

Oil: cheap at half the price

Developments in international energy markets, particularly in the price of oil and gas, stand to shape the world economy fundamentally.

- The oil industry has changed markedly over the past century
- Competition today is intense
- The consensus view is that the price of oil will rise continually in response to steadily-rising demand
- We judge that this will likely prove wrong: high prices are encouraging supply, efficiency, and substitution
- Over the coming several years we would be less surprised to see the oil price halve than to see it double

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Introduction

International energy markets will shape the global economy

Few factors are likely to influence the evolution of the world economy more over coming decades than developments in international energy markets – and particularly the prices of internationally-traded oil and gas. These developments will do much to determine not only the pace of global economic activity, but also a range of other matters – from the economic success of individual economies and regions, to industrial structure, the rate of greenhouse gas emissions and consequent climate change. Establishing how the key parameters of the international oil market are likely to evolve, however, is far from straightforward.

In the spirit of ‘To know where we are going, it is first necessary to understand from where we have come’, it is appropriate first to consider briefly the evolution of the modern oil market, which has developed from a cottage industry in the 1800s to an unprecedented four-element structure today. This is considered in the first section of this paper, *The development of the oil industry*.¹

The second section of the paper, *Current situation and strategies*, considers how the combination of a highly competitive industry structure and a decade of high oil prices is leading, albeit with long lags, to impressive increases in supply – not only of oil but also of natural gas – as well as, in some parts of the world, to curtailment of demand.²

The third section, *Looking Ahead*, considers key features of the outlook for industrial structure, supply, and demand. And the *Conclusions* section postulates the implications for world oil prices in the years ahead.

The development of the oil industry³

The oil industry began as a cottage industry

The modern oil industry began, for all practical purposes, as a cottage industry in the United States in the early 1800s, with crude oil being processed and sold by small-scale traders. Progressively, new technologies and mass production cut costs as a large-scale industry began to develop. By 1871 a formal oil-trading exchange had been established in Pennsylvania.

Rockefeller's Standard Oil brought stability ...

The young oil industry, though growing rapidly, was populated by a fairly chaotic mix of players, and was rather disorganised and inefficient until John D. Rockefeller entered, bringing low-cost transportation, vertical integration, and progressively a degree of stabilisation to the market as his operation grew. By 1879, his Standard Oil controlled around 90% of US refining. Then, in a further vertical integration, Rockefeller entered production: by the late 1800s Standard Oil was producing 25% of US crude. The market became yet more stable.

Around the turn of the century, however, Standard's dominance started to be challenged. Domestic competition, together with action under the Sherman Antitrust Act,⁴ reduced Standard's grip on the US market. And in other countries a handful of dominant international oil companies (IOCs) controlled sizeable markets of their own. Meanwhile, major technological advances, including motor cars and aeroplanes, were driving rapid growth in the demand for oil. The IOCs, having been successful in the century's first few decades in discovering, and gaining control of, new oil reserves, as well as transporting it to other industrial nations that lacked oil (including importantly Europe and Japan), were able to meet this demand.

By 1949 the ‘Seven Sisters’ controlled the bulk of the industry

The two World Wars, of 1914-18 and 1939-45, revealed the importance of oil as a strategic asset. By the end of WWII, seven Anglo-American ‘majors’, or ‘Seven Sisters’, controlled the bulk of the industry worldwide – Standard Oil of New York (Mobil); Anglo Persian Oil Company (BP); Royal Dutch Shell; Standard Oil of California (Chevron); Gulf Oil; Texaco; and Standard Oil of New Jersey (Exxon). And for a period they were able to maintain this market dominance, largely because of high barriers to entry.

From the 1960s powerful new players emerged

With decolonisation and the re-birth of globalisation under the post-WWII US-led economic order, however, powerful new players started to emerge. Producing nations began to reclaim control of their oil resources; but they were unable themselves to market anything like all the output. Commodity traders started to develop an independent oil trade. The ‘independents’, meanwhile, expanded abroad, outside the control of the ‘Seven Sisters’. And all the while rapid economic growth was increasing the global demand for oil: from 1960-1970 world consumption more than doubled.

Early in the 1970s, US demand for oil began to outstrip domestic production. With the US an increasingly significant importer of crude oil, additional pressure was put on the world market. Pressures reached a tipping point, first with the quadrupling of the oil price in 1973/74 and then with the further doubling in 1978/79. Markets changed fundamentally. With the national oil companies (NOCs) seeking outlets for their production, and demand increasing in world markets, independent oil trading took off as the new generation of traders bypassed the Seven Sisters’ network.

By the early 1980s, oil contracts were trading on futures exchanges. The IOCs, driven by rising prices and reduced access to supplies, reinvigorated their efforts to find their own reserves. They invested heavily in exploration and production, and began trading oil, both to manage price risk and as an activity in its own right. Independents meanwhile challenged the previously-dominant IOCs by also being aggressive in exploration efforts.

