



Saudi Arabia's coming oil and fiscal challenge

Summary

Saudi Arabia is currently enjoying oil revenues in excess of its fiscal needs, but government spending and domestic consumption of crude oil are rising far faster than overall oil output.

For about the next decade, the Kingdom will continue to be in a strong fiscal position:

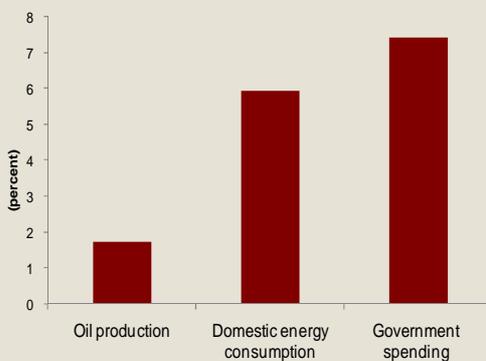
- The “breakeven” price for oil that matches actual revenues with expenditures is currently around \$84 per barrel for the Kingdom, comfortably below the global price.
- Net foreign assets held by the central bank are \$481 billion, 111 percent of GDP and three times the government budget, easily enough to finance any likely deficits for many years.
- The government has very low debt, at 10 percent of GDP, all domestically held. Should foreign reserves drop, the government has large untapped borrowing capacity.

After the benign decade ahead, unless the current spending and oil trends are changed, the government faces a very different environment:

- Domestic consumption of oil, now sold locally for an average of around \$10 per barrel, will reach 6.5 million barrels per day in 2030, exceeding oil export volumes.
- We do not expect total Saudi oil production to rise above 11.5 million barrels per day by 2030.
- Even with a projected slowdown in growth of government spending, the breakeven price for oil will be over \$320 per barrel in 2030.
- The government will be running budget deficits from 2014, which become substantial by the 2020s. By 2030, foreign assets will be drawn down to minimal levels and debt will be rising rapidly.

Preventing this outcome requires tough policy reforms in areas such as domestic pricing of energy and taxation, an aggressive commitment to alternative energy sources, especially solar and nuclear power, and increasing the Kingdom's share of global oil production.

Likely annual growth rates for oil production, energy consumption and government spending (2011-2030)



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Background and introduction

There is widespread understanding that with oil prices around \$100 per barrel, Saudi Arabia's oil wealth is providing vast revenue inflows, enabling a strong fiscal position with low government debt and high government savings. This wealth is particularly timely as the government has increased spending and cash transfers to Saudi citizens in the wake of the broader "Arab Spring".

For the near term, Saudi Arabia is likely to continue to receive oil revenues in excess of its spending needs, with the oil price needed to balance the budget currently about \$20 per barrel below the actual price.

Not widely realized, however, is that three major trends, if continued on their current and most likely paths, portend a much more difficult energy and revenue future for the Kingdom. These trends are:

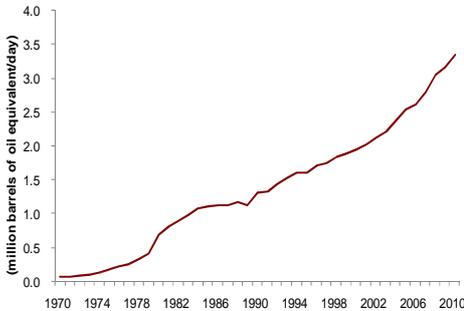
- The Kingdom's domestic consumption of oil (and gas) is rising very sharply, reducing the amount of oil available for export. Low domestic prices—oil is sold in Saudi Arabia at between 3 percent and 20 percent of the global price—mean the efficiency of oil use is worsening. Consumption is growing at about twice the rate of non-oil GDP growth.
- Saudi government spending is likely to continue rising at an annual pace of 7 percent or more, with ongoing reliance on oil revenues as the primary revenue source.
- Saudi oil output has not risen significantly in 30 years, and in our view is unlikely to rise on a sustained basis over the next decade or more.

The combination of these trends would leave only sustained sharp rises in oil prices to meet fiscal needs. While we think prices will continue to rise, we do not think they will rise at the rate required to meet the "breakeven" price for the budget. Indeed, a decade-long plateau in oil prices, as the market has previously experienced, would likely lead to a rapid deterioration of the Kingdom's future fiscal position.

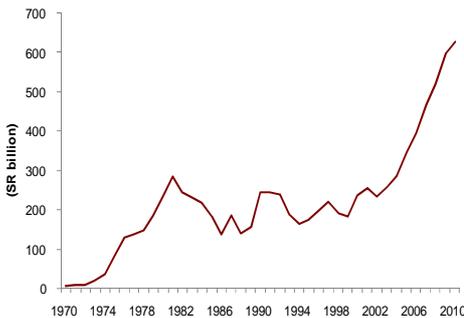
We think it is now time to step back and produce a paper that looks at the full range of Saudi Arabia's oil and energy realities, beyond the implications over the next few years of \$100 per barrel oil. The story is far more complex than the simple fact of high current oil revenues can convey.

First, we look at Saudi Arabia's current and continued place in the global oil market, considering demand, supply and production capacity, price issues, and the potential game changers on the horizon. In particular, we seek to address how much oil the Kingdom is likely to be producing going out 20 years. Then, we turn to the Kingdom's fiscal realities and what these mean for long-term growth in government spending. Then, we address the troubling high growth in domestic oil consumption. Finally, we combine these trends to plot a path for the Kingdom's revenue and breakeven oil price needs over the next 20 years.

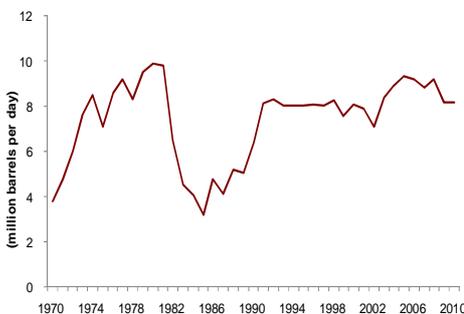
Domestic energy consumption



Government spending



Oil production





Saudi Arabia and global oil market trends

Demand

Today the world consumes approximately 88 million barrels per day of oil. Of this, Saudi Arabia produces around 9 million barrels per day and Opec provides a total of 29 million barrels per day (33 percent of total world consumption). Global consumption grows at about half the pace of global GDP growth, or typically 1.5 to 2.0 percent per year. With the global economy still emerging from recession the International Energy Agency (IEA) forecasts that global oil demand will grow by an average of 1.3 percent per year for the next five years, equivalent to 1.1 million barrels per day of oil per year.

Behind these broad numbers several powerful trends are apparent in global oil consumption. First, oil has largely conceded the market for electricity production to natural gas, coal, and nuclear. Oil's role in global electricity production dropped from 25 percent in 1973 to 4 percent in 2010. Oil is also in its twilight years for industrial uses, resulting in oil being primarily a transportation fuel. Should oil lose a significant part of the global market for transportation fuels, the economic results for Saudi Arabia would be devastating.

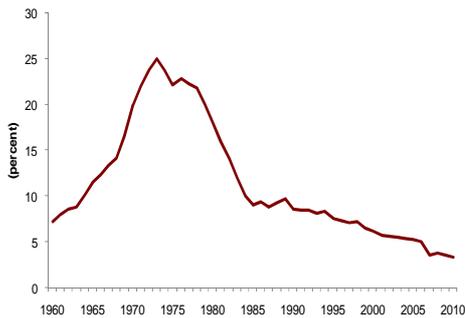
Second, there is a clear shift in the growth in oil demand from West to East. Oil consumption in the advanced OECD countries peaked in the first quarter of 2006 at 50.6 million barrels per day. Although consumption has rebounded from its global recession low-point of 44.6 million barrels per day in the second quarter of 2009, this growth has clearly slowed on a sustained basis for several reasons, including the shift to biofuels, mandated energy efficiency gains in auto mileage, and the more direct impact that higher crude oil prices have on gasoline prices, especially in the US. Oil demand in the OECD countries is unlikely to grow much, if at all, from current levels of about 46 million barrels per day.

In the US, which is by far the largest consumer of oil at just over 19 million barrels per day, or 22 percent of global consumption, oil consumption in 2010 was lower than in 2000, even though the US economy had grown by 18 percent over this period. With sub-trend economic growth in the US likely for at least the next few years, and increases now occurring in US domestic oil production, it is probable that there will be no growth in its oil imports over the next decade. In its latest medium-term outlook, the IEA expects total demand from North America to be 0.6 million barrels per day lower in 2016 than in 2010.

The growth in oil consumption is coming from the East. According to IEA data, 95 percent of net growth in oil consumption is coming from China, the Middle East and the rest of Asia. China's demand for oil has grown by an annual average of 500,000 barrels per day per year over the last five years. The Middle East, traditionally viewed as an oil exporter, is now an important consumer of oil as well, with oil consumption growing by an annual average of 300,000 barrels per day per year over the past five years. This growth carries very important and worrisome implications in the case of Saudi Arabia, which we discuss in some detail later.

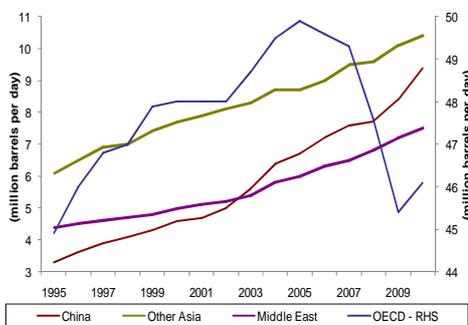
Over the past 20 years, Saudi exports to Asia have grown from one-third to two-thirds of total crude oil exports. This trend is likely to

Oil share in electric power sector



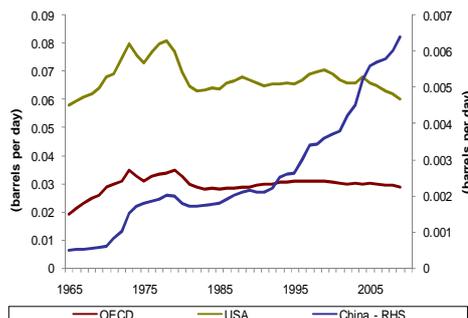
Source: IMF

Oil demand



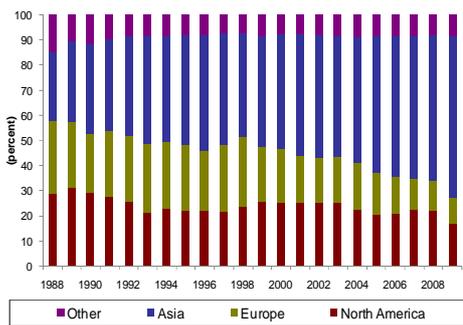
Source: IEA

Per capita oil consumption

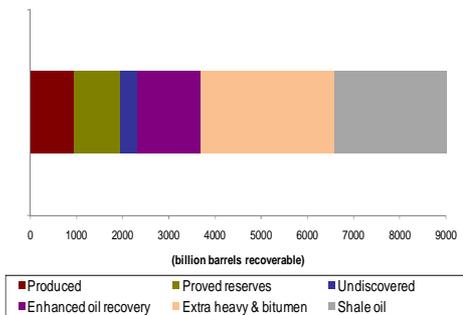




Saudi oil exports by destination

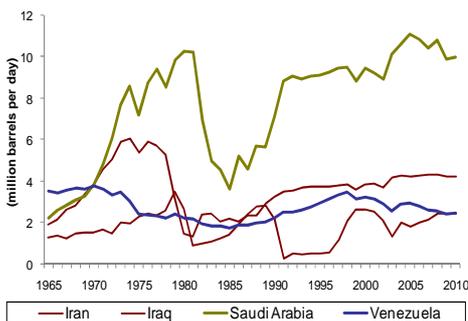


Global oil resource base



Source: USGS

Oil production



Source: BP

continue, due to both the high growth in consumption and Asia's commitment to oil-based transportation in the future. Some 79 oil refineries are being constructed throughout Asia and the Middle East, while the US and Europe are building just ten. In contrast, there are only 13 new biofuels facilities being constructed in Asia, and none in the Middle East, compared to 67 in the US and Europe.

