, production of liquids worldwide should have reached 35 gigabarrels by 2008, about 13 per cent above preliminary indications of the actual level. CERA use past production trends plus intended investment and development to derive their short-term forecast.

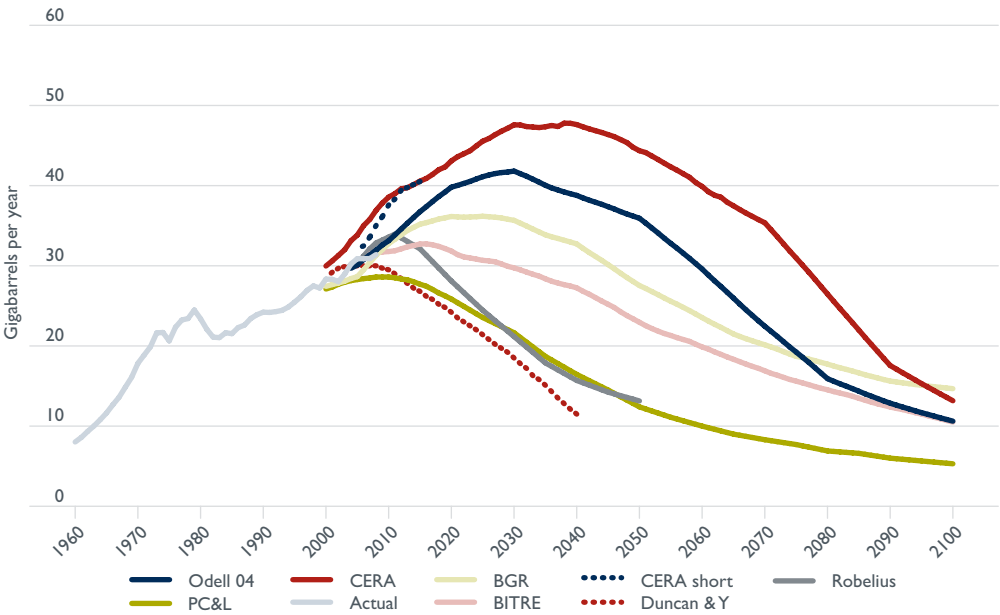
Odell's (2003) crude forecast, when supplemented by BITRE's 'other liquids' forecast to get a total liquids forecast, is the second highest of the forecasts until the last quarter of the century, when both it and the CERA forecast dip below the BGR forecast.

Duncan and Youngquist, with an estimated ultimate recoverable resource similar to Perrodon, Campbell and Laherrere in 1998, derived a sharply declining production trend after 2008 for world liquids. Duncan and Youngquist (1999) used a two-pronged methodology. First they estimated the minimum path of future production based on past trends, and then they used judgemental adjustments to these. Both studies have the level of liquids declining from about 2010.

The BGR (2004) forecast of crude, when supplemented by BITRE’s ‘other liquids’ forecast to get a total liquids forecast, is similar in path to the BITRE forecast, but somewhat higher, due to its higher assessment of ultimate production.

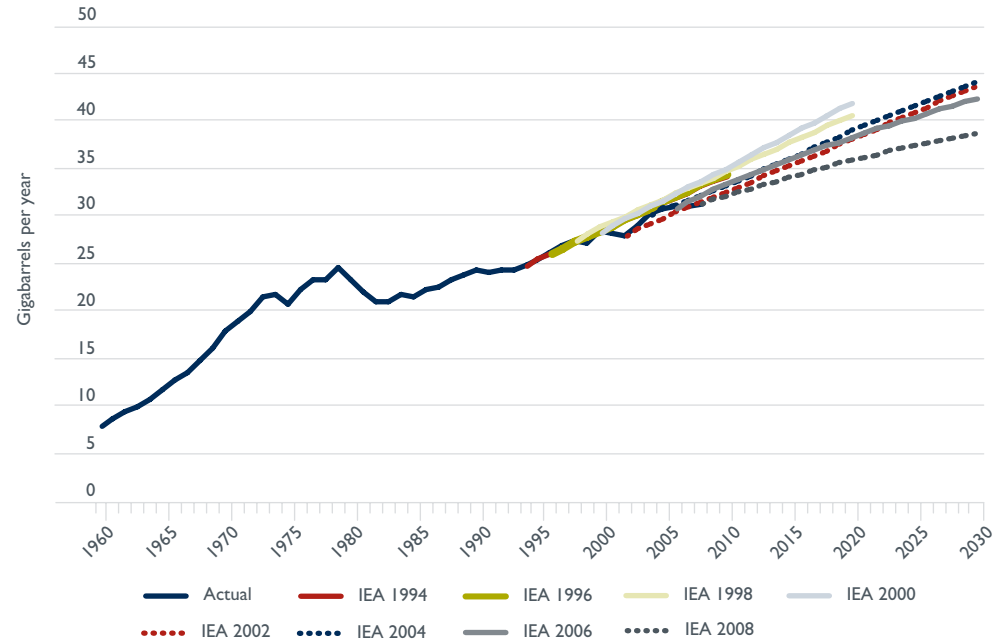
Robelius (2007) forecast of liquids is again higher than Perrodon, Laherrere and Campbell in the short run, but then drops down to roughly equal them by the second quarter of this century.

Figure A4 Turn-of-century forecasts of ‘total liquids’ production



Finally, the International Energy Agency in their ‘World Energy Outlook’ has made 15–25 year forecasts of world liquids since 1994. Figure A.5 shows that there has been a consistent lowering of projection trends, culminating in the latest (mid 2008) forecast.

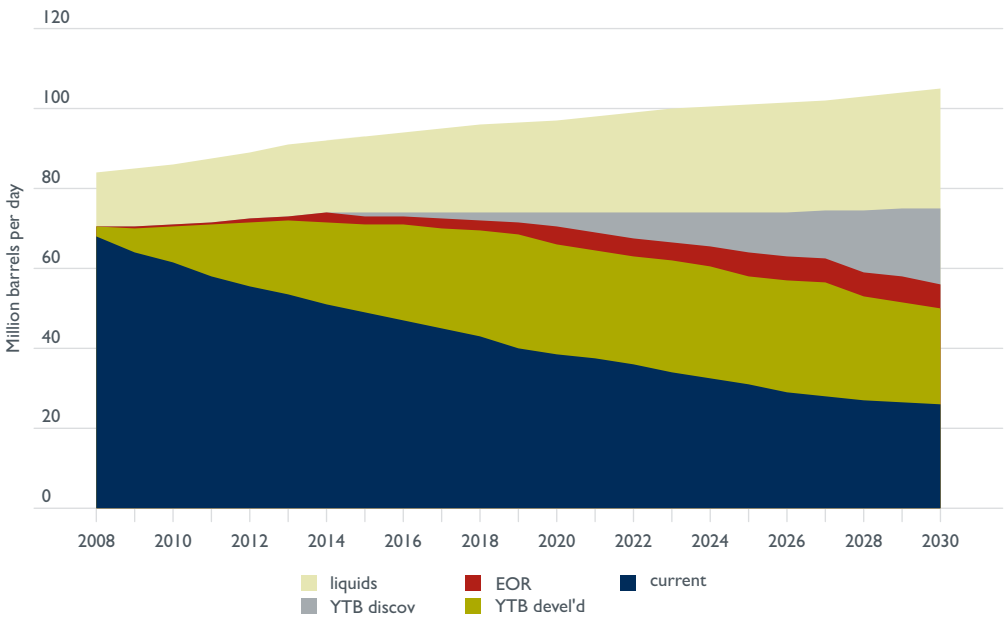
Figure A5 **Forecasts of ‘total liquids’ production by the International Energy Agency**



The 2008 International Energy Agency world liquids forecast

Figure A6 shows the details of the latest forecast to 2030 of world liquids by the International Energy Agency (IEA).

Figure A6 The 2008 IEA world liquids forecast



The forecast can be separated into three major components:

1. Production of traditional crude from existing fields, which is the summation of the current, yet to be developed, and enhanced oil recovery categories in the above graph
2. Production expected from yet to be discovered fields (which will be discovered in the 2008 to 2030 period), and
3. Production of liquids (including heavy oil, natural gas liquids, coal-to-liquids, gas-to-liquids, shale to oil, biofuels, etc.)

What correspondence is there to the BITRE forecasts presented above?

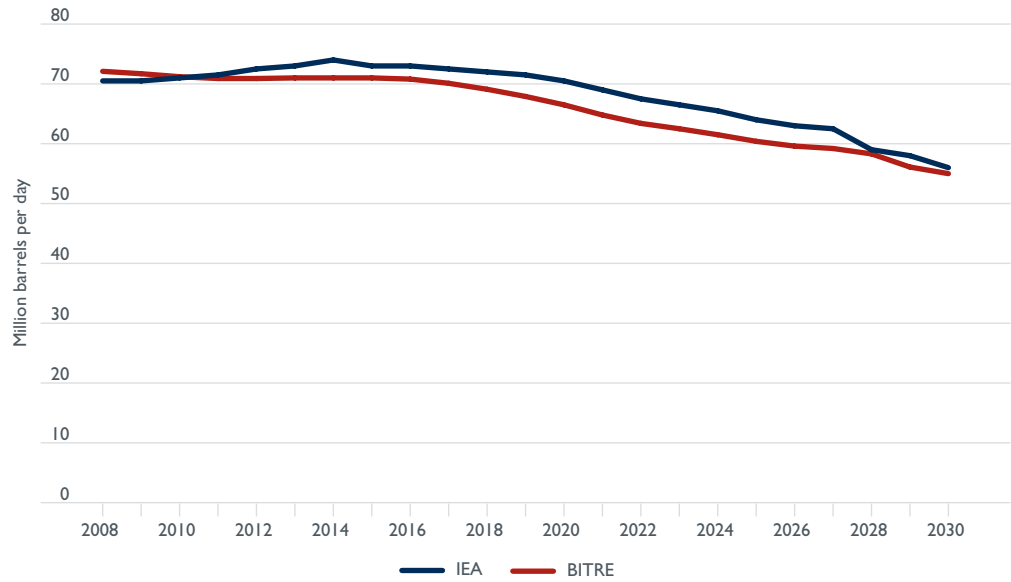
Starting with the first category, the comparable BITRE forecasts are for BITRE conventional oil plus most of the deep water production predicted for the period to 2030. The average discovery-to-production lag on conventional crude is on average about 60 years worldwide, and so none of the BITRE conventional discoveries will produce production during the period under the current methodology. But the lag on deep water is about 22 years currently, and with the smoothing procedures, some of this will appear as production before 2030.

In order to calculate how much of the deep water production will be from newly discovered fields (and so not included in the IEA 'production from current fields'

category) it is necessary to quarantine the 2008 and after discoveries. Table A1 shows how this is done.

When the resulting estimates of production from newly discovered fields are subtracted from the total of BITRE conventional plus deep from Table 13.3 above, and the resulting sum converted to million barrels per day, the correspondence between BITRE and the IEA on the first category of production of traditional crude from existing fields can be calculated. The two forecasts are shown in Figure A7

Figure A7 BITRE and IEA forecasts of production of traditional crude from existing fields



As can be seen, the forecasts are quite comparable, positing a drop-off from about 2017. This correspondence is quite important, in that this component is the one backed up by the most disaggregate analyses of both organisations. In the case of the IEA, it was based on a study of more than 600 oil fields and in the BITRE analysis, of 40-plus countries/regions.

Ignoring for the moment the second (discovery) component, the BITRE and IEA forecasts for the third component (non-conventional (heavy) oil, natural gas liquids, bio-fuels, and in the case of the IEA, also gas-to-liquids, coal-to-liquids, shale-to-oil, etc) are shown in Figure A8.

Because of the extras included in the IEA component (basically coal-to-liquids, gas-to-liquids and shale-to-oil), the IEA forecast grows away from the BITRE forecast as these components grow. If it is assumed that the difference of the IEA estimate from the BITRE estimate in 2030 is the result of a straight line growth in these sub-components, then their addition to the BITRE forecast give the correspondence for the third category shown in Figure A9.