From the early 1990s until the 2008 global financial crisis (GFC) global oil demand grew strongly with the growth in the developing world: Asian Pacific oil demand more than doubled between 1990 and 2012.⁵ The Middle East provided most of the incremental production, but Western production fell. The NOCs became even more important.

Current situation and strategies

The oil industry today is thus composed of four principal groups – the NOCs; the international oil companies (IOCs); the independents; and the trading houses. Each is in a particular structural market situation, and each is pursuing a particular set of strategies.

The NOCs dominate oil and gas reserves

The NOCs remain powerful because of their large resource base: today seven of them, the so-called ‘New Seven Sisters’ – Petrobras (Brazil); Petronas (Malaysia); Saudi Aramco (Saudi Arabia); NIOC (Iran); Gazprom (Russia); CNPC (China); and PDVSA (Venezuela) – dominate global oil and gas reserves.

Their basic strategy is to continue to build their reserves, and to develop productive up-stream capabilities. And the NOCs of developing countries, notably China and Brazil, are growing their operations by making strategic acquisitions, and investing in production technology.

IOCs have become ‘Super Majors’

The IOCs have consolidated, to become the ‘Super Majors’ – Chevron; British Petroleum; ConocoPhillips; Royal Dutch Shell; Total; and ExxonMobil. Having focussed in the 1990s and beyond primarily on producing from their legacy assets, and having failed to add materially to their reserves (they now control less than 10% of the world’s known oil and gas resource base), many are playing ‘catch-up’ and modifying their strategies. And they have had some success: natural gas reserves held by the ‘Majors’⁶ have increased by 6% since 2000.

A number of the IOCs are reconsidering their optimal structure. Many are edging away from their integrated model, having concluded that, in order to grow, they have to improve efficiency through divestitures and acquisitions, whether up-stream or down-stream, to focus on what variously each defines as its ‘core activities’. Many are decentralising their operations, and concentrating on up-stream activities. The International Energy Agency (IEA) estimates that, in 2013, global up-stream oil and gas investment by the ‘Super Majors’ will have increased by 10%, to some \$154.4 billion, out of a world total of a little over \$700 billion.⁷

The independents’ strategy is to compete by specialising in particular activities all along the value chain – whether down-stream, mid-stream, or up-stream. They also reckon to be particularly

Independents still challenge key players

nimble, and thereby quick to exploit opportunities. A great number of independents sell and distribute an array of oil products, and a number of large independent refiners are doing well. The independents are proving adept at finding, and then exploiting or selling, new reserves.

Their aim is to remain highly competitive with all players in the industry; and to continue to challenge those which are dominant by being more aggressive, particularly perhaps in exploration efforts.

Traders compete with IOCs and NOCs as never before

Traditionally, the business model of the trading houses was to hold a portfolio of supply and purchase contracts, and exploit price differences relating to lot size, quality, location, time, and transport. Today, however, having grown significantly in size and scope, particularly in recent years, they are also competing with the traditional business of the IOCs and the independents.

The strategy of the largest independent oil traders – Glencore; Vitol; Trafigura; Gunvor; Mercuria; and Noble Group – is to expand their global reach, while also seeking to achieve consistent, low-cost supply for their down-stream activities.⁸ Accordingly, they are entering new, fast-growing developing markets, and moving both up and down the value chain so as to benefit from higher-return activities – most have established a significant presence in Latin America, Africa, and Asia. The trading houses are thus transforming themselves from ‘middle-men’ to fully-integrated oil companies.

Looking Ahead**Competition is likely to remain strong**

The structure of the industry seems set to continue evolving as current strategies play out over the coming decade and beyond. While the barriers to entry are high, given the relatively large number of powerful players, competition is likely to remain strong. Producing nations and the NOCs are likely to retain their market position. The IOCs stand to remain influential, given their existing strong position in the industry, whether up-stream or down-stream. Independents and smaller integrated competitors seem likely to maintain significant positions by being more nimble than the majors in a range of activities along the value chain. And the trading houses will likely continue investing in up-stream and down-stream assets, with some becoming quasi-IOCs in the process.

Myriad factors influence price developments

Price developments, however, are notoriously difficult to foresee. Not only is the structure of the industry continually evolving, but so too is the balance between global supply and global demand – not just for oil but increasingly also for close substitutes, particularly natural gas. And even quite small ex ante imbalances between supply and demand can have large effects on the price, given that, in the near term particularly, there are no close substitutes for oil – other than, increasingly – natural gas.

The 1973/74 quadrupling of the world oil price, for example, was set off by a political oil embargo that produced a supply/demand imbalance of only 2 million barrels per day (mb/d), at a time when world production was around 56 mb/d.⁹ And ex post data revealed that the 1978/79 doubling was due not to any fundamental supply/demand imbalance, but merely to the perception that there was – a perception that led to panic stock-building around the world as people filled every available tank.

Short term price forecasts are challenging for a variety of reasons:

- They are sensitive to the economic business cycle;
- They can be influenced importantly by supply shocks, both positive and negative; and
- Stock-building and de-stocking can induce significant speculative swings.