Broadly, global oil demand is likely to continue to grow for decades to come. Several long-term forecasts for oil demand project global consumption continuing to grow at around 1.3 to 1.5 percent per year out to at least 2030, with, as we note above, the growth coming mainly in Asia and mainly as a transportation fuel.

Supply

The global oil resource base is abundant at almost 9 trillion barrels of conventional and non-conventional crude oil (such as extra heavy crude oil, shale oil and tar sands), according to the US Geological Survey. These various types of oil become economically recoverable under various oil price scenarios, but basically, at sustained prices of over \$80 dollars per barrel, many of the unconventional sources can be, and currently are, profitably produced. At current global output of 88 million barrels per day, 9 trillion barrels of oil would represent about 280 years of supply.

While the world, therefore, has an abundant oil resource base, the constraint is often the surface infrastructure to produce, process, and deliver the oil. Sustained high prices will bring these unconventional sources and the necessary infrastructure on-stream. We think, as discussed below, that prices will stay high enough to result in substantial development of many expensive-to-produce reserves, such as Canadian tar sands and deep offshore oil reserves. We believe this will be an important factor that likely keeps Saudi Arabia's share of global oil production from increasing much, if at all, above the current level of 10 percent for many years.

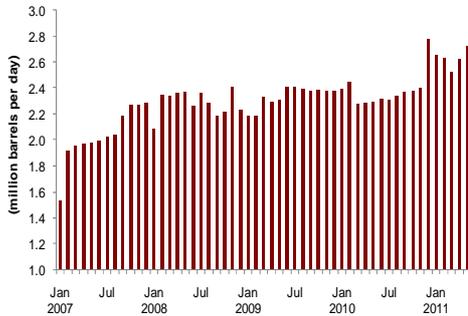
Besides economics, geopolitics has been a factor keeping substantial supplies of oil off the market. When Opec was formed in 1960 four of the five founding members—Iran, Iraq, Saudi Arabia and Venezuela—could all produce a similar amount of oil; about 1 million barrels per day. Today, Saudi Arabia can produce 12.5 million barrels per day, Iran about 4 million barrels per day and Iraq and Venezuela under 3 million barrels per day. Iran, Iraq and Venezuela clearly have the resource base potential to produce much higher volumes, but have been held back more by their political history than by geology. We expect the ongoing ramp-up of Iraqi oil, in particular, to be a potential game-changer in the oil market and to have implications for, among other things, Saudi oil capacity and output and the power balance in Opec.

Potential game-changer: Iraq

A major upgrade to Iraqi oil production capacity is taking place. In late-2009, the Iraqi government signed a number of deals with leading global oil companies that if fully implemented would lift oil production capacity from under 3 million barrels per day to 12 million barrels per day by 2020. Under the terms of the contracts, international oil companies are paid according to the volume of production, which gives an incentive for fast development and high



Iraqi oil production



Source: JODI

output. Iraqi oil output is already rising because of improved infrastructure and security conditions. Production hit a 10-year high in December 2010, of 2.8 million barrels per day, according to the Joint Oil Data Initiative (JODI) database, and the average for the first five months of this year was 12 percent higher than for the same period of 2010.

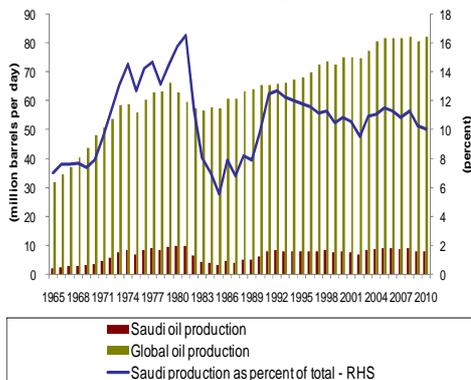
However, the following factors mean that the production target will not be achieved, and the Iraqi government has indicated that it could aim for lower production:

- **Lingering security issues:** While substantial improvements have been made, incidents are still common.
- **Insufficient export capability:** Industry estimates are that investment of around \$50 billion is required for the necessary upgrades to Iraq’s ports and pipelines. While the oilfield development is proceeding, a key bottleneck is the inability to move the oil.
- **Potential water shortages:** With low pressure in several fields, water injection is essential, but Iraq already suffers from serious water shortages. The government plans the large-scale transportation and treatment of water from the Gulf for injection, but this will prove both complex and costly.
- **Logistical challenges:** The huge amount of development work taking place will potentially cause shortages of equipment and personnel that will be aggravated by poor infrastructure and potentially lengthen project implementation times.

Nonetheless, even if production reaches close to half of the targeted level, or 6 million barrels per day, by 2020, a goal analysts think possible, it could have a major impact on the global oil market. The additional output from Iraq alone would absorb about 55 percent of IEA-forecast growth in worldwide oil demand to 2020 and would put downward pressure on prices.

Integrating Iraq back into the Opec production quota system could also be a challenge, particularly in light of the most recent Opec meeting, which collapsed over disagreement on increasing output. Once its output reaches 4.5 million barrels per day, Iraq would be the second largest producer in Opec. If output goes much higher it would have implications for Saudi Arabia’s leading role in Opec.

Saudi Arabia’s share of global oil output



Source: Ministry of Petroleum and Mineral Resources/BP

Saudi Arabia has supplied a surprisingly stable percentage of total global oil output over the past 50 years, averaging around 10 percent. During the oil market gyrations of the 1970s and 1980s, when disruptions and price spikes were frequent, Saudi output ranged from 16 percent of the world total in 1980 (offsetting lost Iranian oil during the Iranian revolution), to 6 percent in 1985 when Saudi Arabia, as Opec’s “swing producer”, swung production to as low as 2 million barrels per day. Over the last 20 years, Saudi Arabia has experienced a fairly steady decline in its share of total global oil output from 12 percent in 1991 to 10 percent today.

We say above “surprisingly” stable because oil analysts have for many years forecast that the world would require more Saudi oil



output in the future than has actually ever been the case. New oil discoveries, technology, increasing efficiency of oil use, geopolitical events and changing oil policies all have contributed to lower actual need for Saudi oil than thought previously. The tendency has been to overestimate the global demand for oil, underestimate the growth in supplies outside the Middle East, then assume that Saudi Arabia, with its vast oil reserves of over 260 billion barrels, would fill a growing gap that actually never materializes.

IEA production projections for 2030

(million barrels per day)

| Year of forecast | Global demand | Opec production | Middle East production |
|---|---------------|-----------------|------------------------|
| 2004 | 121.3 | 64.8 | 51.8 |
| 2005 | 115.4 | 57.2 | 44.0 |
| 2006 | 116.3 | 56.3 | 45.7 |
| 2007 | 116.3 | 60.6 | 45.0 |
| 2008 | 106.4 | 52.9 | 37.9 |
| 2009 | 103.0 | 53.8 | 37.2 |
| Difference (2009 versus 2004 forecast) | -18.3 | -11.0 | -14.6 |

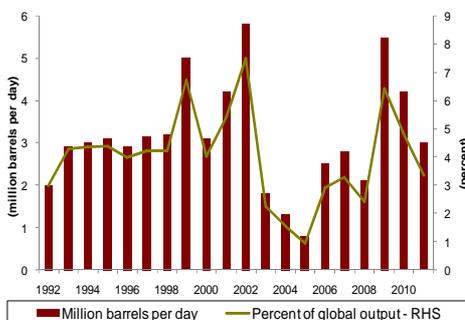
We think a most likely scenario is that the actual trend of stable to gradually declining Saudi share of global oil output will continue. By 2030, if global oil production has grown by 1.4 percent per year and Saudi Arabia continues to capture about 10 percent of global market share, then the Kingdom’s output would be around 11.5 million barrels per day, versus today’s 9+ million barrels per day. This is not a significant change and still well within Saudi Arabia’s existing crude oil production capacity of 12.5 million barrels per day.

While oil consuming countries have rightfully worried about security of supply, in recent years Saudi officials have often spoken of their need for “security of demand”. The Kingdom spends a substantial amount of money building and maintaining oil production capacity that provides a cushion to meet growth in demand and an ability to offset lost supply in cases of disruption, as is happening today in the case of Libya.

The past decade provides a good example of the difficulty of matching global demand expectations with Saudi oil capacity additions. With the global economy booming in the early 2000s, the Kingdom embarked on a plan to lift oil output capacity from 10 million barrels per day to the current level of 12.5 million barrels per day. Just as the expansion was being completed, the global economy sank into recession, oil prices collapsed and demand contracted. As a result, Saudi unused capacity from 2009 until the recent loss of Libyan oil has been around 4 million barrels per day versus a publicly -stated policy commitment of 1.5 to 2 million barrels per day.

As global consumption rises, we think it likely that Saudi policy will be to maintain a spare capacity cushion that tracks a percent of the global total, rather than a constant fixed number. Looking at global excess production capacity as a measure of supply tightness in the oil market, the chart on the left shows that excess capacity in percentage terms is less comfortable than suggested by the absolute number. Thus, while potentially producing 11.5 million

Global spare production capacity





barrels per day by 2030, we think Saudi Arabia would also seek to have an unused capacity cushion of 2.5 to 3 million barrels per day at that point as well, reflecting the same percentage of the global market as a 2 million barrels per day excess capacity today.