Figure A8 BITRE and IEA forecasts of non-conventional oil and liquids

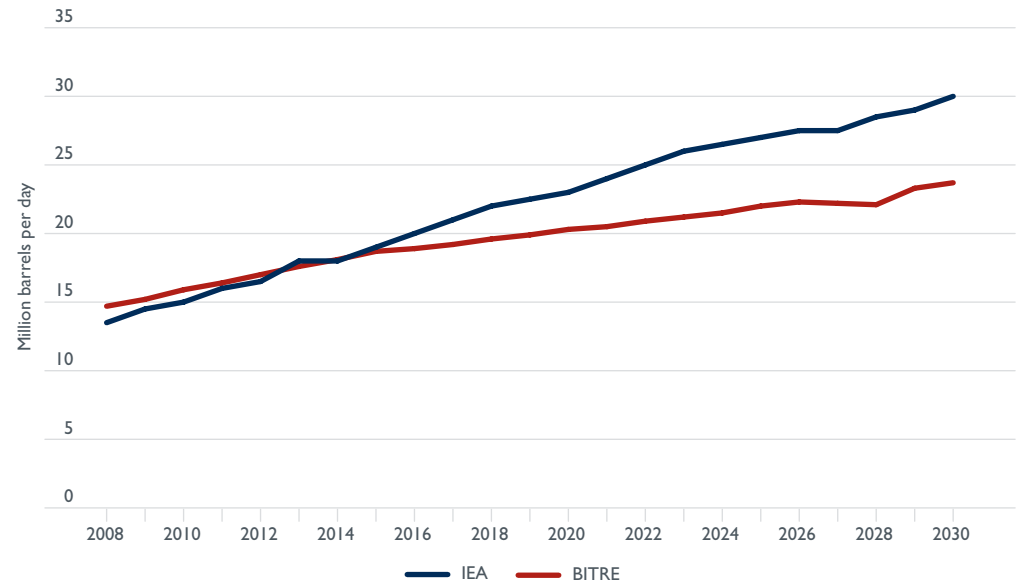
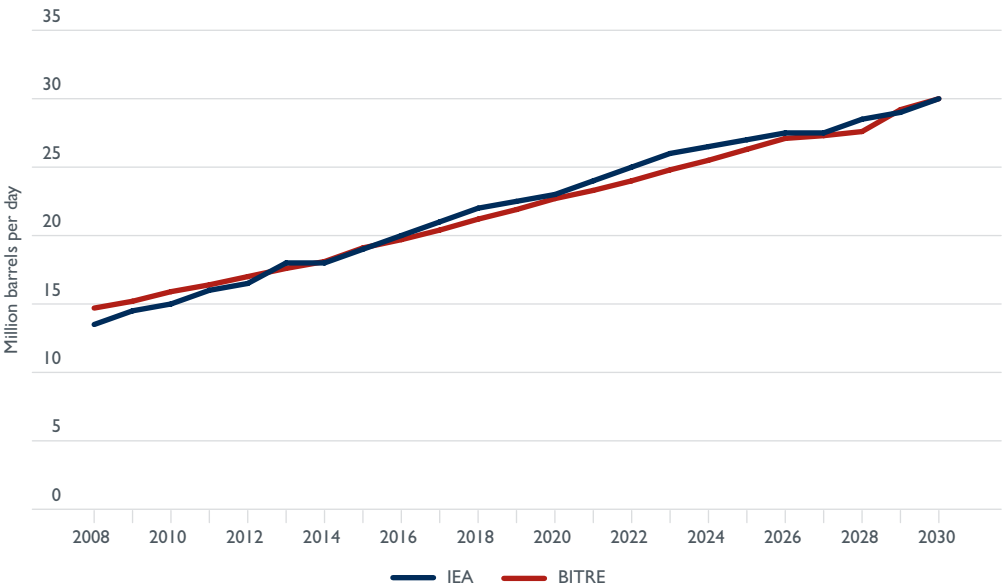


Figure A9 IEA and augmented BITRE forecasts of non-conventional oil and liquids



Again, the correspondence can be taken as potentially good for the third component of the IEA 2008 forecast.

However, it is when we return to component two – production from fields discovered in the 2008 to 2030 period – that differences emerge.

The BITRE estimate of the path of cumulative discovery for traditional and deep water crude is plotted against the IEA path of cumulative production from fields discovered

in 2008 and after in Figure A10. It can be seen that the lag projected by the IEA is on the order of 17–18 years. This is even shorter than the average 22 year lag for deep water fields, the sector with the shortest lags thus far (see Figure A11).

Figure A10 **Lag between discovery and production for IEA new discoveries, 2008 to 2030**

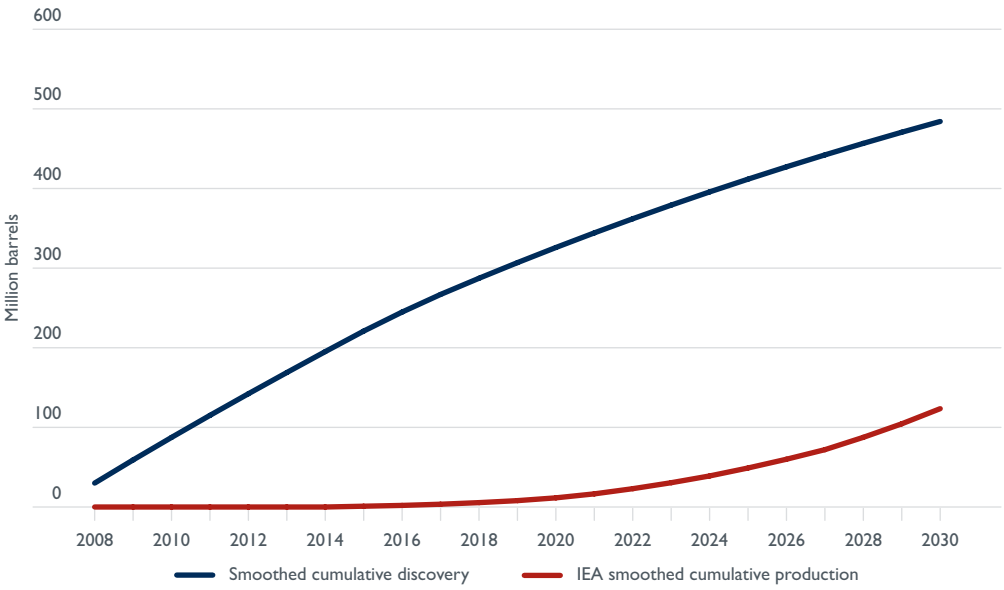
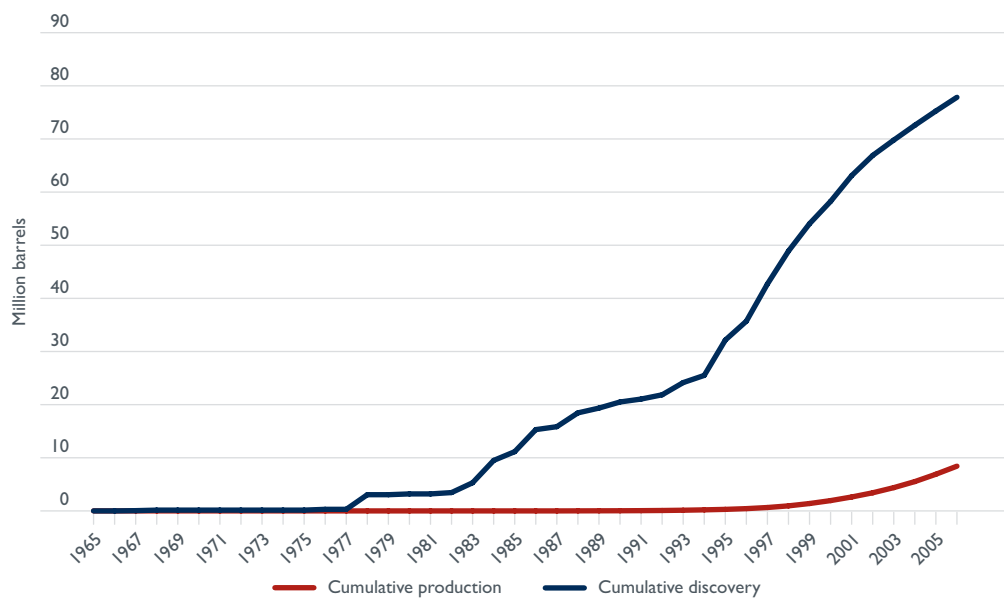
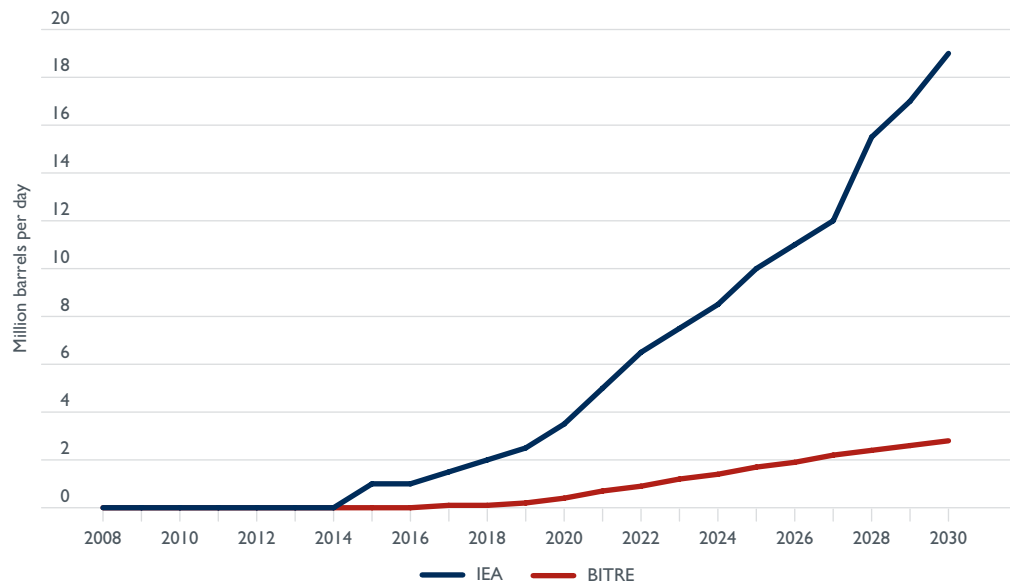


Figure A11 **Lags between discovery and production for deep water oil**



Because of the large differences in lags assumed by the BITRE and IEA, the forecasts of production from these new discoveries within the period are also large. Figure A12 shows the two forecasts for the second component of production. The IEA assumes about 19 Mbpd from new discoveries by 2030, BITRE assumes 3 Mbpd. This is the essential difference between the two forecasts.

Figure A12 **BITRE and IEA forecasts of production from new discoveries, 2008–2030**



If the IEA assumption of all future discoveries being fully produced in an average of 17 years, what effect would this have on the forecasts of BITRE-defined total crude?

Tables A2 to A8 show the calculations.

In essence, the shorter lags result in production being brought forward from the tail of the distribution, resulting in crude production that continues to rise until 2028, but then falls off rather more steeply than the BITRE basecase forecast (see Figure A13). This is a similar result to the increased Middle East production scenario of Chapter 13.

Figure A13 **Result of assuming a 17-year lag from discovery to production vs BITRE basecase**

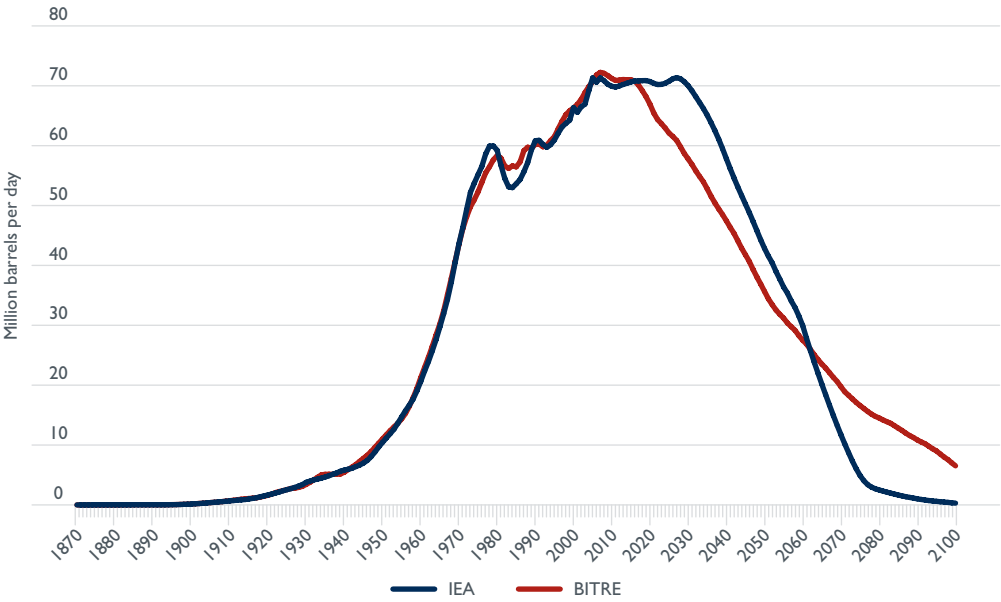


Table A1 Deep Water 2008 and after

Year	Gb D	CD	21yr SCD	adj SCD	predlag	raw Pred CP	5yr smth Pred SCP	SCP	raw Pred P	5yr smth Pred SP	Actual P
1950	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1951	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1952	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1953	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1954	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1955	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1956	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1957	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1958	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1959	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1960	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1961	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1962	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1963	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1964	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1965	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1966	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1967	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1968	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1969	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1970	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1971	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1972	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1973	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1974	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1975	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1976	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1977	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1978	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1979	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1980	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1981	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1982	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1983	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1984	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1985	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1986	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1987	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1988	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.01
1989	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.01
1990	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.02
1991	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.02
1992	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.03
1993	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.04
1994	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.07
1995	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.09
1996	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.13
1997	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.20
1998	0.00	0.00	0.12	0.12	22	0.00	0.00	0.00	0.00	0.00	0.32
1999	0.00	0.00	0.35	0.35	22	0.00	0.00	0.00	0.00	0.00	0.42
2000	0.00	0.00	0.69	0.69	22	0.00	0.00	0.00	0.00	0.00	0.57
2001	0.00	0.00	1.13	1.13	22	0.00	0.00	0.00	0.00	0.00	0.66
2002	0.00	0.00	1.66	1.66	22	0.00	0.00	0.00	0.00	0.00	0.82
2003	0.00	0.00	2.29	2.29	22	0.00	0.00	0.00	0.00	0.00	0.88
2004	0.00	0.00	3.01	3.01	22	0.00	0.00	0.00	0.00	0.00	1.22
2005	0.00	0.00	3.81	3.81	22	0.00	0.00	0.00	0.00	0.00	1.32
2006	0.00	0.00	4.69	4.69	22	0.00	0.00	0.00	0.00	0.00	1.62
2007	0.00	0.00	5.64	5.64	22	0.00	0.00	0.00	0.00	0.00	
2008	2.47	2.47	6.66	6.66	22	0.00	0.00	0.00	0.00	0.00	
2009	2.36	4.84	7.73	7.73	22	0.00	0.00	0.00	0.00	0.00	
2010	2.26	7.09	8.87	8.87	22	0.00	0.00	0.00	0.00	0.00	
2011	2.15	9.25	10.06	10.06	22	0.00	0.00	0.00	0.00	0.00	
2012	2.05	11.29	11.31	11.31	22	0.00	0.00	0.00	0.00	0.00	
2013	1.94	13.24	12.61	12.61	22	0.00	0.00	0.00	0.00	0.00	
2014	1.84	15.07	13.97	13.97	22	0.00	0.00	0.00	0.00	0.00	
2015	1.73	16.80	15.37	15.37	22	0.00	0.00	0.00	0.00	0.00	
2016	1.62	18.42	16.83	16.83	22	0.00	0.00	0.00	0.00	0.01	
2017	1.52	19.94	18.34	18.34	22	0.00	0.00	0.00	0.00	0.02	
2018	1.41	21.35	19.89	19.89	22	0.00	0.02	0.00	0.02	0.05	
2019	1.31	22.66	21.38	21.38	22	0.00	0.09	0.00	0.07	0.09	
2020	1.20	23.86	22.80	22.80	22	0.12	0.23	0.00	0.14	0.16	
2021	1.18	25.04	24.16	24.16	22	0.35	0.46	0.00	0.23	0.24	
2022	1.16	26.19	25.46	25.46	22	0.69	0.79	0.00	0.33	0.33	
2023	1.13	27.33	26.70	26.70	22	1.13	1.22	0.00	0.44	0.43	
2024	1.11	28.44	27.90	27.90	22	1.66	1.76	0.00	0.53	0.53	
2025	1.09	29.53	29.05	29.05	22	2.29	2.38	0.00	0.63	0.62	
2026	1.07	30.60	30.16	30.16	23	3.01	3.09	0.00	0.71	0.71	
2027	1.05	31.65	31.23	31.23	23	3.81	3.89	0.00	0.79	0.79	
2028	1.03	32.67	32.27	32.27	23	4.69	4.76	0.00	0.87	0.87	
2029	1.00	33.68	33.28	33.28	23	5.64	5.71	0.00	0.94	0.94	
2030	0.98	34.66	34.26	34.26	23	6.66	6.72	0.00	1.01	1.01	

Table A2 World conventional 2007 and before—gigabarrels

Year	SD	CD	2/yr SCD	years lag	raw Pred CP	3yr smth Pred SCP	actual SCP	raw Pred P	5yr sm Pred SP	Actual P
1960	36.91	897.86	902.69	41	118.75	119.06	117.43	7.77	7.76	7.53
1961	37.44	939.60	940.13	42	127.26	127.53	125.59	8.47	8.36	8.16
1962	37.63	989.97	977.76	43	136.57	136.55	134.32	9.02	8.95	8.73
1963	37.72	1026.67	1015.48	44	145.82	146.03	143.70	9.48	9.58	9.38
1964	37.68	1066.24	1053.16	44	155.71	156.06	153.77	10.02	10.25	10.07
1965	37.40	1102.95	1090.56	45	166.65	166.96	164.62	10.90	10.97	10.85
1966	36.95	1145.54	1127.51	46	178.53	178.76	176.27	11.80	11.82	11.65
1967	36.55	1182.18	1164.06	46	191.12	191.39	188.81	12.63	12.77	12.53
1968	35.83	1218.86	1199.90	47	204.53	205.11	202.39	13.72	13.77	13.58
1969	35.21	1253.43	1235.11	47	219.69	219.91	217.16	14.80	14.80	14.77
1970	34.55	1291.16	1269.66	48	235.51	235.79	233.08	15.88	15.83	15.92
1971	33.05	1327.12	1302.71	49	252.17	252.75	249.98	16.96	16.77	16.90
1972	32.40	1358.61	1335.11	49	270.58	270.57	267.98	17.81	17.53	18.00
1973	30.94	1388.03	1366.05	50	288.95	288.96	287.03	18.40	18.14	19.05
1974	30.16	1418.03	1396.21	51	307.35	307.54	306.64	18.58	18.68	19.61
1975	29.29	1445.19	1425.50	51	326.32	326.49	326.77	18.95	19.17	20.13
1976	28.57	1473.49	1454.07	52	345.80	346.17	347.42	19.68	19.67	20.64
1977	27.41	1497.94	1481.49	52	366.41	366.42	368.81	20.25	20.20	21.40
1978	26.47	1525.01	1507.96	53	387.06	387.32	390.69	20.90	20.66	21.87
1979	25.55	1546.66	1533.51	53	408.48	408.52	412.57	21.21	20.93	21.88
1980	24.64	1568.26	1558.14	53	430.03	429.80	434.19	21.28	21.01	21.62
1981	23.49	1592.02	1581.63	54	450.90	450.83	454.89	21.02	20.86	20.71
1982	22.39	1619.97	1604.03	54	471.55	471.45	474.79	20.63	20.65	19.90
1983	21.49	1639.70	1625.52	55	491.91	491.64	494.18	20.19	20.49	19.39
1984	20.68	1660.12	1646.19	55	511.46	511.79	513.52	20.15	20.46	19.34
1985	19.79	1681.27	1665.99	56	532.01	532.25	533.10	20.46	20.62	19.57
1986	19.04	1702.94	1685.02	56	553.28	553.11	552.93	20.86	20.93	19.83
1987	18.21	1721.21	1703.23	56	574.04	574.57	573.24	21.45	21.30	20.31
1988	17.57	1738.14	1720.80	57	596.37	596.31	594.11	21.74	21.58	20.87
1989	16.78	1755.38	1737.58	57	618.51	618.31	615.77	22.01	21.74	21.66
1990	16.26	1770.77	1753.84	57	640.06	640.14	637.95	21.82	21.77	22.19
1991	15.73	1784.43	1769.58	57	661.84	661.80	660.16	21.66	21.77	22.20
1992	15.06	1797.38	1784.63	58	683.49	683.43	682.10	21.63	21.75	21.94
1993	14.12	1809.92	1798.75	58	704.95	705.15	703.86	21.72	21.84	21.76
1994	13.62	1822.22	1812.37	58	727.00	727.05	725.75	21.90	22.08	21.89
1995	13.05	1833.70	1825.42	58	749.20	749.34	747.91	22.30	22.42	22.16
1996	12.43	1844.93	1837.85	58	771.83	772.17	770.46	22.83	22.80	22.55
1997	11.78	1855.88	1849.63	58	795.48	795.50	793.31	23.33	23.12	22.85
1998	11.29	1866.90	1860.54	58	819.19	819.13	816.25	23.63	23.34	22.94
1999	10.85	1877.46	1870.64	58	842.73	842.65	839.29	23.52	23.46	23.04
2000	10.39	1888.15	1879.93	58	866.04	866.02	862.94	23.37	23.54	23.65
2001	9.98	1898.62	1888.48	58	889.29	889.50	886.21	23.48	23.62	23.27
2002	9.65	1908.18	1896.38	58	913.16	913.19	909.66	23.70	23.81	23.45
2003	9.34	1916.46	1903.66	58	937.13	937.25	933.21	24.06	24.08	23.55
2004	9.05	1925.76	1910.35	58	961.47	961.68	957.25	24.43	24.34	24.04
2005	8.76	1934.10	1916.45	58	986.45	986.44	981.96	24.76	24.48	24.71
2006	8.50	1942.27	1922.01	58	1011.40	1011.21	1006.11	24.77	24.45	24.14
2007	8.24	1950.34	1927.03	58	1035.77	1035.59		24.38	24.28	
2008	0.00	1950.34	1931.53	58	1059.60	1059.52		23.93	23.99	
2009	0.00	1950.34	1935.50	58	1083.19	1083.08		23.56	23.64	
2010	0.00	1950.34	1938.97	58	1106.45	1106.37		23.29	23.36	
2011	0.00	1950.34	1941.93	58	1129.47	1129.41		23.04	23.18	
2012	0.00	1950.34	1944.39	58	1152.31	1152.41		23.01	23.06	
2013	0.00	1950.34	1946.40	58	1175.46	1175.43		23.01	22.91	
2014	0.00	1950.34	1948.02	58	1198.51	1198.36		22.93	22.73	
2015	0.00	1950.34	1949.19	58	1221.10	1220.90		22.54	22.52	
2016	0.00	1950.34	1949.96	58	1243.09	1243.07		22.17	22.27	
2017	0.00	1950.34	1950.34	58	1265.01	1265.02		21.96	21.95	
2018	0.00	1950.34	1950.34	58	1286.97	1286.76		21.73	21.60	
2019	0.00	1950.34	1950.34	58	1308.29	1308.09		21.33	21.21	
2020	0.00	1950.34	1950.34	58	1329.00	1328.89		20.81	20.74	
2021	0.00	1950.34	1950.34	58	1349.39	1349.14		20.25	20.19	
2022	0.00	1950.34	1950.34	58	1369.04	1368.74		19.60	19.67	
2023	0.00	1950.34	1950.34	58	1387.79	1387.73		18.99	19.22	
2024	0.00	1950.34	1950.34	58	1406.36	1406.42		18.69	18.84	
2025	0.00	1950.34	1950.34	58	1425.11	1424.98		18.55	18.55	
2026	0.00	1950.34	1950.34	58	1443.45	1443.35		18.38	18.34	
2027	0.00	1950.34	1950.34	58	1461.50	1461.50		18.14	18.13	
2028	0.00	1950.34	1950.34	58	1479.55	1479.43		17.94	17.85	
2029	0.00	1950.34	1950.34	58	1497.26	1497.05		17.62	17.55	
2030	0.00	1950.34	1950.34	58	1514.34	1514.24		17.19	17.27	
2031	0.00	1950.34	1950.34	58	1531.11	1531.12		16.88	16.98	
2032	0.00	1950.34	1950.34	58	1547.89	1547.83		16.72	16.69	
2033	0.00	1950.34	1950.34	58	1564.49	1564.32		16.49	16.44	
2034	0.00	1950.34	1950.34	58	1580.57	1580.49		16.18	16.22	
2035	0.00	1950.34	1950.34	58	1596.42	1596.42		15.92	16.00	
2036	0.00	1950.34	1950.34	58	1612.26	1612.20		15.78	15.78	
2037	0.00	1950.34	1950.34	58	1627.92	1627.83		15.62	15.56	
2038	0.00	1950.34	1950.34	58	1643.30	1643.21		15.38	15.32	

(continued)

Table A2 World conventional 2007 and before—gigabarrels (continued)