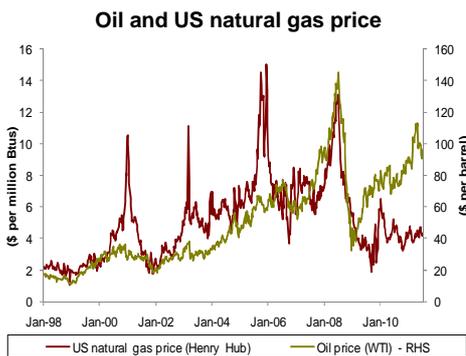
Potential game-changer: Shale gas

The development of new technology has made shale gas a potential super-abundant source of energy in the US and elsewhere. Its production appears to be contributing to the breakdown of the historically close relationship between oil and natural gas prices. Should gas become a direct alternative to oil, then it could have a dramatic impact on oil prices. Currently, gas is mainly a fuel for electric power and oil is a transportation fuel, so the two are not easily interchangeable. However, in terms of pure energy content, one million British thermal units (Btus) of gas has about one-sixth the energy content of one barrel of oil, suggesting oil would trade in a market of efficient interchangeability at about six times the price of gas. Currently gas is about \$4.30 per million Btus, and if it were substitutable for oil as a transportation fuel, oil would trade in an efficient market at around \$26 per barrel. Clearly, oil producers are monitoring developments in engine technologies with interest.

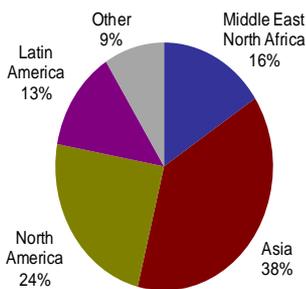
Shale gas is extracted by the use of hydraulic fracturing (known as “fracking”), which involves the injection of liquids into shale rock that cause the rock to fracture and thereby release the gas inside. The process has been around for some time but widespread use only began recently as improved technology has made it more economical. Production of shale gas in the US is twelve times greater than it was a decade ago, now totaling about 25 percent of total US gas production. Total conventional and shale gas proven reserves in the US now total 330 trillion cubic feet, equivalent to 59 billion barrels of oil equivalent, or nearly one-quarter of the proven oil reserves of Saudi Arabia.

Extraction is concentrated in the US, where it is estimated that the breakeven price of shale gas production is between \$4.1 and \$8.2 per million Btus. Higher output has kept natural gas prices around this range since September 2008 and reasonably stable despite the run-up in oil prices. The chart to the left shows that movements in the prices of natural gas and oil were fairly closely related until the last few years. Since oil prices hit their lows in December 2008 WTI is up by 215 percent, whereas natural gas prices are almost 20 percent lower over the same period.

North America contains the largest proportion of global shale gas resources, at 24 percent, slightly ahead of China (note that shale gas “resources” refers to natural concentrations of shale gas, whereas shale gas “reserves” are those part of the resources that can predictably and economically be extracted). The Middle East and North Africa has the next largest share of shale gas resources, at 16 percent, though there has been little exploitation of these. The development of shale gas is spreading, but has been controversial owing to environmental concerns. The IEA expects that a jump in new output of unconventional gas (shale gas plus tight gas and coal-bed methane) will result in global gas demand exceeding that for coal by 2025 and approaching oil by 2035.



Share of global shale gas resources



Source: IEA



Capacity, output and energy investment

Saudi Aramco embarked on its major crude oil capacity expansion program in 2004. Although the timing of its completion left Saudi Arabia with more spare capacity than needed, the Kingdom has nonetheless kept up a more broad-based investment program that includes significant expansions in natural gas production, oil refining, and petrochemicals production. Here we look at the full scope of Saudi Aramco's investment program.

Between 2004 and 2010 new crude oil production capacity totaling 4.25 million barrels per day was brought on stream, which, after offsetting capacity declines in some fields, lifted current production capacity from 10 million barrels per day to 12.5 million barrels per day. The capacity additions alone are greater than the total production capacity of any other Opec member. The Khurais field, which entered production in June 2010, was at 1.2 million barrels per day the largest single increment to oil production in the Kingdom's history and equivalent to the current output from Algeria. The bulk of the new capacity was for Arab Light, a crude grade that is highly in demand due to the ease it can be refined into transportation fuels.

Recent Saudi oil production expansion

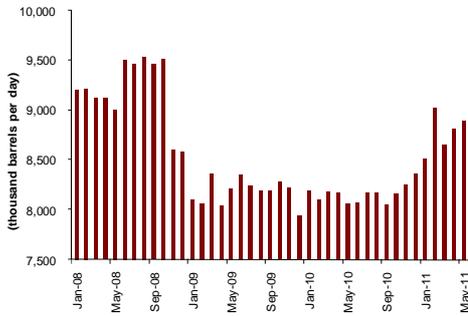
| Oilfield | Year of completion | Crude grade | Capacity (million b/d) |
|-------------|--------------------|-------------------------|------------------------|
| Haradh | 2006 | Arab light | 0.9 |
| Khurais | 2009 | Arab light | 1.2 |
| Khursaniyah | 2010 | Arab light | 0.5 |
| Nuayyim | 2009 | Arab super light | 0.1 |
| Qatif | 2004 | Arab light, Arab medium | 0.8 |
| Shaybah | 2009 | Arab extra light | 0.75 |

Because of the timing of the global downturn, the Kingdom undertook a costly oil expansion program that has not yet been needed. For example, in 2010, production averaged 8.2 million barrels per day, leaving spare capacity of over 4 million barrels per day, considerably above Kingdom's policy level of 1.5 to 2 million barrels per day. Even at a peak so far this year, of just over 9 million barrels per day in February, spare production capacity was well in excess of the desired cushion.

The only further addition to crude oil production capacity that is underway is the Manifa field. The completion date for this project has recently been brought forward and Saudi Aramco now plans to reach full production of 0.9 million barrels per day by 2014 (with 0.5 million barrels per day of this starting in 2013). Manifa is heavy crude that will be processed at local refineries and is primarily aimed at the domestic market.

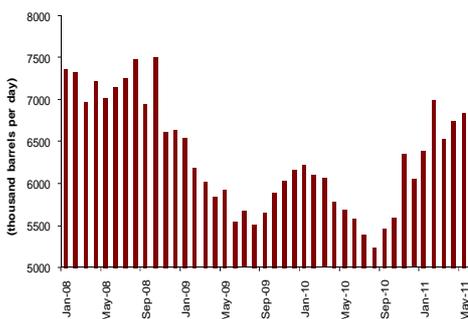
As oil prices were running up to their peak of nearly \$150 per barrel in mid-2008, Saudi Aramco unveiled details of additional increments to oil production that it could develop in order to lift production capacity to 15 million barrels per day. Of these, there have only been developments on one field, Safaniya, where Saudi Aramco recently highlighted its work to maintain production capacity, rather than expand it. Heavy crude would account for around two-thirds of the new supply if the plan to hit capacity of 15 million barrels per day were undertaken.

Saudi oil production



Source: JODI

Saudi oil exports



Source: JODI



Potential new additions to oil production capacity

| Oilfield | Crude grade | New capacity (million b/d) |
|-----------|------------------|----------------------------|
| Zuluf | Arab heavy | 0.9 |
| Safaniyah | Arab heavy | 0.7 |
| Berri | Arab extra light | 0.3 |
| Khurais | Arab light | 0.3 |
| Shaybah | Arab extra light | 0.25 |

Oil exploration dominated Saudi Aramco's spending for many years, but the focus is now on gas and downstream projects. Saudi Aramco plans to spend \$125 billion on upstream and downstream projects over the next five years. While this is a vast sum of money, on an annual average basis it is well below the \$40 billion per year that estimated spending reached during the second half of the previous decade. Based on current plans we do not expect an increase in overall oil production capacity for at least five years, unless there was a dramatic change in market conditions that required a rush of investment.

Main gas projects underway

| Field | | Expected completion | Capacity (billion cf/d) |
|-------------|--------------------|---------------------|-------------------------|
| Wasit | Non-associated gas | 2013 | 2.5 |
| Karan | Non-associated gas | 2012 | 1.8 |
| Shaybah NGL | Associated gas | 2013 | 2.5 |

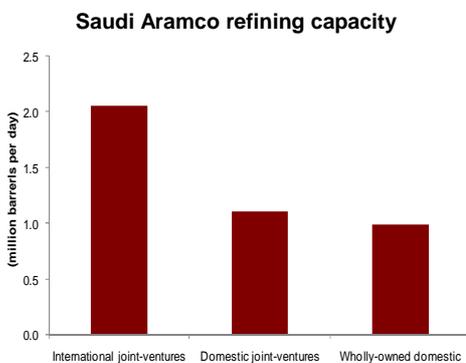
Although a full breakdown of the planned spending is not available, details of some of the major projects are clear. Three huge gas projects (Karan, Wasit and Shaybah) are scheduled to enter production by the end of 2013, bringing on stream a total of 6.7 billion cubic feet per day, an increase of over 70 percent from the 2010 production level of 9.4 billion cubic feet per day. Of this 4.3 billion cubic feet per day (Karan and Wasit) are non-associated gas, meaning gas that is not produced along with crude oil and therefore can be extracted regardless of adjustments to oil output (in line with changes to Opec quotas, for example). More than half of the Kingdom's gas reserves are associated gas. These new gas fields, together with others, should slow the growth of the use of oil for domestic electric power generation.

Major refining projects underway

| Refinery | JV partner | Expected completion | New capacity ('000 b/d) |
|----------------------|------------|---------------------|-------------------------|
| Domestic | | | |
| Jizan | - | 2015 | 400 |
| Jubail | Total | 2013 | 400 |
| Yanbu | Sinopec | 2013 | 400 |
| International | | | |
| Port Arthur (US) | Shell | 2011 | 325 ¹ |

¹Lifting total capacity to 600,000 barrels per day

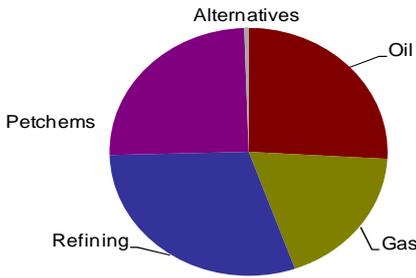
In downstream oil, Saudi Aramco is financing a significant increase in refining capacity, both in the Kingdom and overseas. Three new local refineries with a combined capacity of up to 1.2 million barrels per day are set to come on stream in the next few years. There will



Source: Saudi Aramco



Estimated breakdown of current Saudi Aramco investment spending



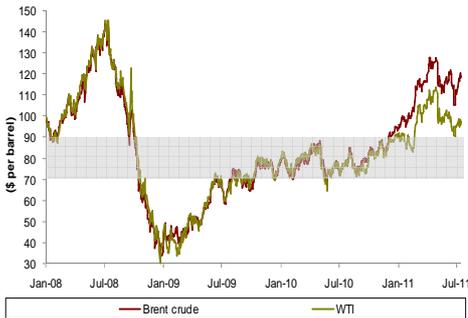
also be a major expansion of Saudi Aramco’s refinery in the US. In addition, Saudi Aramco is increasing its involvement in the petrochemicals sector. Its largest planned project is a \$17 billion integrated refining and petrochemicals joint venture with Dow Chemical. Further expansion of the PetroRabigh facility, a joint venture with Sumitomo Chemical of Japan, is also under study.