Year			21yr		raw		3yr smth	raw		5yr sm
	SD	CD	SCD	yearslag	Pred CP	Pred SCP	actualSCP	Pred P	Pred SP	Actual P
2039	0.00	1950.34	1950.34		1658.39	1658.29		15.08	15.04	
2040	0.00	1950.34	1950.34		1673.17	1673.03		14.75	14.72	
2041	0.00	1950.34	1950.34		1687.53	1687.42		14.38	14.37	
2042	0.00	1950.34	1950.34		1701.54	1701.41		14.00	14.02	
2043	0.00	1950.34	1950.34		1715.16	1715.04		13.63	13.68	
2044	0.00	1950.34	1950.34		1728.42	1728.40		13.36	13.35	
2045	0.00	1950.34	1950.34		1741.61	1741.45		13.05	13.02	
2046	0.00	1950.34	1950.34		1754.30	1754.18		12.74	12.69	
2047	0.00	1950.34	1950.34		1766.64	1766.53		12.34	12.32	
2048	0.00	1950.34	1950.34		1778.63	1778.50		11.97	11.92	
2049	0.00	1950.34	1950.34		1790.22	1790.00		11.50	11.53	
2050	0.00	1950.34	1950.34		1801.14	1801.07		11.07	11.18	
2051	0.00	1950.34	1950.34		1811.85	1811.83		10.76	10.87	
2052	0.00	1950.34	1950.34		1822.50	1822.40		10.58	10.61	
2053	0.00	1950.34	1950.34		1832.87	1832.83		10.43	10.24	
2054	0.00	1950.34	1950.34		1843.12	1843.06		10.23	9.93	
2055	0.00	1950.34	1950.34		1853.18	1852.28		9.22	9.59	
2056	0.00	1950.34	1950.34		1860.54	1861.45		9.17	9.37	
2057	0.00	1950.34	1950.34		1870.64	1870.37		8.92	9.04	
2058	0.00	1950.34	1950.34		1879.93	1879.68		9.31	8.78	
2059	0.00	1950.34	1950.34		1888.48	1888.26		8.58	8.40	
2060	0.00	1950.34	1950.34		1896.38	1896.17		7.91	7.96	
2061	0.00	1950.34	1950.34		1903.66	1903.47		7.29	7.32	
2062	0.00	1950.34	1950.34		1910.35	1910.16		6.69	6.71	
2063	0.00	1950.34	1950.34		1916.45	1916.27		6.11	6.14	
2064	0.00	1950.34	1950.34		1922.01	1921.83		5.56	5.58	
2065	0.00	1950.34	1950.34		1927.03	1926.85		5.02	5.04	
2066	0.00	1950.34	1950.34		1931.53	1931.35		4.50	4.51	
2067	0.00	1950.34	1950.34		1935.50	1935.33		3.98	3.99	
2068	0.00	1950.34	1950.34		1938.97	1938.80		3.47	3.48	
2069	0.00	1950.34	1950.34		1941.93	1941.76		2.97	2.98	
2070	0.00	1950.34	1950.34		1944.39	1944.24		2.48	2.51	
2071	0.00	1950.34	1950.34		1946.40	1946.27		2.03	2.05	
2072	0.00	1950.34	1950.34		1948.02	1947.87		1.60	1.61	
2073	0.00	1950.34	1950.34		1949.19	1949.05		1.19	1.19	
2074	0.00	1950.34	1950.34		1949.96	1949.83		0.78	0.81	
2075	0.00	1950.34	1950.34		1950.34	1950.22		0.39	0.50	
2076	0.00	1950.34	1950.34		1950.34	1950.34		0.13	0.26	
2077	0.00	1950.34	1950.34		1950.34	1950.34		0.00	0.10	
2078	0.00	1950.34	1950.34		1950.34	1950.34		0.00	0.03	
2079	0.00	1950.34	1950.34		1950.34	1950.34		0.00	0.00	
2080	0.00	1950.34	1950.34		1950.34	1950.34		0.00	0.00	
2081	0.00	1950.34	1950.34		1950.34	1950.34		0.00	0.00	
2082	0.00	1950.34	1950.34		1950.34	1950.34		0.00	0.00	
2083	0.00	1950.34	1950.34		1950.34	1950.34		0.00	0.00	
2084	0.00	1950.34	1950.34		1950.34	1950.34		0.00	0.00	
2085	0.00	1950.34	1950.34		1950.34	1950.34		0.00	0.00	
2086	0.00	1950.34	1950.34		1950.34	1950.34		0.00	0.00	
2087	0.00	1950.34	1950.34		1950.34	1950.34		0.00	0.00	
2088	0.00	1950.34	1950.34		1950.34	1950.34		0.00	0.00	
2089	0.00	1950.34	1950.34		1950.34	1950.34		0.00	0.00	
2090	0.00	1950.34	1950.34		1950.34	1950.34		0.00	0.00	
2091	0.00	1950.34	1950.34		1950.34	1950.34		0.00	0.00	
2092	0.00	1950.34	1950.34		1950.34	1950.34		0.00	0.00	
2093	0.00	1950.34	1950.34		1950.34	1950.34		0.00	0.00	
2094	0.00	1950.34	1950.34		1950.34	1950.34		0.00	0.00	
2095	0.00	1950.34	1950.34		1950.34	1950.34		0.00	0.00	
2096	0.00	1950.34	1950.34		1950.34	1950.34		0.00	0.00	
2097	0.00	1950.34	1950.34		1950.34	1950.34		0.00	0.00	
2098	0.00	1950.34	1950.34		1950.34	1950.34		0.00	0.00	
2099	0.00	1950.34	1950.34		1950.34	1950.34		0.00	0.00	
2100	0.00	1950.34	1950.34		1950.34	1950.34		0.00	0.00	

Table A3 World conventional 2008 and after—gigabarrels

Year	SD	CD	15yr SCD	years lag	raw Pred CP	11yr smth Pred SCP	SCP	raw Pred P	5yr sm Pred P	Actual P
1960									0.00	
1961									0.00	
1962									0.00	
1963									0.00	
1964									0.00	
1965									0.00	
1966									0.00	
1967									0.00	
1968									0.00	
1969									0.00	
1970									0.00	
1971									0.00	
1972									0.00	
1973									0.00	
1974									0.00	
1975									0.00	
1976									0.00	
1977									0.00	
1978									0.00	
1979									0.00	
1980									0.00	
1981									0.00	
1982									0.00	
1983									0.00	
1984									0.00	
1985									0.00	
1986									0.00	
1987									0.00	
1988									0.00	
1989		0.00	0.00						0.00	
1990		0.00	0.00						0.00	
1991		0.00	0.00						0.00	
1992		0.00	0.00						0.00	
1993		0.00	0.00						0.00	
1994		0.00	0.00						0.00	
1995		0.00	0.00						0.00	
1996		0.00	0.00						0.00	
1997		0.00	0.00						0.00	
1998		0.00	0.00						0.00	
1999		0.00	0.00						0.00	
2000		0.00	0.00						0.00	
2001		0.00	0.53	17					0.00	
2002		0.00	1.58	17					0.00	
2003		0.00	3.13	17					0.00	
2004		0.00	5.16	17					0.00	
2005		0.00	7.66	17					0.00	
2006		0.00	10.60	17					0.00	
2007		0.00	13.99	17					0.00	
2008	8.00	8.00	17.80	17					0.00	
2009	7.74	15.73	22.02	17		0.00		0.00	0.00	
2010	7.49	23.22	26.64	17		0.00		0.00	0.00	
2011	7.23	30.45	31.65	17		0.00		0.00	0.00	
2012	6.98	37.43	37.04	17		0.00		0.00	0.04	
2013	6.76	44.19	42.79	17		0.00		0.00	0.10	
2014	6.59	50.78	48.90	17		0.19		0.19	0.19	
2015	6.37	57.15	55.34	17		0.48		0.28	0.33	
2016	6.19	63.34	61.59	17		0.95		0.47	0.52	
2017	6.01	69.35	67.64	17		1.64		0.70	0.74	
2018	5.82	75.17	73.50	17	0.53	2.61		0.96	1.00	
2019	5.64	80.81	79.18	17	1.58	3.88		1.27	1.31	
2020	5.46	86.27	84.70	17	3.13	5.49		1.62	1.66	
2021	5.28	91.55	90.04	17	5.16	7.50		2.00	2.04	
2022	5.13	96.69	95.21	17	7.66	9.92		2.42	2.45	
2023	4.98	101.66	100.23	17	10.60	12.80		2.88	2.87	
2024	4.83	106.49	105.08	17	13.99	16.12		3.32	3.31	
2025	4.68	111.17	109.78	17	17.80	19.86		3.75	3.73	
2026	4.53	115.70	114.32	17	22.02	24.02		4.16	4.14	
2027	4.38	120.09	118.71	17	26.64	28.58		4.56	4.51	
2028	4.23	124.32	122.96	17	31.65	33.49		4.90	4.84	
2029	4.09	128.41	127.06	17	37.04	38.67		5.19	5.13	
2030	3.94	132.35	131.02	17	42.79	44.08		5.41	5.36	
2031	3.80	136.15	134.83	17	48.90	49.66		5.58	5.53	
2032	3.66	139.81	138.50	17	55.34	55.36		5.70	5.65	
2033	3.52	143.33	142.03	17	61.59	61.12		5.76	5.71	
2034	3.38	146.71	145.43	17	67.64	66.90		5.78	5.73	
2035	3.24	149.95	148.69	17	73.50	72.65		5.74	5.70	
2036	3.10	153.06	151.81	17	79.18	78.31		5.66	5.62	
2037	2.97	156.03	154.81	17	84.70	83.84		5.53	5.50	
2038	2.84	158.87	157.67	17	90.04	89.21		5.36	5.36	
2039	2.71	161.58	160.40	17	95.21	94.40		5.19	5.20	

(continued)

Table A3 World conventional 2008 and after—gigabarrels (continued)

Year	SD	CD	15yr SCD	years lag	raw Pred CP	11yr smth Pred SCP	SCP	raw Pred P	5yr sm Pred P	Actual P
2040	2.59	164.16	163.01	17	100.23	99.43		5.03	5.03	
2041	2.46	166.63	165.50	17	105.08	104.30		4.87	4.87	
2042	2.34	168.97	167.87	17	109.78	109.01		4.71	4.71	
2043	2.22	171.19	170.12	17	114.32	113.57		4.56	4.56	
2044	2.11	173.30	172.26	17	118.71	117.97		4.41	4.41	
2045	2.00	175.30	174.29	17	122.96	122.23		4.26	4.26	
2046	1.89	177.18	176.21	17	127.06	126.34		4.11	4.11	
2047	1.78	178.97	178.03	17	131.02	130.30		3.96	3.97	
2048	1.68	180.65	179.74	17	134.83	134.12		3.82	3.82	
2049	1.59	182.24	181.36	17	138.50	137.81		3.68	3.68	
2050	1.49	183.73	182.89	17	142.03	141.35		3.54	3.54	
2051	1.40	185.13	184.33	17	145.43	144.75		3.40	3.41	
2052	1.31	186.44	185.68	17	148.69	148.02		3.27	3.27	
2053	1.23	187.68	186.95	17	151.81	151.15		3.14	3.14	
2054	1.15	188.83	188.14	17	154.81	154.16		3.00	3.01	
2055	1.08	189.91	189.25	17	157.67	157.03		2.87	2.88	
2056	1.01	190.92	190.29	17	160.40	159.78		2.75	2.75	
2057	0.94	191.87	191.27	17	163.01	162.40		2.62	2.63	
2058	0.88	192.75	192.18	17	165.50	164.91		2.50	2.50	
2059	0.82	193.57	193.03	17	167.87	167.29		2.38	2.39	
2060	0.76	194.33	193.82	17	170.12	169.56		2.27	2.27	
2061	0.71	195.04	194.55	17	172.26	171.71		2.15	2.16	
2062	0.66	195.69	195.24	17	174.29	173.75		2.04	2.05	
2063	0.61	196.30	195.87	17	176.21	175.69		1.94	1.94	
2064	0.56	196.86	196.46	17	178.03	177.52		1.83	1.84	
2065	0.52	197.38	197.00	17	179.74	179.26		1.73	1.74	
2066	0.48	197.86	197.50	17	181.36	180.90		1.64	1.64	
2067	0.44	198.30	197.96	17	182.89	182.44		1.54	1.55	
2068	0.40	198.71	198.39	17	184.33	183.90		1.46	1.46	
2069	0.37	199.08	198.78	17	185.68	185.27		1.37	1.37	
2070	0.34	199.42	199.14	17	186.95	186.55		1.29	1.29	
2071	0.31	199.73	199.47	17	188.14	187.76		1.21	1.21	
2072	0.28	200.01	199.76	17	189.25	188.89		1.13	1.14	
2073	0.26	200.26	200.04	17	190.29	189.95		1.06	1.06	
2074	0.23	200.49	200.28	17	191.27	190.95		0.99	1.00	
2075	0.21	200.70	200.51	17	192.18	191.87		0.93	0.93	
2076	0.19	200.89	200.71	17	193.03	192.74		0.86	0.87	
2077	0.17	201.06	200.90	17	193.82	193.54		0.81	0.81	
2078	0.15	201.21	201.06	17	194.55	194.29		0.75	0.75	
2079	0.14	201.35	201.21	17	195.24	194.99		0.70	0.70	
2080	0.12	201.47	201.34	17	195.87	195.64		0.65	0.65	
2081	0.11	201.58	201.46	17	196.46	196.24		0.60	0.60	
2082	0.09	201.67	201.57	17	197.00	196.79		0.56	0.56	
2083	0.08	201.76	201.66	17	197.50	197.31		0.51	0.52	
2084	0.07	201.83	201.75	17	197.96	197.78		0.47	0.48	
2085	0.06	201.90	201.83	17	198.39	198.22		0.44	0.44	
2086	0.06	201.95	201.89	17	198.78	198.62		0.40	0.40	
2087	0.05	202.00	201.95	17	199.14	198.99		0.37	0.37	
2088	0.04	202.04	202.01	17	199.47	199.32		0.34	0.34	
2089	0.04	202.08	202.05	17	199.76	199.63		0.31	0.31	
2090	0.03	202.12	202.09	17	200.04	199.91		0.28	0.28	
2091	0.08	202.19	202.13	17	200.28	200.17		0.26	0.26	
2092	0.02	202.21	202.16	17	200.51	200.40		0.23	0.23	
2093	0.02	202.23	202.19	17	200.71	200.61		0.21	0.21	
2094	0.02	202.25	202.21	17	200.90	200.80		0.19	0.20	
2095	0.02	202.27	202.23	17	201.06	200.98		0.17	0.18	
2096	0.01	202.28	202.25	17	201.21	201.16		0.18	0.17	
2097	0.01	202.29	202.27	17	201.34	201.31		0.16	0.15	
2098	0.01	202.30	202.26	17	201.46	201.45		0.14	0.14	
2099	0.00	202.31	202.27	17	201.57	201.56		0.12	0.12	
2100	0.00	202.31	202.28	17	201.66	201.66		0.10	0.10	

Table A4 World conventional IEA land-based

Year	SD	CD	15–21yr SCD	yearslag	raw Pred CP	3yr smth Pred SCP	SCP	raw Pred P	5yr sm Pred P	Actual P
1960	36.91	902.69	902.69	41	118.75	119.06	117.43	7.77	7.76	7.53
1961	37.44	940.13	940.13	42	127.26	127.53	125.59	8.47	8.36	8.16
1962	37.63	977.76	977.76	43	136.57	136.55	134.32	9.02	8.95	8.73
1963	37.72	1015.48	1015.48	44	145.82	146.03	143.70	9.48	9.58	9.38
1964	37.68	1053.16	1053.16	44	155.71	156.06	153.77	10.02	10.25	10.07
1965	37.40	1090.56	1090.56	45	166.65	166.96	164.62	10.90	10.97	10.85
1966	36.95	1127.51	1127.51	46	178.53	178.76	176.27	11.80	11.82	11.65
1967	36.55	1164.06	1164.06	46	191.12	191.39	188.81	12.63	12.77	12.53
1968	35.83	1199.90	1199.90	47	204.53	205.11	202.39	13.72	13.77	13.58
1969	35.21	1235.11	1235.11	47	219.69	219.91	217.16	14.80	14.80	14.77
1970	34.55	1269.66	1269.66	48	235.51	235.79	233.08	15.88	15.83	15.92
1971	33.05	1302.71	1302.71	48	252.17	252.75	249.98	16.96	16.77	16.90
1972	32.40	1335.11	1335.11	48	270.58	270.57	267.98	17.81	17.53	18.00
1973	30.94	1366.05	1366.05	48	288.95	288.96	287.03	18.40	18.14	19.05
1974	30.16	1396.21	1396.21	48	307.35	307.54	306.64	18.58	18.68	19.61
1975	29.29	1425.50	1425.50	49	326.32	326.49	326.77	18.95	19.17	20.13
1976	28.57	1454.07	1454.07	49	345.80	346.17	347.42	19.68	19.67	20.64
1977	27.41	1481.49	1481.49	49	366.41	366.42	368.81	20.25	20.20	21.40
1978	26.47	1507.96	1507.96	49	387.06	387.32	390.69	20.90	20.66	21.87
1979	25.55	1533.51	1533.51	49	408.48	408.52	412.57	21.21	20.93	21.88
1980	24.64	1558.14	1558.14	49	430.03	429.80	434.19	21.28	21.01	21.62
1981	23.49	1581.63	1581.63	49	450.90	450.83	454.89	21.02	20.86	20.71
1982	22.39	1604.03	1604.03	49	471.55	471.45	474.79	20.63	20.65	19.90
1983	21.49	1625.52	1625.52	49	491.91	491.64	494.18	20.19	20.49	19.39
1984	20.68	1646.19	1646.19	49	511.46	511.79	513.52	20.15	20.46	19.34
1985	19.79	1665.99	1665.99	49	532.01	532.25	533.10	20.46	20.62	19.57
1986	19.04	1685.02	1685.02	49	553.28	553.11	552.93	20.86	20.93	19.83
1987	18.21	1703.23	1703.23	49	574.04	574.57	573.24	21.45	21.30	20.31
1988	17.57	1720.80	1720.80	49	596.37	596.31	594.11	21.74	21.58	20.87
1989	16.78	1737.58	1737.58	49	618.51	618.31	615.77	22.01	21.74	21.66
1990	16.26	1753.84	1753.84	49	640.06	640.14	637.95	21.82	21.77	22.19
1991	15.73	1769.58	1769.58	49	661.84	661.80	660.16	21.66	21.77	22.20
1992	15.06	1784.63	1784.63	48	683.49	683.43	682.10	21.63	21.75	21.94
1993	14.12	1798.75	1798.75	48	704.95	705.15	703.86	21.72	21.84	21.76
1994	13.62	1812.37	1812.37	48	727.00	727.05	725.75	21.90	22.08	21.89
1995	13.05	1825.42	1825.42	47	749.20	749.34	747.91	22.30	22.42	22.16
1996	12.43	1837.85	1837.85	47	771.83	772.17	770.46	22.83	22.80	22.55
1997	11.78	1849.63	1849.63	47	795.48	795.50	793.31	23.33	23.12	22.85
1998	11.29	1860.92	1860.92	47	819.19	819.13	816.25	23.63	23.34	22.94
1999	10.85	1871.77	1870.64	46	842.73	842.65	839.29	23.52	23.46	23.04
2000	10.39	1882.16	1879.93	46	866.04	866.02	862.94	23.37	23.54	23.65
2001	9.98	1892.14	1889.01	46	889.29	889.50	886.21	23.48	23.62	23.27
2002	9.65	1901.78	1897.96	45	913.16	913.19	909.66	23.70	23.81	23.45
2003	9.34	1911.12	1906.79	45	937.13	937.25	933.21	24.06	24.08	23.55
2004	9.05	1920.17	1915.51	45	961.47	961.68	957.25	24.43	24.34	24.04
2005	8.76	1928.92	1924.11	44	986.45	986.44	981.96	24.76	24.48	24.71
2006	8.50	1937.42	1932.61	44	1011.40	1011.21	1006.11	24.77	24.45	24.14
2007	8.24	1945.66	1941.01	43	1035.77	1035.59		24.38		24.28
2008	8.00	1958.34	1949.32	43	1059.60	1059.52		23.93		23.99
2009	7.74	1966.07	1957.52	42	1083.19	1083.08		23.56		23.64
2010	7.49	1973.56	1965.61	42	1106.45	1106.37		23.29		23.36
2011	7.23	1980.80	1973.59	42	1129.47	1129.41		23.04		23.18
2012	6.98	1987.77	1981.44	41	1152.31	1152.41		23.01		23.09
2013	6.76	1994.53	1989.20	41	1175.46	1175.43		23.01		23.00
2014	6.59	2001.13	1996.91	40	1198.51	1198.36		22.93		22.92
2015	6.37	2007.50	2004.53	40	1221.10	1220.90		22.54		22.85
2016	6.19	2013.69	2011.55	39	1243.09	1243.07		22.17		22.79
2017	6.01	2019.69	2017.98	39	1265.01	1265.20		22.13		22.68
2018	5.82	2025.52	2023.85	39	1287.51	1287.46		22.26		22.60
2019	5.64	2031.16	2029.53	38	1309.88	1309.84		22.37		22.52
2020	5.46	2036.61	2035.04	38	1332.12	1332.18		22.35		22.40
2021	5.28	2041.90	2040.38	38	1354.55	1354.46		22.27		22.23
2022	5.13	2047.03	2045.56	37	1376.69	1376.54		22.09		22.11
2023	4.98	2052.01	2050.57	37	1398.39	1398.48		21.93		22.09
2024	4.83	2056.84	2055.42	36	1420.35	1420.55		22.07		22.15
2025	4.68	2061.52	2060.12	36	1442.91	1442.91		22.36		22.28
2026	4.53	2066.05	2064.67	35	1465.47	1465.51		22.60		22.48
2027	4.38	2070.43	2069.06	34	1488.14	1488.27		22.76		22.64
2028	4.23	2074.66	2073.31	34	1511.20	1511.21		22.94		22.70
2029	4.09	2078.75	2077.41	33	1534.30	1534.21		23.00		22.68
2030	3.94	2082.70	2081.36	33	1557.14	1557.15		22.94		22.62
2031	3.80	2086.50	2085.17	32	1580.01	1580.13		22.98		22.50
2032	3.66	2090.16	2088.85	32	1603.24	1603.11		22.98		22.34
2033	3.52	2093.68	2092.38	31	1626.08	1625.84		22.73		22.15
2034	3.38	2097.06	2095.77	30	1648.21	1648.07		22.23		21.95
2035	3.24	2100.30	2099.03	30	1669.93	1669.86		21.79		21.70
2036	3.10	2103.40	2102.16	29	1691.44	1691.33		21.47		21.39
2037	2.97	2106.37	2105.15	29	1712.62	1712.46		21.14		21.06
2038	2.84	2109.21	2108.01	28	1733.34	1733.19		20.72		20.68
2039	2.71	2111.92	2110.75	27	1753.61	1753.45		20.26		20.24

(continued)

Table A4 World conventional IEA land-based (continued)

Year	SD	CD	15–21yr SCD	years lag	raw Pred CP	3yr smth Pred SCP	SCP	raw Pred P	5yr sm Pred P	Actual P
2040	2.59	2114.51	2113.36	27	1773.40	1773.21		19.76	19.75	
2041	2.46	2116.97	2115.85	26	1792.61	1792.44		19.24	19.24	
2042	2.34	2119.31	2118.22	26	1811.32	1811.14		18.69	18.74	
2043	2.22	2121.54	2120.47	25	1829.48	1829.31		18.17	18.24	
2044	2.11	2123.64	2122.61	24	1847.14	1847.06		17.75	17.76	
2045	2.00	2125.64	2124.63	24	1864.57	1864.36		17.29	17.28	
2046	1.89	2127.53	2126.55	23	1881.36	1881.20		16.84	16.80	
2047	1.78	2129.31	2128.37	23	1897.66	1897.49		16.30	16.29	
2048	1.68	2130.99	2130.09	22	1913.46	1913.28		15.79	15.75	
2049	1.59	2132.58	2131.71	22	1928.72	1928.45		15.17	15.21	
2050	1.49	2134.07	2133.23	21	1943.17	1943.06		14.60	14.72	
2051	1.40	2135.47	2134.67	21	1957.28	1957.21		14.15	14.27	
2052	1.31	2136.79	2136.02	19	1971.18	1971.05		13.84	13.88	
2053	1.23	2138.02	2137.29	19	1984.68	1984.60		13.55	13.38	
2054	1.15	2139.18	2138.48	19	1997.93	1997.82		13.22	12.93	
2055	1.08	2140.26	2139.60	19	2010.85	2009.91		12.09	12.47	
2056	1.01	2141.27	2140.64	19	2020.94	2021.82		11.91	12.12	
2057	0.94	2142.21	2141.61	18	2033.66	2033.34		11.53	11.67	
2058	0.88	2143.09	2142.52	18	2045.43	2045.15		11.80	11.28	
2059	0.82	2143.91	2143.37	17	2056.35	2056.09		10.95	10.79	
2060	0.76	2144.67	2144.16	17	2066.50	2066.26		10.16	10.23	
2061	0.71	2145.38	2144.90	17	2075.92	2075.69		9.43	9.47	
2062	0.66	2146.04	2145.58	17	2084.64	2084.41		8.72	8.76	
2063	0.61	2146.65	2146.22	17	2092.66	2092.44		8.04	8.08	
2064	0.56	2147.21	2146.80	17	2100.03	2099.82		7.38	7.41	
2065	0.52	2147.73	2147.35	17	2106.77	2106.56		6.74	6.77	
2066	0.48	2148.21	2147.85	17	2112.89	2112.68		6.12	6.15	
2067	0.44	2148.65	2148.31	17	2118.39	2118.19		5.51	5.54	
2068	0.40	2149.05	2148.73	17	2123.30	2123.10		4.91	4.94	
2069	0.37	2149.42	2149.12	17	2127.61	2127.41		4.32	4.36	
2070	0.34	2149.76	2149.48	17	2131.34	2131.16		3.75	3.80	
2071	0.31	2150.07	2149.81	17	2134.54	2134.38		3.22	3.26	
2072	0.28	2150.35	2150.11	17	2137.27	2137.10		2.71	2.75	
2073	0.26	2150.61	2150.38	17	2139.48	2139.33		2.23	2.26	
2074	0.23	2150.84	2150.63	17	2141.23	2141.08		1.75	1.81	
2075	0.21	2151.05	2150.85	17	2142.52	2142.38		1.30	1.43	
2076	0.19	2151.24	2151.06	17	2143.37	2143.35		0.98	1.13	
2077	0.17	2151.41	2151.24	17	2144.16	2144.15		0.79	0.91	
2078	0.15	2151.56	2151.41	17	2144.90	2144.88		0.74	0.78	
2079	0.14	2151.70	2151.55	17	2145.58	2145.57		0.68	0.70	
2080	0.12	2151.82	2151.69	17	2146.22	2146.20		0.63	0.65	
2081	0.11	2151.92	2151.81	17	2146.80	2146.79		0.59	0.60	
2082	0.09	2152.02	2151.91	17	2147.35	2147.33		0.54	0.56	
2083	0.08	2152.10	2152.01	17	2147.85	2147.83		0.50	0.52	
2084	0.07	2152.18	2152.09	17	2148.31	2148.30		0.46	0.48	
2085	0.06	2152.24	2152.17	17	2148.73	2148.72		0.43	0.44	
2086	0.06	2152.30	2152.24	17	2149.12	2149.11		0.39	0.40	
2087	0.05	2152.35	2152.30	17	2149.48	2149.47		0.36	0.37	
2088	0.04	2152.39	2152.35	17	2149.81	2149.80		0.33	0.34	
2089	0.04	2152.43	2152.40	17	2150.11	2150.10		0.30	0.31	
2090	0.03	2152.46	2152.44	17	2150.38	2150.37		0.27	0.28	
2091	0.08	2152.54	2152.48	17	2150.63	2150.62		0.25	0.26	
2092	0.02	2152.56	2152.51	17	2150.85	2150.85		0.23	0.23	
2093	0.02	2152.58	2152.53	17	2151.06	2151.05		0.20	0.21	
2094	0.02	2152.59	2152.56	17	2151.24	2151.24		0.18	0.20	
2095	0.02	2152.61	2152.58	17	2151.41	2151.40		0.17	0.18	
2096	0.01	2152.62	2152.60	17	2151.55	2151.55		0.15	0.17	
2097	0.01	2152.64	2152.61	17	2151.69	2151.68		0.13	0.15	
2098	0.01	2152.65	2152.60	17	2151.81	2151.80		0.12	0.14	
2099	0.00	2152.65	2152.61	17	2151.91	2151.91		0.11	0.12	
2100	0.00	2152.65	2152.62	17	2152.01	2151.98		0.07	0.10	