It should therefore be clear that while the Kingdom has largely completed its major push of the last decade to expand production capacity, it continues a substantial capital expenditure program to sustain that capacity and to grow elsewhere along the value chain. As the Kingdom’s oil production grows only gradually over the next 20 years, the spending requirements in the oil sector will nonetheless continue to be substantial, which has implications for the Kingdom’s fiscal position that we discuss later.

Prices

Should Saudi oil production rise only gradually over coming years, as we think most likely, then price becomes the important factor in determining whether oil revenues satisfy the country’s needs. Saudi officials stated that they were uncomfortable with prices as WTI was rising above \$100 per barrel, and have also suggested that a reasonable price is between \$70 and \$90 per barrel. In general though, Saudi officials avoid stating a specific price target and prefer to emphasize that their policy is to monitor the fundamentals of supply and demand and ensure that the global market is adequately supplied with oil.

Oil prices



Given the Kingdom’s interests in satisfying fiscal requirements and maximizing over time the revenues from its massive oil reserves, we think a price range of between \$70 and \$90 per barrel is currently a “sweet spot” for Saudi Arabia. For almost the last two years, from the summer of 2009 until early 2011, oil prices have been in this range with quite low volatility. A desire to push prices back into this range explains the Kingdom’s determination to raise oil output despite the failure to reach agreement at the recent Opec meeting and its reported role in the decision by IEA members to release oil from their strategic stocks.

Oil prices and US recessions
(recessions are shaded area)

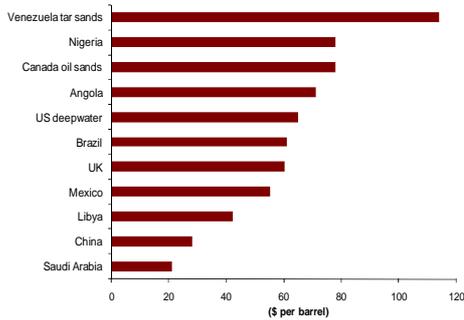


The Kingdom has no interest in prices that are so high that they cause the global economy to slow down, and therefore lower demand growth for oil. The chart on the left shows that each of the recessions in the US over the past 40 years was preceded by a major rise in oil prices. Recent data suggests the US economy has again slowed, and indeed this comes in the context of rising oil and gasoline prices. Oil prices, of course, have hardly, if ever, been the only factor at play. In the current case, the continued decline in home prices, high food prices and high unemployment are drags on US growth. Currently, a negative impact on global economic growth and oil demand seems to happen when crude oil prices (WTI) move above \$100 per barrel. We therefore think that the upper end of the “sweet spot” range for Saudi Arabia is at about \$90 per barrel, a level that should ensure continued healthy growth of global oil demand.

On the lower end of the range, at \$70 per barrel, a couple of factors contribute. First, oil prices below that level may discourage needed levels of investment in the global oil industry. Sustained and ideally not very volatile oil prices above about \$70 per barrel are needed to encourage development of difficult-to-produce oil reserves, such as



Development costs for upstream projects (WTI)



Source: CERA

those in deep water oil basins, or oil sands. It is in the Kingdom's interest, in our view, for such investment to be made globally to keep oil competitive with non-oil fuel sources, and to avoid sharp cyclical volatility in prices from periods of extremely tight or loose excess production capacity. Second, as shall be outlined below, Saudi fiscal requirements are best served currently with prices above \$70 per barrel.

It has become popular to reduce the oil revenue needs of oil producing countries to a "breakeven" price for oil. This is perhaps a reflection that with this year's unrest across the Arab World, the need for adequate immediate oil revenues has become one of the most important of the several drivers of oil policies in oil producing countries. With this in mind, we now turn our attention to fiscal issues in Saudi Arabia, focusing on the role of oil in Saudi Arabia's government finances. We also address our work on a breakeven price in some detail below because of the importance of precision with this concept.

Saudi government finances

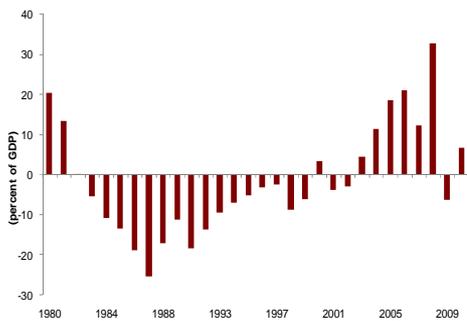
A strong fiscal position

The Kingdom is currently in a remarkably strong fiscal position owing to the prudent use of recent budget surpluses. A surge in oil prices from an average of \$31.1 per barrel in 2003 to \$99.7 per barrel in 2008 lifted oil revenues from SR231 billion (\$62 billion) to SR983 billion (\$262 billion) over the same period. This resulted in six consecutive years of budget surpluses, following a long period over which the budget was generally in deficit. Although the budget fell into deficit in 2009 as a result of lower oil prices and higher government spending to soften the impact of the global recession, it returned again to surplus last year. Oil accounts for around 85-90 percent of budget revenues.

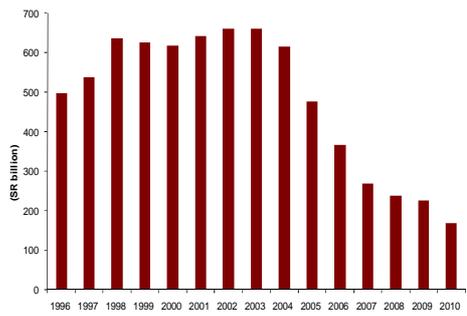
Recent surpluses have been used to repay much of the domestic debt that was built during the years of budget deficits and to raise foreign assets. Budget deficits were recorded every year from 1983 to 1999 as the government struggled to reduce its spending following the sharp decline in oil prices in the early 1980s. Between 1984 and 1992 the deficit averaged 16 percent of GDP. These deficits were funded by the issuance of domestic debt (the government has only once borrowed externally, after the 1990-1991 Gulf war). Domestic debt reached a peak as a percent of GDP of 119 percent at the end of 1999. In nominal terms, the peak was SR660 billion (\$176 billion) at the end of 2002. Since then, domestic debt has been cut each year to stand at SR167 billion (\$45 billion), 10.2 percent of GDP, at the end of 2010.

The large deficits prevented the government from building up foreign assets. Net foreign assets held by SAMA, the central bank, hovered around \$50 billion for much of the decade to the end of 2002, when they stood at \$42 billion (22 percent of GDP). Subsequent years of surpluses have allowed SAMA to lift its stock of net foreign assets to \$481 billion (111 percent of GDP) by the end of May 2011. Including independent government organizations (primarily the pension and development funds), total official net foreign assets of the Kingdom were \$562 billion (129 percent of GDP) as at end-May.

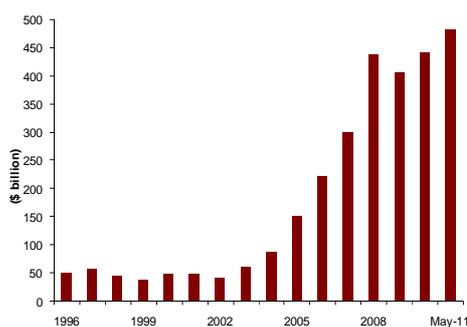
Budgetary performance



Government debt



SAMA net foreign assets





The Kingdom is therefore in an enviable position. While many countries in the world are striving to cut debt, Saudi Arabia's debt is very small and its vast foreign assets provide a huge cushion in the event of a fall in revenues. For example, the Kingdom could run a deficit of 10 percent of 2010 GDP for the next decade without issuing any debt and still have official reserves of over \$110 billion. At the most extreme, and only for the sake of comparison, the Kingdom could finance all likely spending from savings and non-oil revenues without needing to increase debt for two-and-a-half years even if it earned absolutely no oil revenues over that period.

Rapid growth in government spending

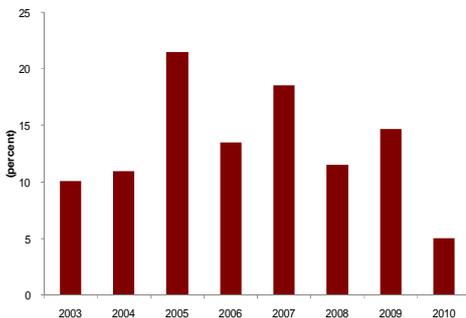
High oil prices are the reason for the transformation in the Kingdom's balance sheet. But they have also enabled a surge in government spending. History shows that it has been challenging for the government to moderate the growth in spending, regardless of the oil price environment. Government spending growth averaged 13 percent per year between 2003 and 2010. In 2003 the government ran a budget surplus of SR36 billion (\$10 billion) with an average price for Saudi export crude of \$28 per barrel. In 2009, the budget was in deficit (SR86 billion; \$23 billion) even though Saudi export crude averaged \$62 per barrel.

Some of the growth in spending is attributable to a surge in spending on infrastructure. Total capital expenditure was SR180 billion (\$48 billion) in 2009, up from SR33 billion (\$9 billion) in 2003. The leap in capital expenditure is due to successive government spending plans aimed at providing quantitative and qualitative enhancements to physical and social infrastructure. Such spending is set to remain high until 2014 at least, in line with the 2010-2014 Development Plan, and probably for several years longer as the recent commitment to spend SR250 billion (\$67 billion) building 500,000 new housing units is implemented. We expect a reduction in this category of government spending over the second half of the decade as the bulk of the infrastructure upgrade is completed. But current expenditures will increase with ongoing maintenance and operating costs of the new facilities.

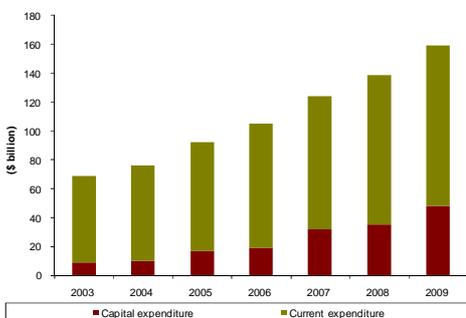
However, infrastructure spending only accounts for around 30 percent of total expenditure. The remainder is current spending, the largest component of which are the wages and salaries of government employees. The most recent breakdown of spending is from 2009. It shows that since 2003, current spending has risen by SR193 billion (\$51 billion) and investment spending by SR146 billion (\$39 billion). Current spending is a far bigger constraint on the flexibility of government spending. This is because reducing the government wage bill is a far more sensitive task than lessening investment spending, as it involves one or both of cutting the number of people employed by the government and lowering the pay of government employees. In contrast, investment spending can be more easily scaled back should the government choose not to go ahead with a project.

Spending on the government wage bill increased by 76 percent (SR91 billion; \$24 billion) between 2003 and 2009. Over this period the number of employees in the public sector rose by 26 percent; in addition, several pay rises were awarded and an inflation allowance was introduced in 2008. As the number of employees rose faster

Growth in government spending



Breakdown of government spending





than the government services component of GDP (which was up by 18 percent from 2003 to 2009), productivity in the government fell. Spending growth was the fastest for government supplies and services, which leapt by 181 percent to SR117 billion (\$31 billion). In contrast, the Kingdom has made major savings in interest payments on government debt, as the debt was repaid. Back in 2000, these payments accounted for 14 percent of total government spending; by 2009 they had fallen to just 2 percent.