Table A5 Deep water 2007 and before

Year	Gb D	CD	21yr SCD	adj SCD	predlag	raw Pred CP	5yr smth Pred SCP	SCP	raw Pred P	5yr smth Pred SP	Actual P
1960	0.00	0.00	0.00	0.02	29	0.00	0.00	0.00	0.00	0.00	0.00
1961	0.00	0.00	0.00	0.03	29	0.00	0.00	0.00	0.00	0.00	0.00
1962	0.00	0.00	0.01	0.04	28	0.00	0.00	0.00	0.00	0.00	0.00
1963	0.00	0.00	0.02	0.05	28	0.00	0.00	0.00	0.00	0.00	0.00
1964	0.00	0.00	0.03	0.05	27	0.00	0.00	0.00	0.00	0.00	0.00
1965	0.00	0.00	0.05	0.06	26	0.00	0.00	0.00	0.00	0.00	0.00
1966	0.00	0.00	0.06	0.07	26	0.00	0.00	0.00	0.00	0.00	0.00
1967	0.05	0.05	0.07	0.09	26	0.00	0.00	0.00	0.00	0.00	0.00
1968	0.10	0.15	0.09	0.23	26	0.00	0.00	0.00	0.00	0.00	0.00
1969	0.00	0.15	0.10	0.38	26	0.00	0.00	0.00	0.00	0.00	0.00
1970	0.00	0.15	0.11	0.53	26	0.00	0.00	0.00	0.00	0.00	0.00
1971	0.00	0.15	0.14	0.68	26	0.00	0.00	0.00	0.00	0.00	0.00
1972	0.00	0.15	0.17	0.85	26	0.00	0.00	0.00	0.00	0.00	0.00
1973	0.00	0.15	0.44	1.10	25	0.00	0.00	0.00	0.00	0.00	0.00
1974	0.00	0.15	0.70	1.55	25	0.00	0.00	0.00	0.00	0.00	0.00
1975	0.00	0.15	0.98	2.08	25	0.00	0.00	0.00	0.00	0.00	0.00
1976	0.15	0.30	1.26	2.70	25	0.00	0.00	0.00	0.00	0.00	0.00
1977	0.00	0.30	1.56	3.33	25	0.00	0.00	0.00	0.00	0.00	0.00
1978	2.75	3.05	2.03	4.05	25	0.00	0.00	0.00	0.00	0.00	0.00
1979	0.00	3.05	2.88	4.80	24	0.00	0.00	0.00	0.00	0.00	0.00
1980	0.15	3.20	3.88	5.60	24	0.00	0.00	0.00	0.00	0.00	0.00
1981	0.00	3.20	5.05	6.42	24	0.00	0.00	0.00	0.00	0.00	0.00
1982	0.25	3.45	6.22	7.29	23	0.00	0.00	0.00	0.00	0.00	0.00
1983	1.85	5.30	7.57	8.26	23	0.00	0.00	0.00	0.00	0.00	0.00
1984	4.20	9.50	9.30	9.30	23	0.00	0.00	0.00	0.00	0.00	0.00
1985	1.65	11.15	10.65	10.65	22	0.00	0.00	0.00	0.00	0.00	0.00
1986	1.85	13.00	12.18	12.18	22	0.00	0.00	0.00	0.00	0.00	0.00
1987	0.25	13.25	14.03	14.03	22	0.00	0.01	0.00	0.00	0.00	0.00
1988	1.85	15.10	16.17	16.17	22	0.01	0.01	0.01	0.01	0.01	0.01
1989	0.70	15.80	18.43	18.43	22	0.02	0.02	0.02	0.01	0.01	0.01
1990	1.15	16.95	20.83	20.83	22	0.03	0.04	0.03	0.01	0.02	0.02
1991	0.55	17.50	23.37	23.37	22	0.05	0.05	0.05	0.02	0.03	0.02
1992	0.80	18.30	26.05	26.05	22	0.07	0.09	0.08	0.04	0.05	0.03
1993	2.30	20.60	28.86	28.86	22	0.09	0.16	0.13	0.07	0.07	0.04
1994	1.35	21.95	31.73	31.73	22	0.23	0.26	0.20	0.10	0.10	0.07
1995	6.65	28.60	34.52	34.52	22	0.38	0.38	0.29	0.12	0.14	0.09
1996	3.55	32.15	37.36	37.36	22	0.53	0.53	0.43	0.15	0.20	0.13
1997	7.00	39.15	40.24	40.24	22	0.68	0.80	0.64	0.26	0.26	0.20
1998	6.20	45.35	43.11	43.11	22	0.85	1.14	0.95	0.34	0.34	0.32
1999	5.15	50.50	45.89	45.89	22	1.55	1.57	1.39	0.43	0.44	0.42
2000	3.00	53.50	48.63	48.63	22	2.08	2.10	1.94	0.53	0.55	0.57
2001	3.00	56.50	51.32	51.32	22	2.70	2.74	2.62	0.64	0.66	0.66
2002	3.00	59.50	53.99	53.99	22	3.33	3.55	3.41	0.81	0.79	0.82
2003	3.00	62.50	56.61	56.61	22	4.05	4.42	4.38	0.87	0.98	0.88
2004	2.89	65.39	59.13	59.13	22	5.60	5.53	5.52	1.11	1.18	1.22
2005	2.79	68.18	61.58	61.58	22	6.42	7.00	6.90	1.46	1.35	1.32
2006	2.68	70.86	63.71	63.71	22	8.26	8.62	8.42	1.63	1.57	1.62
2007	2.58	73.44	65.68	65.68	22	10.65	10.31		1.69	1.75	
2008	0.00	73.44	67.31	67.31	22	12.18	12.26		1.95	1.87	
2009	0.00	73.44	68.65	68.65	22	14.03	14.29		2.03	1.99	
2010	0.00	73.44	69.74	69.74	22	16.17	16.33		2.04	2.13	
2011	0.00	73.44	70.69	70.69	22	18.43	18.57		2.24	2.25	
2012	0.00	73.44	71.50	71.50	22	20.83	20.97		2.41	2.38	
2013	0.00	73.44	72.16	72.16	22	23.37	23.51		2.54	2.52	
2014	0.00	73.44	72.68	72.68	22	26.05	26.17		2.66	2.63	
2015	0.00	73.44	73.07	73.07	22	28.86	28.91		2.74	2.71	
2016	0.00	73.44	73.32	73.32	22	31.73	31.71		2.80	2.78	
2017	0.00	73.44	73.44	73.44	22	34.52	34.54		2.84	2.81	
2018	0.00	73.44	73.44	73.44	22	37.36	37.39		2.85	2.83	
2019	0.00	73.44	73.44	73.44	22	40.24	40.22		2.83	2.83	
2020	0.00	73.44	73.44	73.44	22	43.11	43.05		2.82	2.81	
2021	0.00	73.44	73.44	73.44	22	45.89	45.84		2.79	2.78	
2022	0.00	73.44	73.44	73.44	22	48.63	48.59		2.75	2.74	
2023	0.00	73.44	73.44	73.44	22	51.32	51.29		2.70	2.70	
2024	0.00	73.44	73.44	73.44	22	53.99	53.94		2.65	2.63	
2025	0.00	73.44	73.44	73.44	22	56.61	56.52		2.59	2.55	
2026	0.00	73.44	73.44	73.44	23	59.13	59.00		2.48	2.44	
2027	0.00	73.44	73.44	73.44	23	61.58	61.34		2.34	2.29	
2028	0.00	73.44	73.44	73.44	23	63.71	63.48		2.14	2.10	
2029	0.00	73.44	73.44	73.44	23	65.68	65.39		1.90	1.88	
2030	0.00	73.44	73.44	73.44	23	67.31	67.02		1.63	1.65	
2031	0.00	73.44	73.44	73.44	23	68.65	68.42		1.40	1.41	
2032	0.00	73.44	73.44	73.44	23	69.74	69.58		1.16	1.19	
2033	0.00	73.44	73.44	73.44	23	70.69	70.55		0.97	1.00	
2034	0.00	73.44	73.44	73.44	23	71.50	71.36		0.81	0.83	
2035	0.00	73.44	73.44	73.44	23	72.16	72.02		0.66	0.67	
2036	0.00	73.44	73.44	73.44	23	72.68	72.55		0.53	0.53	
2037	0.00	73.44	73.44	73.44	23	73.07	72.94		0.39	0.40	
2038	0.00	73.44	73.44	73.44	24	73.32	73.19		0.26	0.28	
2039	0.00	73.44	73.44	73.44	24	73.44	73.34		0.15	0.18	

(continued)

Table A5 Deep water 2007 and before (continued)

Year	Gb D	CD	21yr SCD	adj SCD	predlag	raw Pred CP	5yr smth Pred SCP	SCP	raw Pred P	5yr smth Pred SP	Actual P
2040	0.00	73.44	73.44	73.44	24	73.44	73.42		0.07	0.10	
2041	0.00	73.44	73.44	73.44	24	73.44	73.44		0.02	0.05	
2042	0.00	73.44	73.44	73.44	24	73.44	73.44		0.00	0.02	
2043	0.00	73.44	73.44	73.44	24	73.44	73.44		0.00	0.01	
2044	0.00	73.44	73.44	73.44	24	73.44	73.44		0.00	0.00	
2045	0.00	73.44	73.44	73.44	24	73.44	73.44		0.00	0.00	
2046	0.00	73.44	73.44	73.44	24	73.44	73.44		0.00	0.00	
2047	0.00	73.44	73.44	73.44	24	73.44	73.44		0.00	0.00	
2048	0.00	73.44	73.44	73.44	24	73.44	73.44		0.00	0.00	
2049	0.00	73.44	73.44	73.44	24	73.44	73.44		0.00	0.00	
2050	0.00	73.44	73.44	73.44	24	73.44	73.44		0.00	0.00	
2051	0.00	73.44	73.44	73.44	24	73.44	73.44		0.00	0.00	
2052	0.00	73.44	73.44	73.44	24	73.44	73.44		0.00	0.00	
2053	0.00	73.44	73.44	73.44	24	73.44	73.44		0.00	0.00	
2054	0.00	73.44	73.44	73.44	24	73.44	73.44		0.00	0.00	
2055	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2056	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2057	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2058	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2059	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2060	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2061	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2062	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2063	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2064	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2065	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2066	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2067	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2068	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2069	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2070	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2071	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2072	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2073	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2074	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2075	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2076	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2077	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2078	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2079	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2080	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2081	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2082	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2083	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2084	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2085	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2086	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2087	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2088	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2089	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2090	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2091	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2092	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2093	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2094	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2095	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2096	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2097	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2098	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2099	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	
2100	0.00	73.44	73.44	73.44	25	73.44	73.44		0.00	0.00	