The breakeven oil price

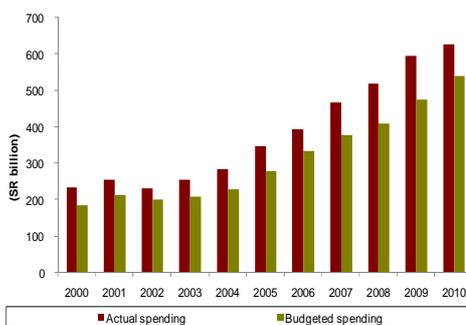
We define the breakeven oil price as the oil price at which actual government revenue will equal actual government expenditure. It is different than the price the budget is based on, given that the budget usually incorporates a planned surplus or deficit. It is therefore also different than the price needed to satisfy the revenue assumption in the budget. The breakeven price tends to be higher than these other prices because actual spending tends to be significantly higher than budgeted spending. Actual spending has exceeded budgeted spending by an average of 22 percent over the past decade.

As an example of the above three approaches, based on our calculations, the revenue target in the 2010 budget, which included a forecast SR70 billion (\$19 billion) deficit, needed \$49 per barrel (WTI) to be met. For the budget to balance a price of \$56 per barrel was required. With actual spending 16 percent above the budgeted level, the oil price needed to balance actual revenue with actual spending (the breakeven price) was \$72 per barrel. Whichever approach is considered, it is clear that rising spending over recent years has pushed up the breakeven oil price.

Even focusing solely on the breakeven price, and not the other variations, there are a wide variety of estimates among analysts as to what the current breakeven price is. This variation is because calculating the breakeven price depends on assumptions about the following:

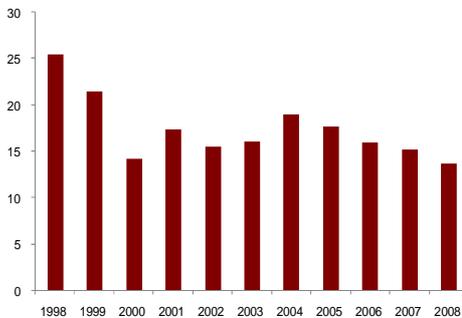
- **Oil export volumes:** Calculating oil revenues must take into consideration oil production, not just the oil price. Therefore, overall oil production and domestic consumption have to be considered.
- **Domestic oil prices:** Oil is sold domestically to a variety of users at a variety of prices. Any changes to these prices would have revenue implications.
- **Saudi Aramco spending:** All the receipts from oil sales initially go to Saudi Aramco. Saudi Aramco first funds from these receipts its budgeted spending needs, as agreed in advance by its owners, the Saudi government. It then transfers the remainder to the government. These funds are the government's oil revenues for general budgetary purposes. Saudi Aramco spending varies from year to year, mainly according to capital expenditures on projects it is undertaking. Saudi Aramco does not publish its budget, so its spending has to be estimated.
- **Non-oil revenues:** Non-oil revenues account for around 12 percent of total government revenue. They can be volatile, such as in 2008, when they jumped by 46 percent (SR37 billion; \$10

Budgeted and actual government spending

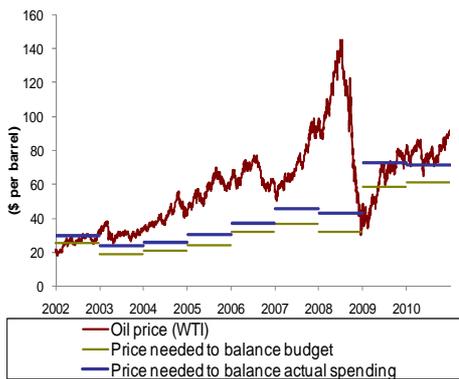




Refined products as percent of oil exports



Breakeven oil price
(Saudi export crude unless stated)



billion), due largely to the receipt of telecom license fees.

- **Off-budget spending:** Not all spending that takes place is captured in the published budget data, so off-budget spending needs to be estimated and adjusted for in the calculations.
- **Exports of refined products:** Part of the oil that is consumed domestically is later exported as refined products. Profits from exports of refined products are counted as oil revenues in the budget calculations. Rising domestic consumption means there has been a consistent decline in exports of refined products as a percentage of oil export revenues; from 25 percent in 1998 to 14 percent in 2008. Over the decade to 2008 (the latest figure available) they have averaged 17 percent of the total. In converting export revenues of refined products into budget revenues, we adjust for the outflows to partners in local joint-venture refineries and the inflows from part Saudi Aramco-owned refineries abroad.

There are two further questions that need to be considered before the breakeven oil price can be determined:

- **What is the impact of the government institutions that are not part of the central government budget?** The breakeven price usually refers to the central government budget. This does not capture the finances of other government institutions such as the pension funds and the Public Investment Fund. These government institutions tend to run surpluses of 2-3 percent of GDP.
- **Which oil price accurately reflects Saudi oil revenues?** There are many different oil prices and these can vary quite markedly. For example, Saudi Arabia charges 17 different prices for its oil exports, depending on grade of crude and which region the consumer is based in. Adjustments to these prices are announced to the market monthly. For our purposes, we report the breakeven price as an average price for Saudi crude oil exports. We estimate that average Saudi crude is currently trading around mid-way between Brent and WTI.

Taking all this into consideration, to the left is a chart of our estimated breakeven price for actual central government revenue to equal actual central government spending and the price needed to balance the government budget in past years, versus the actual price of oil for that year. It is clear from the chart that one aspect of Saudi budget planning is a consistently conservative view of oil prices.

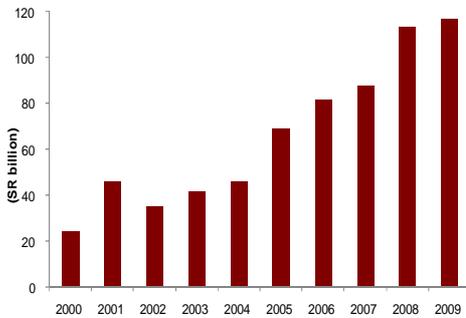
There is limited scope for similar savings elsewhere in the budget. Indeed, the strong upward pressure on most components of the government spending is clear from the breakdown below.

- **Wages:** Wages of government workers are by far the largest component of current spending and at SR210 billion (\$56 billion) accounted for 35 percent of total government spending in 2009. The recent increase in the minimum wage for government workers will add to the wage bill, as will the two-month's salary bonus. We assume that the latter will not be repeated. The rapid growth in Saudi employment in the public sector is likely to

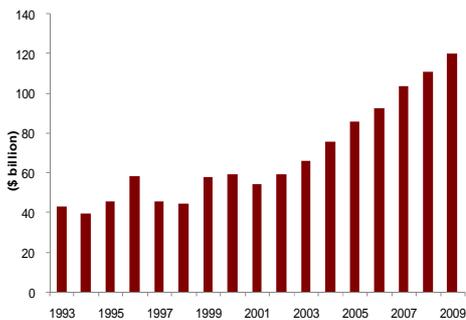


continue; it was up by 14 percent from 2007 to 2009 (latest data); over the same period the number of expatriates in the public sector rose by 9 percent.

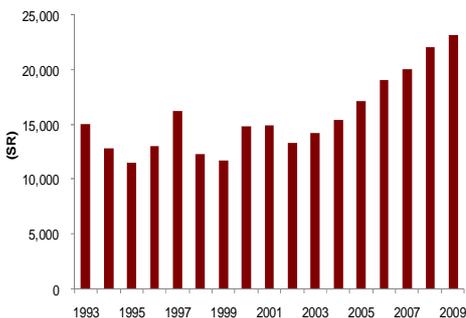
Spending on supplies and services



Total current spending



Current spending per Saudi national



- Supplies and services:** Supplies of materials and payments for services are the second largest and fastest growing category of current spending. We see little reason for the pace of growth to slow until the second half of the decade, when the requirement for raw materials and services related to construction projects should ease.
- Subsidies:** Social security accounts for just over half of the subsidies bill; wheat, barley and poultry feed constitute the bulk of the remainder. The cost of these subsidies should remain on an uptrend owing to greater domestic consumption. A more targeted subsidy program would result in expenditure savings.
- Interest payments:** We do not see any prospect of a significant increase in government debt over the next decade and therefore expect interest payments on government debt to be low.
- Operations and maintenance:** Costs related to the operation and maintenance of government facilities should increase fairly sharply as projects are completed.
- Other:** This includes foreign aid and transfers. We assume that the new unemployment benefit will be categorized as a transfer. It is not clear how much the unemployment benefit will cost. According to the Central Department of Statistics there were 463,000 unemployed Saudis in 2009, however, Ministry of Labor data put the number of job seekers at 112,000. The wording of the decree that introduced the benefit stated that it would go to job seekers (who are registered at the Ministry of Labor), but the difference between a job seeker and someone who is unemployed is unclear. In any case, we estimate that the benefit will initially cost around SR1 billion per month. While it is slated to run for 12 months, it will be difficult for the government to withdraw the benefit.

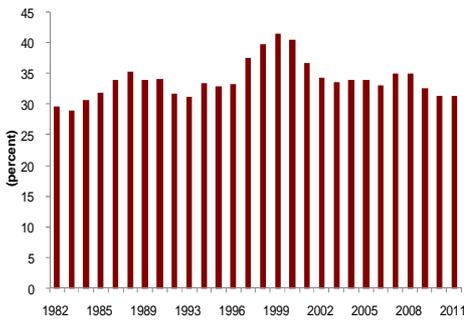
Breakdown of current spending (SR billion)

| | 2000 | 2003 | 2006 | 2009 |
|----------------------------|------------|------------|------------|------------|
| Wages | 115 | 119 | 162 | 210 |
| Supplies and services | 24 | 42 | 82 | 117 |
| Subsidies | 9 | 7 | 6 | 22 |
| Interest payments | 32 | 28 | 28 | 14 |
| Operations and maintenance | 27 | 29 | 35 | 48 |
| Other | 1 | 4 | 16 | 7 |
| Total | 208 | 228 | 328 | 417 |

The other approach to breaking down government spending is by function. Under this approach, spending is classified by its different end uses, such as human resource development, defense and security and infrastructure development (the full breakdown is in the table below). This data is more up-to-date, but it only covers the allocations in the budget rather than actual spending and the composition of some components is unclear and not consistent with international standards.



Budgeted defense and security spending
(percent of total)



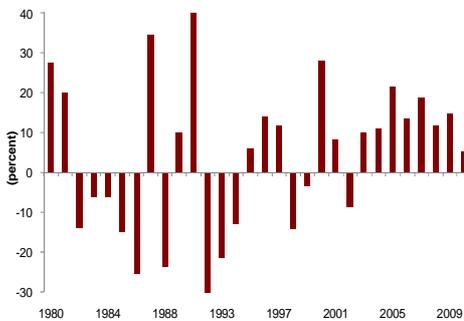
The data shows that there has been very little change in the functional breakdown of government spending over time. From 2002, just before oil prices started to take off and just after large increases in defense and security spending associated with the Iraq war, to 2011, spending in only one area, human resource development, has changed by more than three percentage points.

This stability suggests that the government has limited flexibility in changing the mix of spending. One clear feature of the data is that defense and security spending has consistently accounted for 30 to 35 percent of the total. It has not been below this level since 1983 and was only above it from 1997 to 2001. This is the largest item of spending and we think it unlikely that it will fall below the 30 percent level, particularly as a series of large multi-year defense contracts have been signed in recent years.

Spending on human resource development, economic resource development, health and social development and infrastructure development, a combined 42 percent of spending, has been prioritized by the government. Over the near term expenditure on these areas should grow, though the eventual shift from infrastructure into current spending, as new facilities are completed, will allow a gradual easing toward the end of the decade.

For most of the other components of government spending—transport and communications, subsidies and municipal services—we also expect continued growth in spending; as the number of housing units rises, pressure on municipal services will definitely grow. The only sector where there has been a notable proportional decline in spending is public administration. Expenditure on this area has dropped from 19 percent of the total to 16 percent since 2002, though this still equates to average annual growth of 11 percent. Ongoing automation of government services through the use of the internet should generate some efficiency savings, but the bulk of public administration costs are likely to consist of wages, where there is less room for cutbacks.

Growth in government spending



Note: The 1990 and 1991 budgets were combined, distorting the figures for those years and 1992.

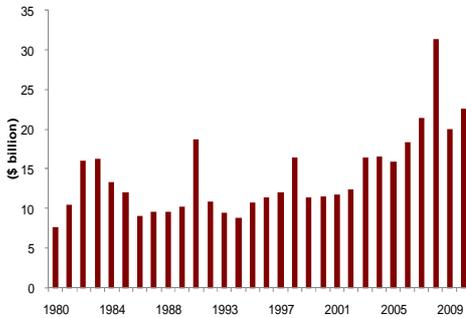
Breakdown of budgeted government spending
(percent of total)

| | 2001 | 2003 | 2005 | 2007 | 2009 | 2011 |
|---------------------------------|------|------|------|------|------|------|
| Human Resource Development | 25 | 24 | 25 | 25 | 26 | 26 |
| Transport & Communications | 3 | 3 | 3 | 3 | 3 | 3 |
| Economic Resource Development | 3 | 3 | 4 | 4 | 5 | 6 |
| Health & Social Development | 8 | 8 | 8 | 8 | 9 | 9 |
| Infrastructure Development | 1 | 1 | 1 | 1 | 2 | 2 |
| Municipal Services | 3 | 3 | 3 | 4 | 3 | 4 |
| Defense & Security | 37 | 34 | 34 | 35 | 33 | 31 |
| Public Administration | 17 | 21 | 18 | 16 | 17 | 16 |
| Government Lending Institutions | 0 | 0 | 0 | 0 | 0 | 0 |
| Subsidies | 3 | 3 | 3 | 3 | 4 | 4 |

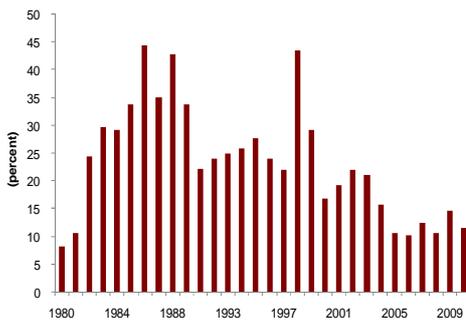
Given the above, we expect government spending growth to average about 7 percent per year over the next 20 years. This is only about half the rate of spending growth of the past decade, but in line with spending growth over the past 20 years, which includes a full cycle of both high and low oil price periods and is more representative of what we are likely to see over the next 20 years. We factor this into our calculations below that determine the breakeven oil price for the Kingdom out to 2030.



Non-oil revenues



Non-oil revenues
(percent of total revenues)



Low non-oil revenues

Future growth in non-oil revenues is also important for calculating the Kingdom's oil revenue needs for the years ahead. Non-oil revenues should continue to grow over the next two decades, though not at a pace that will greatly increase their contribution to overall revenues unless there are changes to government policies, particularly with regard to taxation. For 2009, non-oil revenues contributed 15 percent of total revenues. The current sources of non-oil revenue are:

- Fees and charges:** Fees and charges for government services such as communications, postal services, water, landing taxes for airplanes, telecoms licenses and services to individuals such as passports and iqamas (residency permits for expatriate workers) are currently the main source of non-oil revenues. They constituted 40 percent of total non-oil revenue in 2009. The government could raise more money by adjusting the fees it charges for these services.
- Investment income:** Income earned by the government's investments is the second largest source of government revenue, comprising 16 percent of the 2009 total. The government has a conservative investment policy and while at the margins it may take on riskier assets with potentially higher returns, we expect that the bulk of its investments, held at the central bank, will continue to comprise US government debt. As a result US interest rates will retain an important role in determining the value of investment income. Rising interest rates over the next few years will lift investment income, assuming there is not a significant drawdown of assets. Any reduction in foreign assets will hit revenue from this source.
- Income taxes:** Taxes on the incomes of foreign companies operating in the Kingdom and zakat (a 2.5 percent levy on a company's total assets) constituted 10 percent of non-oil revenue in 2009. These revenues should grow further as more foreign firms set up operations in the Kingdom and local companies expand. Income and consumption taxes are the main source of revenue for most governments in the world. Introducing these taxes could have an important impact on non-oil revenues.
- Customs:** Customs revenues are expected to rise in line with the growth in trade as the economy expands.
- Other:** This includes government sales of property, fines, rents for the use of government property and other sources of non-oil revenue. Sales of government property could become a useful source of non-oil revenue, though the one-time nature of these transactions means that they should be carefully sequenced.

Non-oil revenues

(SR billion)

| | 2000 | 2003 | 2006 | 2009 |
|-------------------|-----------|-----------|-----------|-----------|
| Investment income | 6 | 5 | 15 | 11 |
| Income taxes | 2 | 2 | 12 | 8 |
| Fees and charges | 21 | 26 | 27 | 30 |
| Customs | 10 | 8 | 11 | 13 |
| Other | 6 | 6 | 10 | 14 |
| Total | 44 | 47 | 74 | 75 |



With this mix of non-oil revenues, it is very unlikely that they could be increased significantly without difficult policy changes, especially in the area of taxation. Dependence on oil revenues for around 85 percent of total government revenues is likely to continue for many years.

Domestic energy consumption

The growth in domestic energy consumption

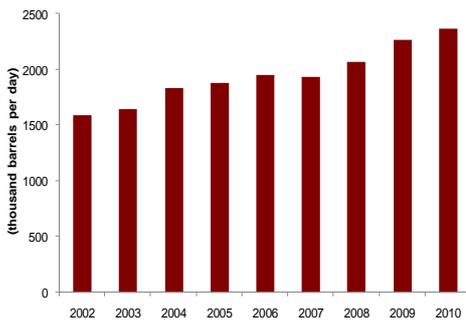
Three important trends come together to pose a significant challenge to Saudi Arabia's continued dependence on oil revenues. We have addressed two: the Kingdom is likely to experience only a very gradual increase in production of crude oil, and the government's spending will continue to rise at a rapid pace and rely primarily on oil revenues. The third of these trends is that the country's domestic consumption of energy, especially oil, at very cheap prices, is also likely to continue to rise rapidly, sharply reducing the amount of oil available for export. Combined, these trends paint a picture of significant future challenges for the Kingdom.

Oil consumption is rising rapidly in Saudi Arabia. Domestic use of oil averaged 2.4 million barrels per day in 2010, up from 1.9 million barrels per day in 2007 and 1.6 million barrels per day in 2003 according to data supplied by the government to the Joint Oil Data Initiative (JODI). Annual growth has averaged 5.2 percent since 2003. Domestic consumption in the first quarter of 2011 was 2.9 percent higher than the same period of last year, though it declined in the subsequent two months. Consumption peaks during the summer owing to the amount of energy that is used to power air conditioning. At its peak, in August 2010, domestic consumption was 2.9 million barrels per day, compared to a low point for last year of 1.9 million barrels per day in November, when it was cooler and offices and shops were closed for part of the month because of the Eid al-Adha holiday.

Total domestic consumption of petroleum products (which includes refined products and natural gas as well as crude oil) was 3.2 million barrels of oil equivalent per day in 2009, according to the Ministry of Petroleum and Mineral Resources. This was 69 percent higher than in 1999 and 179 percent greater than in 1989. The pace of consumption growth has picked up in recent years, from an annual average of 4.8 percent between 2000 and 2004 to 5.9 percent between 2005 and 2009. If growth is maintained at this latter pace, domestic consumption of both oil and gas would reach 5.9 million barrels of oil equivalent per day by 2020 and 10.6 million barrels of oil equivalent per day by 2030.

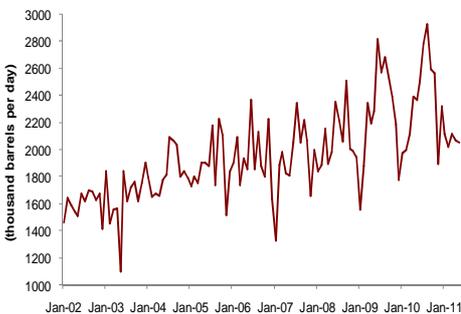
In the available data, consumption of oil and gas is broken down into two sources, the oil industry and the rest of the economy. Consumption in the oil industry accounted for 10 percent of the total in 2009 and is related to oil production, though it tends to grow faster; it climbed by 14 percent between 1999 and 2009. It is consumption in the rest of the economy (residential, commercial, industrial, transportation and power generation) where the bulk of growth has occurred. This rose by 77 percent between 1999 and 2009, when it stood at 2.8 million barrels of oil equivalent per day. Natural gas accounted for 40 percent of total consumption, with liquefied petroleum gas, used in home cooking, at 1 percent and

Domestic oil consumption
(annual data)



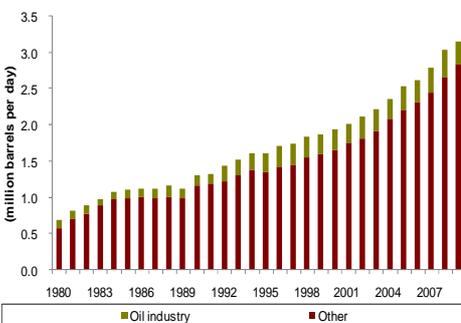
Source: JODI

Domestic oil consumption
(monthly data)



Source: JODI

Domestic consumption of petroleum products



Source: Ministry of Petroleum and Mineral Resources



other refined products the remainder.