Table A6 Deep Water 2008 and after—gigabarrels

Year	D	CD	2 lyr SCD	adj SCD	predlag	raw Pred CP	5yr smth Pred SCP	SCP	raw Pred P	10yr smth Pred SP	Actual P
1960	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1961	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1962	0.00	0.00	0.01	0.01		0.00	0.00	0.00	0.00	0.00	0.00
1963	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1964	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1965	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1966	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1967	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1968	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1969	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1970	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1971	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1972	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1973	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1974	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1975	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1976	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1977	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1978	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1979	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1980	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1981	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1982	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1983	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1984	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1985	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1986	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1987	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
1988	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.01
1989	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.01
1990	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.02
1991	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.02
1992	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.03
1993	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.04
1994	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.07
1995	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.09
1996	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.13
1997	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.20
1998	0.00	0.00	0.12	0.12	17	0.00	0.00	0.00	0.00	0.00	0.32
1999	0.00	0.00	0.35	0.35	17	0.00	0.00	0.00	0.00	0.00	0.42
2000	0.00	0.00	0.69	0.69	17	0.00	0.00	0.00	0.00	0.00	0.57
2001	0.00	0.00	1.13	1.13	17	0.00	0.00	0.00	0.00	0.00	0.66
2002	0.00	0.00	1.66	1.66	17	0.00	0.00	0.00	0.00	0.00	0.82
2003	0.00	0.00	2.29	2.29	17	0.00	0.00	0.00	0.00	0.00	0.88
2004	0.00	0.00	3.01	3.01	17	0.00	0.00	0.00	0.00	0.00	1.22
2005	0.00	0.00	3.81	3.81	17	0.00	0.00	0.00	0.00	0.00	1.32
2006	0.00	0.00	4.69	4.69	17	0.00	0.00	0.00	0.00	0.00	1.62
2007	0.00	0.00	5.64	5.64	17	0.00	0.00	0.00	0.00	0.00	
2008	2.47	2.47	6.66	6.66	17	0.00	0.00	0.00	0.00	0.00	
2009	2.36	4.84	7.73	7.73	17	0.00	0.00	0.00	0.00	0.01	
2010	2.26	7.09	8.87	8.87	17	0.00	0.00	0.00	0.00	0.02	
2011	2.15	9.25	10.06	10.06	17	0.00	0.00	0.00	0.00	0.04	
2012	2.05	11.29	11.31	11.31	17	0.00	0.00	0.00	0.00	0.07	
2013	1.94	13.24	12.61	12.61	17	0.00	0.02	0.02	0.02	0.11	
2014	1.84	15.07	13.97	13.97	17	0.00	0.09	0.07	0.07	0.16	
2015	1.73	16.80	15.37	15.37	17	0.12	0.23	0.14	0.14	0.22	
2016	1.62	18.42	16.83	16.83	17	0.35	0.46	0.23	0.23	0.28	
2017	1.52	19.94	18.34	18.34	17	0.69	0.79	0.33	0.33	0.35	
2018	1.41	21.35	19.89	19.89	17	1.13	1.22	0.44	0.44	0.43	
2019	1.31	22.66	21.38	21.38	17	1.66	1.76	0.53	0.53	0.52	
2020	1.20	23.86	22.80	22.80	17	2.29	2.38	0.63	0.63	0.60	
2021	1.18	25.04	24.16	24.16	17	3.01	3.09	0.71	0.71	0.69	
2022	1.16	26.19	25.46	25.46	17	3.81	3.89	0.79	0.79	0.77	
2023	1.13	27.33	26.70	26.70	17	4.69	4.76	0.87	0.87	0.85	
2024	1.11	28.44	27.90	27.90	17	5.64	5.71	0.94	0.94	0.92	
2025	1.09	29.53	29.05	29.05	17	6.66	6.72	1.01	1.01	0.99	
2026	1.07	30.60	30.16	30.16	17	7.73	7.79	1.07	1.07	1.06	
2027	1.05	31.65	31.23	31.23	17	8.87	8.93	1.13	1.13	1.12	
2028	1.03	32.67	32.27	32.27	17	10.06	10.12	1.19	1.19	1.18	
2029	1.00	33.68	33.28	33.28	17	11.31	11.36	1.25	1.25	1.24	
2030	0.98	34.66	34.26	34.26	17	12.61	12.66	1.30	1.30	1.29	
2031	0.96	35.62	35.22	35.22	17	13.97	14.02	1.35	1.35	1.33	
2032	0.94	36.56	36.16	36.16	17	15.37	15.42	1.41	1.41	1.36	
2033	0.92	37.47	37.07	37.07	17	16.83	16.88	1.46	1.46	1.38	
2034	0.89	38.37	37.97	37.97	17	18.34	18.36	1.48	1.48	1.39	
2035	0.87	39.24	38.84	38.84	17	19.89	19.85	1.49	1.49	1.39	
2036	0.85	40.09	39.69	39.69	17	21.38	21.31	1.47	1.47	1.38	
2037	0.83	40.92	40.52	40.52	17	22.80	22.74	1.42	1.42	1.36	
2038	0.81	41.73	41.33	41.33	17	24.16	24.10	1.36	1.36	1.34	
2039	0.79	42.51	42.11	42.11	17	25.46	25.40	1.30	1.30	1.30	

(continued)

Table A6 Deep Water 2008 and after—gigabarrels (continued)

Year	D	CD	21yr SCD	adj SCD	predlag	raw Pred CP	5yr smth Pred SCP	SCP	raw Pred P	10yr smth Pred SP	Actual P
2040	0.76	43.28	42.88	42.88	17	26.70	26.65		1.25	1.26	
2041	0.74	44.02	43.62	43.62	17	27.90	27.85		1.20	1.22	
2042	0.72	44.74	44.34	44.34	17	29.05	29.01		1.15	1.17	
2043	0.70	45.44	45.04	45.04	17	30.16	30.12		1.11	1.13	
2044	0.68	46.11	45.71	45.71	17	31.23	31.20		1.08	1.09	
2045	0.65	46.77	46.37	46.37	17	32.27	32.24		1.04	1.06	
2046	0.63	47.40	47.00	47.00	17	33.28	33.25		1.01	1.03	
2047	0.61	48.01	47.61	47.61	17	34.26	34.24		0.99	1.00	
2048	0.59	48.60	48.20	48.20	17	35.22	35.20		0.96	0.97	
2049	0.57	49.17	48.77	48.77	17	36.16	36.14		0.94	0.94	
2050	0.55	49.71	49.31	49.31	17	37.07	37.05		0.92	0.92	
2051	0.52	50.24	49.84	49.84	17	37.97	37.95		0.89	0.90	
2052	0.50	50.74	50.34	50.34	17	38.84	38.82		0.87	0.87	
2053	0.48	51.22	50.82	50.82	17	39.69	39.67		0.85	0.85	
2054	0.46	51.68	51.28	51.28	17	40.52	40.50		0.83	0.83	
2055	0.44	52.11	51.71	51.71	17	41.33	41.31		0.81	0.81	
2056	0.41	52.53	52.13	52.13	17	42.11	42.09		0.79	0.79	
2057	0.39	52.92	52.52	52.52	17	42.88	42.86		0.76	0.76	
2058	0.37	53.29	52.89	52.89	17	43.62	43.60		0.74	0.74	
2059	0.35	53.64	53.24	53.24	17	44.34	44.32		0.72	0.72	
2060	0.33	53.97	53.57	53.57	17	45.04	45.02		0.70	0.70	
2061	0.31	54.27	53.87	53.87	17	45.71	45.69		0.68	0.68	
2062	0.28	54.56	54.16	54.16	17	46.37	46.35		0.65	0.65	
2063	0.26	54.82	54.42	54.42	17	47.00	46.98		0.63	0.63	
2064	0.24	55.06	54.66	54.66	17	47.61	47.59		0.61	0.61	
2065	0.22	55.28	54.88	54.88	17	48.20	48.18		0.59	0.59	
2066	0.20	55.47	55.07	55.07	17	48.77	48.75		0.57	0.57	
2067	0.17	55.65	55.25	55.25	17	49.31	49.29		0.55	0.55	
2068	0.15	55.80	55.41	55.41	17	49.84	49.82		0.52	0.52	
2069	0.13	55.93	55.55	55.55	17	50.34	50.32		0.50	0.50	
2070	0.11	56.04	55.68	55.68	17	50.82	50.80		0.48	0.48	
2071	0.09	56.13	55.79	55.79	17	51.28	51.26		0.46	0.46	
2072	0.07	56.19	55.88	55.88	17	51.71	51.69		0.44	0.44	
2073	0.04	56.24	55.96	55.96	17	52.13	52.11		0.41	0.41	
2074	0.02	56.26	56.03	56.03	17	52.52	52.50		0.39	0.39	
2075	0.00	56.26	56.09	56.09	17	52.89	52.87		0.37	0.37	
2076	0.00	56.26	56.13	56.13	17	53.24	53.22		0.35	0.35	
2077	0.00	56.26	56.17	56.17	17	53.57	53.55		0.33	0.33	
2078	0.00	56.26	56.20	56.20	17	53.87	53.85		0.31	0.31	
2079	0.00	56.26	56.22	56.22	17	54.16	54.14		0.28	0.28	
2080	0.00	56.26	56.24	56.24	17	54.42	54.40		0.26	0.26	
2081	0.00	56.26	56.25	56.25	17	54.66	54.64		0.24	0.24	
2082	0.00	56.26	56.25	56.25	17	54.88	54.86		0.22	0.22	
2083	0.00	56.26	56.26	56.26	17	55.07	55.05		0.20	0.20	
2084	0.00	56.26	56.26	56.26	17	55.25	55.23		0.18	0.18	
2085	0.00	56.26	56.26	56.26	17	55.41	55.39		0.16	0.16	
2086	0.00	56.26	56.26	56.26	17	55.55	55.54		0.14	0.15	
2087	0.00	56.26	56.26	56.26	17	55.68	55.66		0.13	0.13	
2088	0.00	56.26	56.26	56.26	17	55.79	55.77		0.11	0.12	
2089	0.00	56.26	56.26	56.26	17	55.88	55.87		0.10	0.10	
2090	0.00	56.26	56.26	56.26	17	55.96	55.95		0.08	0.09	
2091	0.00	56.26	56.26	56.26	17	56.03	56.02		0.07	0.07	
2092	0.00	56.26	56.26	56.26	17	56.09	56.08		0.06	0.06	
2093	0.00	56.26	56.26	56.26	17	56.13	56.12		0.05	0.05	
2094	0.00	56.26	56.26	56.26	17	56.17	56.16		0.04	0.04	
2095	0.00	56.26	56.26	56.26	17	56.20	56.19		0.03	0.04	
2096	0.00	56.26	56.26	56.26	17	56.22	56.22		0.02	0.03	
2097	0.00	56.26	56.26	56.26	17	56.24	56.23		0.02	0.02	
2098	0.00	56.26	56.26	56.26	17	56.25	56.24		0.01	0.02	
2099	0.00	56.26	56.26	56.26	17	56.25	56.25		0.01	0.01	
2100	0.00	56.26	56.26	56.26	17	56.26	56.26		0.00	0.01	

Table A7 IEA world conventional—million barrels per day

<i>Year</i>	<i>pre-existing</i>	<i>new discovery</i>	<i>IEA</i>	<i>BITRE</i>
1960	20.63	0.00	20.63	21.26
1961	22.35	0.00	22.35	22.95
1962	23.92	0.00	23.92	24.62
1963	25.70	0.00	25.70	26.45
1964	27.59	0.00	27.59	28.36
1965	29.72	0.00	29.72	30.21
1966	31.93	0.00	31.93	32.41
1967	34.33	0.00	34.33	35.10
1968	37.21	0.00	37.21	37.84
1969	40.48	0.00	40.48	40.69
1970	43.62	0.00	43.62	43.49
1971	46.31	0.00	46.31	46.10
1972	49.31	0.00	49.31	48.11
1973	52.18	0.00	52.18	49.78
1974	53.73	0.00	53.73	50.95
1975	55.15	0.00	55.15	52.28
1976	56.55	0.00	56.55	53.89
1977	58.62	0.00	58.62	55.47
1978	59.93	0.00	59.93	56.49
1979	59.95	0.00	59.95	57.64
1980	59.23	0.00	59.23	58.32
1981	56.73	0.00	56.73	57.92
1982	54.52	0.00	54.52	56.60
1983	53.12	0.00	53.12	56.20
1984	52.99	0.00	52.99	56.62
1985	53.63	0.00	53.63	56.46
1986	54.34	0.00	54.34	57.28
1987	55.64	0.00	55.64	59.17
1988	57.19	0.00	57.19	59.74
1989	59.36	0.00	59.36	59.55
1990	60.83	0.00	60.83	60.23
1991	60.89	0.00	60.89	60.26
1992	60.20	0.00	60.20	59.81
1993	59.73	0.00	59.73	60.07
1994	60.17	0.00	60.17	60.85
1995	60.96	0.00	60.96	61.51
1996	62.11	0.00	62.11	62.83
1997	63.14	0.00	63.14	64.09
1998	63.73	0.00	63.73	65.19
1999	64.26	0.00	64.26	65.83
2000	66.36	0.00	66.36	66.31
2001	65.56	0.00	65.56	66.89
2002	66.49	0.00	66.49	67.72
2003	66.94	0.00	66.94	68.87
2004	69.21	0.00	69.21	69.87
2005	71.31	0.00	71.31	70.68
2006	70.59	0.00	70.59	71.80
2007	71.32	0.00	71.32	72.24
2008	70.83	0.01	70.83	72.08
2009	70.22	0.02	70.24	71.69
2010	69.86	0.06	69.91	71.22
2011	69.68	0.11	69.79	70.89
2012	69.68	0.30	69.98	70.95
2013	69.65	0.57	70.22	71.05
2014	69.48	0.96	70.43	71.00
2015	69.14	1.49	70.63	71.01
2016	68.61	2.20	70.81	70.79
2017	67.83	2.99	70.81	70.12
2018	66.92	3.94	70.86	69.19
2019	65.87	5.01	70.87	68.16
2020	64.52	6.19	70.71	66.93
2021	62.94	7.47	70.41	65.46
2022	61.40	8.82	70.21	64.36
2023	60.03	10.20	70.23	63.68
2024	58.84	11.58	70.42	62.94
2025	57.82	12.94	70.76	62.10
2026	56.93	14.24	71.17	61.53
2027	55.93	15.43	71.36	60.87
2028	54.66	16.51	71.17	59.81
2029	53.25	17.44	70.68	58.69
2030	51.82	18.19	70.02	57.78
2031	50.38	18.78	69.16	56.86
2032	48.99	19.19	68.18	55.80
2033	47.77	19.43	67.20	54.85
2034	46.69	19.50	66.20	53.95
2035	45.67	19.41	65.09	52.78
2036	44.67	19.17	63.84	51.55
2037	43.71	18.80	62.51	50.44
2038	42.75	18.34	61.08	49.44
2039	41.70	17.81	59.51	48.49
2040	40.60	17.25	57.84	47.46