The impact of the rapid growth in domestic consumption on local oil demand has been compounded by shortages of gas. Four joint-ventures between Saudi Aramco and foreign oil companies began searching for gas in the Empty Quarter in 2004 (their exploration areas cover 332,000 square kilometers), but the discoveries have not been that large and the exploration costs are relatively high. As a result, some projects that were based on gas feedstock are instead using crude oil as feedstock. Oil is increasingly being used to generate electricity (the IEA estimates that an average of 582,000 barrels per day of crude will be burned for power generation in 2011, up from 170,000 barrels per day in 2006) and to power water desalination, which is an energy intensive process.

Potential for nuclear and renewables in Saudi Arabia

A future energy mix for the Kingdom has been devised that would greatly reduce the domestic reliance on fossil fuels. Under plans unveiled by the King Abdullah City for Atomic and Renewable Energy (KA-Care), the contribution of fossil fuels in total energy mix will fall from 100 percent in 2010 to just 15 percent in 2050. This relies on a large jump in energy from alternative sources. By 2050 the organization projects that nuclear power will account for 36 percent of the Kingdom's energy needs and solar, either in the form of concentrated solar power (where mirrors are used to concentrate a large area of sunlight onto a small area) or photovoltaics (panels with semiconductors that can convert sunlight directly into electricity) a further 39 percent.

Sustainable energy mix for Saudi Arabia (percent of total)

| | 2010 | 2030 | 2050 |
|----------------------------|------|------|------|
| Existing gas | 46 | 14 | 0 |
| Existing crude | 11 | 3 | 0 |
| Existing heavy fuel oil | 21 | 6 | 0 |
| Existing diesel | 11 | 2 | 0 |
| New committed fossil fuels | 10 | 11 | 0 |
| New required fossil fuels | 0 | 21 | 15 |
| Nuclear | 0 | 18 | 36 |
| Concentrated solar power | 0 | 11 | 19 |
| Solar photovoltaics | 0 | 12 | 20 |
| Wind/other renewable | 0 | 3 | 10 |

Source: KA-Care

A step toward this goal was taken in May, when KA-Care announced plans for the construction of up to 16 nuclear reactors by 2030, at a cost of around \$7 billion each. The first two are scheduled to be operational within a decade. In total, the Kingdom is planning to have installed capacity of 40 gigawatts for nuclear power and 30 gigawatts for solar power by 2030. In addition, much of the research agenda of some of the Kingdom's new universities, particularly the King Abdullah University of Science and Technology (KAUST), is focused on the development of alternative energies.

It is notable that the goal of the energy strategy is not to slow the growth in consumption, but to change the sources of energy. This highlights the importance of pricing the new fuels at levels that are



attractive compared to gas and oil. The table below of KA-Care's estimates of the cost of production of one kilowatt hour of energy shows that gas is around one third of the price of nuclear and around one-fifth of the price of solar assuming a gas price of \$2.8 per million Btu (nearly four times higher than the current level). The installation of the new energy generation capacity will also be expensive. The study does not put an absolute figure on this, but claims that the export of the technology used in the new industries and the boost to GDP these industries would generate will be a major source of new revenue to offset the cost of new facilities.

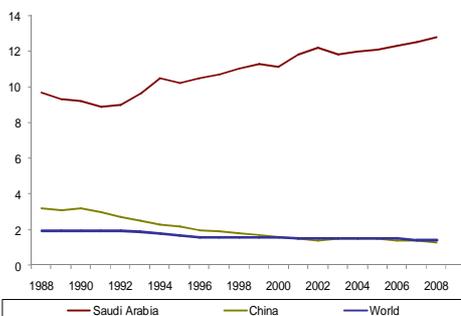
Cost of producing one kilowatt hour of energy

| | Cost (US cents) | Load factor (percent) | Cost (US cents) | Load factor (percent) |
|----------------------------|------------------------------|--------------------------|------------------------------|--------------------------|
| | Oil:\$16/boe, gas:\$2.8/mBtu | | Oil:\$65/boe, gas:\$4.2/mBtu | |
| Gas CCGT base ¹ | 4.0 | 85 | 4.8 | 85 |
| Gas OCGT base ² | 4.3 | 85 | 5.4 | 85 |
| Oil base | 6.0 | 85 | 12.4 | 85 |
| Gas peaking | 9.7 | 20 | 10.5 | 20 |
| Oil peaking | 14.4 | 20 | 20.8 | 20 |
| Coal | 5.6 | 85 | | |
| Geothermal | 7.0 | 90 | | |
| Nuclear | 12.7 | 80 | | |
| Wind (onshore) | 13.4 | 22 | | |
| Solar CSP | 17.5 | 34 | | |
| Solar PV | 24.4 | 24 | | |
| Wind (offshore) | 27.5 | 27 | | |

¹Combined cycle gas turbine
²Open cycle gas turbine
 Source: KA-Care

The plans are extremely ambitious. Today, nuclear and solar energy combined account for 7 percent of the total global energy mix, and forecasters expect this to grow to about 11 percent by 2030. Under the KA-Care assumptions, nuclear and solar would satisfy 41 percent of the Kingdom's energy needs by 2030, making the plan one of the world's most aggressive alternative energy programs. Developing these alternatives would somewhat offset domestic consumption of oil, but oil in the Kingdom, as elsewhere, is primarily a transportation fuel, not an electric power fuel.

Energy efficiency
 (barrels of oil equivalent per day to generate \$1,000 of GDP)



While it is natural that as a country develops its energy consumption rises, where the Kingdom differs from the norm is that it has become less efficient in its use of energy. The chart to the left compares energy use with the size of the economy. For the world as a whole, the economy has grown faster than energy consumption, meaning that the world has become more energy efficient. In 2009 it took energy equivalent to 1.3 barrels of oil per day to generate \$1,000 of GDP, compared to 1.95 barrels in 1988. For China, where oil consumption has grown the fastest over this period, the improvement in the efficiency of use was even greater, to 1.2 barrels of equivalent oil per day per \$1,000 of GDP from 3.2 barrels in 1988.

In contrast, energy is used far less efficiently in the Kingdom and energy efficiency has consistently worsened. In 2009, it took energy equivalent to 13.6 barrels of oil per day to generate \$1,000 of GDP, ten times greater than the average for the world and 40 percent more than in Saudi Arabia in 1988. In recent years the deterioration in



energy efficiency worsened. Between 2007 and 2010 demand for oil in the Kingdom increased by 22 percent, double the growth of the non-oil private sector. Oil consumption in the Kingdom grew at a slightly faster pace than the rate in China over the period, even though the Chinese economy expanded at almost three times the pace of the Kingdom's non-oil economy.

Setting aside natural gas and looking solely at the domestic growth in oil consumption, if continued at its average growth rate of the past eight years, then the Kingdom will be consuming 3.9 million barrels per day of oil annually by 2020, and 6.5 million barrels per day by 2030. If we assume that only transportation and industrial use of oil grows at that rate, while oil used for power generation stays constant, then domestic oil consumption in 2030 grows to 5.5 million barrels per day. Recall this would be a portion of our base case view of total production of 11.5 million barrels per day, leaving the country with 6 million barrels per day for export .

The high cost of low energy prices

The key reason for the rise in consumption is very low energy prices. Gas is \$0.75 per million British thermal units, gasoline is \$0.45 or \$0.61 per gallon (for 91 or 95 octane fuel, respectively) and electricity starts at \$0.013 per kilowatt hour for residential users and \$0.036 per kilowatt hour for commercial users. These are among the lowest prices in the world. Energy priced at such low levels does not encourage conservation or penalize inefficient use. Very low prices also necessitate high spending on the construction and maintenance of related facilities, such as water and power plants.

Retail gasoline price

| Country | Price (\$/gallon) | Country | Price (\$/gallon) |
|--------------|-------------------|-------------|-------------------|
| Saudi Arabia | 0.61 | India | 4.66 |
| Indonesia | 1.93 | South Korea | 6.47 |
| US | 3.86 | Germany | 8.01 |
| China | 4.23 | UK | 8.09 |

Source: EIA, Reuters

There is limited publicly available information on the cost of a barrel of oil to local consumers. The data that is available shows that this cost is very low. Saudi Electricity pays Saudi Aramco \$0.74 per million British thermal units (\$4.3 per barrel) for light crude and \$0.47 per million British thermal units (\$2.7 per barrel) for heavy crude. The prospectus for the stock market listing of Jof Cement, issued last year, stated that it has a one-year contract for Saudi Aramco to deliver fuel at a cost of SR115 per ton (\$4.2 per barrel). We assume that the same price is charged to other cement companies. Prices are unlikely to be significantly different for other industrial users.

The price Saudi Aramco receives from local gasoline retailers can be derived using assumptions based on the gasoline price data that is available. Gasoline retails at an average price of \$0.53 per gallon, equivalent to \$22.3 per barrel. Saudi gasoline retailers have a built in 20 percent profit margin, from which they fund distribution and marketing. As Saudi Aramco also refines the fuel and incorporates these costs in its selling price (in the US in 2010 refining costs accounted for around 8 percent of the average retail gasoline price before tax), we assume that fuel retailers pay around \$18 per barrel for gasoline.



It is clear that Saudi Arabia earns far more from exporting oil than it does from consuming it locally.

- Potential impacts on the global price of oil aside, if all of the 2.4 million barrels per day consumed domestically in 2010 were priced at \$10 per barrel for local consumers (more than what the electricity company and industrial consumers pay but less than our estimate for gasoline retailers), were instead exported, this would have generated additional oil revenue of around \$60 billion, on top of the \$215 billion received in oil export earnings.
- If local oil consumption continues to grow at the same pace that it has over the last eight years, then by 2020 it would reach 3.9 million barrels per day and by 2030 it would be 6.5 million barrels per day. Extending the trend even further, by 2037 domestic consumption would exceed the Kingdom's current production and by 2043 it would be greater than the Kingdom's current production capacity of 12.5 million barrels per day.

Reform of domestic pricing policy is an important way to tackle the rising consumption of energy and improve the efficiency with which it is used. Some progress was made in July 2010, when the government lifted electricity tariffs for commercial and industrial users, though the last change in energy prices that directly affected individual consumers was downward, with the introduction of the cheaper 91 octane gasoline in May 2006. Other oil exporters in the region are revising their energy pricing policies. The UAE started gradually lifting fuel prices last year and Iran has recently adopted a more aggressive approach to raising fuel prices and reallocating the additional revenues.

There are other less sensitive approaches open to the government to contain energy consumption. For example, an improvement in the distribution infrastructure would generate savings; a study of six cities by the National Water Company found that losses due to leakage varied between 10 and 25 percent. The introduction of a public transport network and public awareness campaigns can also contribute to reducing fuel and electricity use. The development of alternative sources of energy within the Kingdom, while not tackling energy consumption growth, would reduce the reliance on oil to meet local demand and thereby free more for export.