(continued)

Table A7 IEA world conventional—million barrels per day (continued)

<i>Year</i>	<i>pre-existing</i>	<i>new discovery</i>	<i>IEA</i>	<i>BITRE</i>
2041	39.50	16.69	56.19	46.37
2042	38.47	16.14	54.61	45.36
2043	37.50	15.60	53.10	44.12
2044	36.59	15.08	51.66	42.87
2045	35.68	14.57	50.25	41.78
2046	34.77	14.08	48.85	40.68
2047	33.75	13.60	47.35	39.33
2048	32.67	13.13	45.80	38.06
2049	31.58	12.67	44.26	36.88
2050	30.62	12.22	42.84	35.65
2051	29.77	11.78	41.56	34.43
2052	29.07	11.35	40.43	33.45
2053	28.06	10.93	38.99	32.55
2054	27.19	10.51	37.70	31.83
2055	26.28	10.09	36.38	31.19
2056	25.67	9.69	35.36	30.38
2057	24.77	9.29	34.06	29.76
2058	24.05	8.89	32.95	29.15
2059	23.02	8.51	31.53	28.27
2060	21.80	8.13	29.93	27.50
2061	20.05	7.76	27.81	26.86
2062	18.39	7.40	25.79	25.97
2063	16.81	7.05	23.86	25.09
2064	15.28	6.71	21.99	24.27
2065	13.79	6.37	20.17	23.52
2066	12.34	6.05	18.40	22.86
2067	10.92	5.74	16.66	22.09
2068	9.53	5.43	14.96	21.31
2069	8.18	5.14	13.31	20.62
2070	6.87	4.85	11.72	19.74
2071	5.62	4.57	10.19	18.90
2072	4.42	4.31	8.73	18.30
2073	3.27	4.05	7.32	17.71
2074	2.23	3.80	6.04	17.12
2075	1.36	3.56	4.92	16.60
2076	0.71	3.33	4.04	16.10
2077	0.28	3.11	3.39	15.61
2078	0.07	2.90	2.97	15.16
2079	0.00	2.70	2.70	14.79
2080	0.00	2.50	2.50	14.52
2081	0.00	2.31	2.31	14.19
2082	0.00	2.14	2.14	13.91
2083	0.00	1.97	1.97	13.63
2084	0.00	1.81	1.81	13.24
2085	0.00	1.65	1.65	12.82
2086	0.00	1.51	1.51	12.43
2087	0.00	1.37	1.37	11.98
2088	0.00	1.25	1.25	11.58
2089	0.00	1.13	1.13	11.25
2090	0.00	1.02	1.02	10.85
2091	0.00	0.91	0.91	10.52
2092	0.00	0.82	0.82	10.23
2093	0.00	0.73	0.73	9.80
2094	0.00	0.66	0.66	9.38
2095	0.00	0.60	0.60	9.02
2096	0.00	0.53	0.53	8.50
2097	0.00	0.48	0.48	8.00
2098	0.00	0.42	0.42	7.57
2099	0.00	0.35	0.35	7.03
2100	0.00	0.30	0.30	6.53

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Appendix B

Data sources



Data sources

<i>Area</i>	<i>Discovery</i>	<i>Production</i>
US lower 48	L1 01-04	L1 01-04, EIA 05-06
Alaska	L1,L2 01-04 = tot US—lower 48	L1,L2 01-69 = totUS-US48;EIA70-06
Canada Conv	C 30-59; L3 60-04	C 30-69; CAPP 70-06
Venez Conv	L2 25-04 (CD)	C 30-04; EIA 05-06(adj to conven)
Mexico	C 30-04	C 30-04; EIA 05-06
Rest L Amer	C 30-04=tot LA-Ven-Mex	C 30-04 = tot LA-Ven-Mex
Libya	C 30-04	C 30-69; EIA 70-06
Nigeria	C 30-04 less deep estimate	EIA 60-06
Algeria	C 30-04	C 30-69; EIA 70-06
Egypt	C 30-04	C 30-04; EIA 05-06
Angola	L3 60-00 extpol on Rest Africa	EIA 60-06 less deep 02-06
Rest Africa	C 30-04 = Afr-Li-Ni-Al-E-An-deep	C 30-04
UK	C 30-04	C 30-04
Norway	C 30-04	C 30-04
France	L1 30-00	L1 30-69; EIA 70-06
Rest Europe	C 30-04 = tot Eur-UK-Norway	C 30-04 = tot Eur-UK-Norway
Russia	C 30-04	C 30-04; EIA 05-06
China	C 30-04	C 30-04; EIA 05-06 - deep 97-06
Kazakhstan	C 30-04	C 30-04; EIA 05-06
Azerbaijan	C 30-04	C 30-04; EIA 05-06 (adjusted to C)
Rest Eurasia	C 30-04 = tot Eurasia-R-C-K-A	C 30-04 = tot Eurasia-R-C-K-A
Indonesia	C 30-04	C 30-69; EIA 70-06
India	C 30-04	C 30-69; EIA 70-06
Malaysia	C 30-04	EIA 60-06
Australia	C 30-04	EIA 70-06
Rest East	C 30-04 = tot East-Is-In-M-A	C 30-04; 05-06 extrap - deep 99-06
Other ME	C 30-04	C 30-04
Saudi Arabia	C 30-04 (excludes Neutral Zone)	C 30-04; EIA 05-06 (less NZ est)
Iran	C 30-04	C 30-04; EIA 05-06
Iraq	C 30-04	C 30-04; EIA 05-06
Kuwait	C 30-04 (excludes Neutral Zone)	C 30-04; EIA 05-06 (less NZ est)
Neutral Zone	na	Fraction of Rest ME Gulf
Rest ME Gulf	C 30-04 = tot MEG-S-In-Iq-K	C 30-04; EIA 05-06 (adj to C 04)
Deep	L1 65-00; L4 01-03	L1 80-00; L4 01-03
Gas	L5 00-05	L5 00-05; L6 unconv
Cdn non-conv	na	CAPP (2007)
Ven non-conv	na	EIA 70-06 minus Venez conv

C = Campbell (2005); EIA = EIA(2007b); L1 = Laherrere(2001a); L2 = Laherrere(2005a); L3 = Laherrere(2001b); L4 = Laherrere(2005b); L5 = Laherrere(2007); L6 = Laherrere(2004).

Additional table and figure sources

Figure 13.15 Creaming Curve for the Rest of the World outside North America
Laherrere (2007).

Table 14.7 Natural Gas Plant Liquids
NGPL ratio: Laherrere (2005a).

Table 14.13 World Liquids Actual, gigabarrels per year
NGPLs: Laherrere (2005a).
Refinery gains: Laherrere (2005a).
Other liquids: equals Biofuels: Lahererre (2007).
plus Minor Liquids: equals residual

Figure 14.15 Seasonally adjusted and trend monthly production of crude and liquids
Energy Information Authority, plus seasonal adjustment and trend processing in
Regression Analysis for Time Series software package
Crude: www.eia.doe.gov/ipm/t11d.xls
Liquids: www.eia.doe.gov/emeu/ipsr/t14.xls

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Glossary



Glossary

Actual P	Actual measured production (gigabarrels) in a year for an oil region.
Adj CD	Adjusted Cumulative Discovery—the figure for cumulative discovery as of each year, derived from the original figure for cumulative discovery adjusted either up or down so that the ultimate discovery matches the ultimate production estimate.
Biofuels	Liquids (fuels) derived from vegetative matter (ethanol and biodiesel are the main biofuels).
Cumulative	The result of progressively adding up annual discovery or production from the very beginning of discovery or production in an area.
CD	Cumulative discovery—the addition over time of all annual discoveries of oil in a region up to the date.
CP	Cumulative production—the addition over time of all annual production of oil in a region up to the date.
Crude oil	Oil derived from pumping out of wells or from non-conventional sources.
D	Discovery—annual amount of oil discovered in a region.
Deep water oil	Oil found at depths under the sea of greater than 500 metres.
Discovery	Amounts (gigabarrels) of oil discovered each year.
EIA	Energy Information Administration, part of the US Department of Energy.
Extra heavy oil	Oil derived from deposits of very thick oil.
GDP	Gross Domestic Product—a measure of income.
Gulf	A grouping of oil producing nations surrounding the Gulf of Arabia.
Liquids	The total of crude oil, natural gas plant liquids, refinery gains and other liquids.
Lower 48 states	The mainland states of the United States below the 49th Parallel.
LPG	Liquid Petroleum Gas.
Mb	Megabarrels (million barrels).
Mbpd	Million barrels per day (1Mbpd = 0.365 gigabarrels per year).

ME	Middle East.
Minor liquids	Small amounts of liquids derived during refining.
Natural gas	Gas derived from gas or oil wells.
Neutral Zone	An area in the Gulf whose oil output is shared equally between Saudi Arabia and Kuwait.
NGPL	Natural gas plant liquids.
Non-conventional	Oil derived from deposits of tar, natural bitumen or extra heavy oil.
OPEC	Organisation for Petroleum Exporting Countries.
Other Liquids	A category of Liquids, comprising biofuels and minor liquids.
P Pred	see Pred P.
Polar oil	Oil from polar regions (the biggest of which is still Alaska).
Pred CP	Predicted (raw) cumulative production. It equals adjusted smoothed cumulative discovery lagged by predlag years. It is interpolated when predlag rises by one or more years between observations.
Predlag	Predicted lag between cumulative discovery and production. Historical predicted figures are a five year centred moving average of the raw years lag read off a chart listing adjusted SCD and SCP. Future values of predlag come from a projection of the recent trend to 100 per cent of the ultimate discovery on the stretch lag curve.
Pred P	Predicted annual production (raw), where Pred P equals the difference between a year ago's Pred SCP and the current year's Pred SCP.
Pred SCP	Predicted smoothed cumulative production—an X year centred moving average of Pred CP, where X varies between regions.
Pred SP	Predicted smoothed production—an X year centred moving average of Pred P, where X varies between regions.
Prod	Abbreviation of (annual) 'Production'.
Production	Amounts of oil (gigabarrels) produced each year
Refinery gains	The extra amount of liquid coming out of refineries, compared to the volume of oil going in. Refinery gains result from the expansion of crude during refining.
SCD	The smoothing with an X year centred moving average of cumulative discovery. X varies from region to region.
SCP	The smoothing with an X year centred moving average of cumulative production. X varies from region to region.

SD	The smoothing with an X year centred moving average of annual discovery. X varies from region to region.
SDRs	Special Drawing Rights—basket of Western currencies.
SP	The smoothing with an X year centred moving average of annual production. X varies from region to region.
Stretch lag curve	The number of years lag between when cumulative discovery reached a certain level and when cumulative production reached the same level. Plotting this over time results in a usually stable relationship between the fraction of ultimate cumulative discovery and the number of years lag.
Tar sands	Sands which contain a tar-like hydrocarbon which can be extracted to produce a heavy crude oil.
Tcf	Trillions of cubic feet.
Tcm	Trillions of cubic metres.
U	Ultimate production—an estimate of the maximum amount of oil that can be produced from a region's oil wells. Also called ultimate recoverable reserves.
UD	Ultimate discovery—an estimate of the maximum amount of oil that will be discovered in an oil region.
US	United States.

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