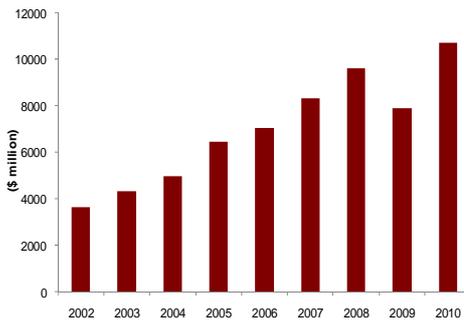
The gas price dilemma

One of the most pressing areas of energy pricing reform for the government to consider is the price of natural gas. Natural gas is currently priced at a fixed rate of \$0.75 per million British thermal units (Btus), compared to an international price (Henry Hub) of \$4.45 per million Btus. Gas is a key feedstock for the Kingdom's petrochemical companies and the low price is central to the competitiveness of local producers. (As the same price is charged for all gas consumers in the Kingdom, and as no natural gas is exported and sold at a separate, higher export price, the pricing regime is in accordance with Saudi commitments made upon its accession to the World Trade Organization.)

However, the costs of developing the new gas discoveries are much greater than the current fixed price. According to industry sources cited by Energy Intelligence Group, development costs are \$6 per



Exports of petrochemicals



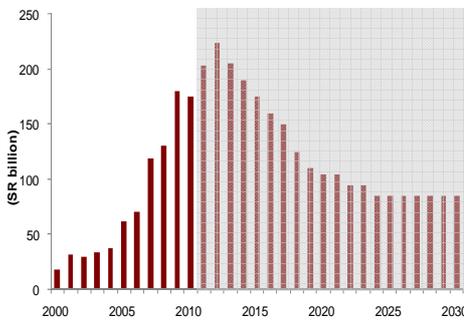
million Btus for the Kidan gas field in the Saudi Aramco/Royal Dutch Shell joint-venture and \$4.5 per million Btus for Karan, an offshore gas field developed solely by Saudi Aramco. The high development cost compared to the sales price is potentially a deterrent to development of new gas reserves. The historical development cost of much of the existing gas production, however, remains below the current sales price.

An increase in the natural gas price has been under discussion for some time, but it is not clear when any decision will be reached. An adjustment would not affect Saudi citizens directly in the way that a hike in gasoline prices would, as they do not buy natural gas. However, it has the potential to weaken the strong competitive position of the Kingdom's petrochemical producers. This would have implications for the ongoing move into downstream products and industries, which is seen by the government as an important future source of non-oil growth and of private sector jobs.

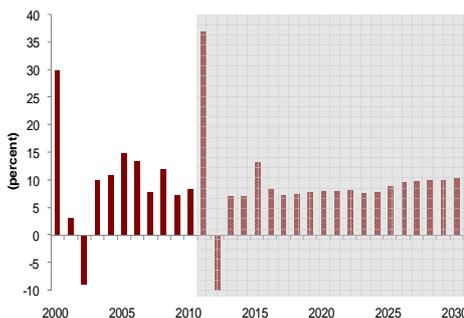
Outlook and implications

We have combined our forecast of the trends outlined above—slow growth in Saudi crude oil production, fast growth in government spending and rapidly rising domestic consumption of oil—to derive detailed projections of government finances and breakeven oil prices for each year until 2030. These show that the Kingdom's fiscal position is reasonably comfortable for the next 10 years, before potentially worsening sharply by the end of the 2020s. Our calculations are based on the following assumptions:

Outlook for capital expenditure
(forecasts in shaded area)



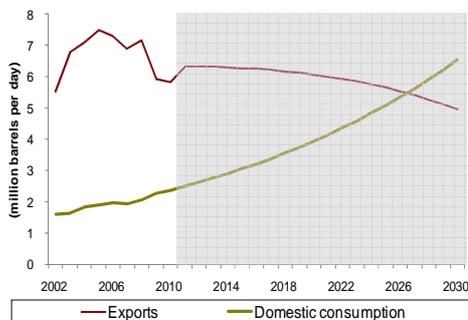
Outlook for government spending growth
(forecasts in shaded area)



- Capital expenditure:** We expect capital expenditure to peak in 2012, as the house-building program gains momentum and infrastructure enhancement is at its high point. It will then fall gradually with the completion of major infrastructure projects. We assume that further cutbacks in capital spending are made in line with a deteriorating budgetary position from toward the end of this decade until 2024, when the level stabilizes. The government cut capital spending aggressively in the 1980s and held it very low for much of the 1990s because of budgetary pressure caused by low oil prices; it could well adopt this approach in the future.
- Current expenditure:** We have produced detailed forecasts for the six components of current spending based on the assumptions stated in the section on current spending earlier in this report. After 2012, when the picture is distorted by various one-time payments made in 2011, growth in spending is forecast at a rate lower than for 2001-2009 (the data that is available), as those years incorporated a boom in government spending.
- Total government spending:** Combining capital and current spending results in a forecast annual average growth in government spending over the period from 2011 to 2030 of 7 percent. This is on par with the average of 6.3 percent for the years from 1993 to 2010, a period we think is comparable, as it contained boom years (spending growth averaged 13 percent between 2003 and 2010) and tough years (spending was cut by an average of 3 percent per year between 1993 and 1999).



Outlook for oil consumption and exports
(forecasts in shaded area)

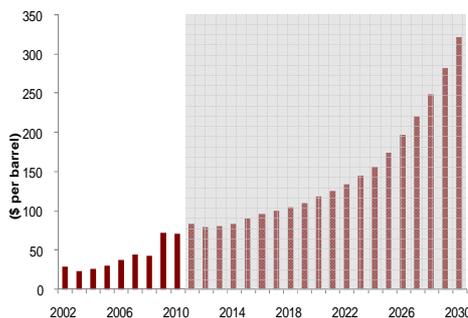


- **Non-oil revenue:** Based on the assumption that there is no change in tax policy and no new policies are adopted to raise non-oil revenues, we project that non-oil revenue will grow by 8 percent per year. This was the average annual growth rate between 2001 and 2010.
- **Oil exports:** We project oil production to increase by 1.4 percent per year, in line with forecasts of long-term global oil demand growth made by the IEA, Opec and the US Department of Energy, and growth in domestic oil consumption is forecast at 5.2 percent, the average between 2003 and 2010 (the only period that domestic oil consumption data is available).
- **Other:** Aramco spending is projected to move to a lower level for the next five years in line with the announced plans. After this we expect higher spending for around another five years as work is undertaken to increase oil production capacity. A similar cycle is expected during the 2020s. Off-budget spending, domestic oil prices and exports of refined products as a proportion of total exports are all assumed to remain constant.

Summary

| | 2005 | 2010 | 2015f | 2020f | 2025f | 2030f |
|---|------|-------|-------|-------|-------|--------|
| Oil indicators (million barrels per day) | | | | | | |
| Oil production | 9.4 | 8.2 | 9.3 | 10.0 | 10.7 | 11.5 |
| Oil exports | 7.5 | 5.8 | 6.3 | 6.0 | 5.6 | 4.9 |
| Domestic consumption | 1.9 | 2.4 | 3.1 | 3.9 | 5.1 | 6.5 |
| Budgetary indicators (SR billion) | | | | | | |
| Total revenue | 564 | 735 | 843 | 961 | 1,108 | 1,120 |
| Total expenditure | 346 | 627 | 893 | 1,147 | 1,620 | 2,453 |
| Balance | 218 | 109 | -50 | -186 | -512 | -1,334 |
| SAMA net foreign assets | 564 | 1,652 | 1,958 | 1,331 | 375 | 375 |
| Domestic debt | 475 | 167 | 167 | 167 | 949 | 5,889 |
| Breakeven oil price (\$ per barrel) | | | | | | |
| Saudi export crude | 30.3 | 71.6 | 90.7 | 118.5 | 175.1 | 321.7 |

Projected breakeven oil price
(Saudi export crude; forecasts in shaded area)



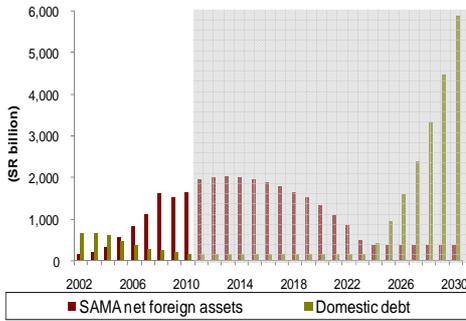
Based on the above assumptions, we estimate that the breakeven oil price required to balance actual government revenue with actual government expenditure will not rise above \$100 per barrel (for Saudi export crude) until 2017 and will stay below \$120 per barrel until 2021. Since prices seem likely to be close to this area for the period, it appears that Saudi Arabia has about a decade where it will only need to run relatively small budget deficits that would not dent foreign assets too greatly.

Beyond that, however, the breakeven price begins to rise rapidly. By 2025 Saudi Arabia would need \$175 per barrel to balance actual revenues to expenditures, and by 2030 the breakeven price would reach in excess of \$320 per barrel. By then oil export volumes would be around 1.5 million barrels per day lower than domestic oil consumption.

We think it very unlikely that oil prices would reach these levels even after 20 years. Our assumption is that oil prices ease slightly over the next few years before rising gradually with inflation from \$90 per barrel for Saudi export crude in 2014. As a result, we expect that the budget will fall into deficit in 2014 and will not return to a surplus through 2030. However, drawing down the huge stock of foreign



Projected trends in SAMA net foreign assets and domestic debt
(forecasts in shaded area)



reserves the government has built will ensure that the deficit can be financed comfortably for many years before the government would need to turn to the debt markets.

Based on past patterns, we expect that the government would fund deficits first by drawing down foreign assets, then by issuing domestic debt, and only in a last resort turning to foreign borrowing. Likely budget surpluses over the next few years will be used to increase foreign assets and future deficits would be financed by drawing down foreign assets until these assets reach about \$100 billion. After this point, we assume the entire deficit would be financed by the new issuance of domestic debt.

With a budget surplus expected for this year and the following two years, SAMA net foreign assets are likely to rise to over SR2 trillion (\$533 billion) by the end of 2013. Even if all subsequent budget deficits are fully financed by drawing down these assets, they will still stand at over SR1 trillion (\$267 billion) at the end of 2021. On our projected fiscal path, net foreign assets would drop to \$100 billion in 2024, after which new debt would be used to finance the deficit. With large budget deficits coming in the second half of the 2020s, the stock of domestic debt would rise quickly, as would the cost of servicing the debt. By 2030 the fiscal position would be very strained.

Of course, the rapid worsening of government finances can be avoided if the trajectory of the current trends of oil production, domestic oil consumption and government spending are altered. Saudi Arabia could curtail the growth in domestic oil consumption with adjustments upward to local energy prices, fulfillment of its plans to develop nuclear and solar powered electricity plants, and a series of energy conservation measures. Government spending growth rates could be gradually lowered, given the many years of fiscal cushion that lie ahead. Changes to taxation policies could strengthen non-oil revenues. Finally, the Kingdom could find ways using its strength within Opec to try to bring its share of global oil production out of the gradual decline it is currently experiencing.



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