Long-term price projections are even more challenging, albeit for a largely different set of reasons. They require projecting both supply and demand; the resulting price; and in turn the impact of price back on both supply and demand. Perhaps for this reason, there is a temptation to focus on just a handful of elements, to the (virtual) exclusion of all others. Two schools of thought prevail.

The ‘Geological School’ sees ever-rising prices ...

The ‘Geological School’, which originated in the 1880s, resurged in the 1970s, and has echoes today as the ‘Peak-oil School’, makes strong assumptions about both supply and demand.

As regards supply, the argument essentially runs that most oil field locations and reserve quantities have by now been discovered and estimated; and that extracting marginal reserves is increasingly expensive (the marginal cost curve is strongly upward sloping).

As regards demand, the argument is that, historically, global energy use has increased more or less in line with global economic activity, and will continue to do so.¹⁰ Hence, the argument runs, with supply severely constrained, economic growth globally will lead to ever-higher prices, and the eventual depletion of oil resources¹¹ – and, as this happens, to a progressive slowdown of economic growth globally.

... but the 'Economic School' is more sanguine

The Economic, 'technology-driven', school, which is more prevalent today, seeks to take account of the effect of supply and demand on price; and of price on supply and demand. Thus rising prices lead not only to the extraction of more expensive oil but, more importantly, and albeit with a considerable lag, to technological developments, both in terms of techniques of extraction and the development and production of substitutes, i.e. an increase in supply.

As regards demand, while the income elasticity for energy may indeed be approximately 1, rising (relative) prices of energy cause demand to increase less than proportionately with economic activity, the result both of demand switching to less-energy-intensive products and to induced technological progress which causes energy to be used more efficiently.

Our judgement

It would be foolish to pretend that it is possible to project oil prices with even reasonable certainty, whether for the near term or further ahead. Nevertheless, it can be useful to have a view, not least to serve as a benchmark against which to assess the significance of data and events as they unfold. We therefore pick out below a number of key factors – geological, technological, and economic – that at the moment seem most likely to determine the outcome over the coming decade and beyond.

The supply side

A decade of consistently-high oil prices has induced substantial technological innovation, both in finding new reserves, and enabling more efficient extraction. And there are probably more innovations to come. This contrasts sharply with the 1990s, where a price between \$20-30/barrel effectively destroyed the incentive for development of new technologies. Game-changing advances in technology include:

Shale gas and oil are a potential game-changer

- Hydraulic fracturing and horizontal drilling techniques are having a profound impact on supply, particularly in the US. Such "unconventional production" has grown remarkably over the past decade in the US, particularly of shale gas. US shale gas production has grown from almost nothing in 2000 to more than 10 billion cubic feet per day in 2010 (~1.9 mb/d of oil equivalent). Over the coming 20 years, shale production may more than quadruple.
- Shale gas deposits around the world are substantial, notably in Russia. Mexico, Argentina, and Colombia too are possible sources of substantial shale deposits.
- Enhanced recovery techniques meanwhile have significantly increased the industry's estimates of technically-recoverable oil reserves. As of 2011, oil reserves were put at 1.35 trillion barrels,¹² an increase of one-third since 2000, and more than double the 1980 figure. As a leader in the use of newly-developed unconventional recovery methods, the US is now the fastest-growing oil producer in the world. In 2011, oil production grew by 285,000 barrels per day, the third year of increase in a row, to reach its highest level since 1998; US net imports were 29% below their 2005 peak; and the US became, for the first time, a net exporter of refined products. The US is projected by the IEA to become self-sufficient in energy by 2035.
- Opportunities for unconventional production beyond the US are considerable. Technological developments, spearheaded in the US, are now spreading internationally: such new technologies may well, for example, boost short-term North Sea production, which had previously been in decline.

Oil supply globally is set to rise

Bottom line: oil supply globally is set to rise. The IEA forecasts that production from OPEC and non-OPEC regions will increase from 87 mb/d in 2012 to 98 mb/d in 2035, the increase coming largely from natural gas liquids and unconventional oil resources.¹³

The demand side

High oil prices are also incentivising both energy efficiency and a switch to substitutes. Together with a renewed, often government-led, focus on energy efficiency in many economies, this has contributed importantly to global energy intensity decreasing at an accelerating rate in 2012,

following modest annual declines since 2000.¹⁴ And there is increasing potential to switch to abundant low-cost substitutes for oil, notably natural gas. A number of factors are likely to be at work:

Increasing energy efficiency is likely to continue

- The increasing energy efficiency of the past several years seems likely to continue, and may well accelerate, due in significant part to the lagged effect of past high prices.
- Policy will also exert some effects. The US and China are taking a number of initiatives to encourage energy efficiency, including introducing truck and building efficiency standards. China conceivably may go significantly further in due course, driven not so much by concern over global warming as by air pollution in cities, and water pollution more widely. And more generally, policy in many countries is likely to contribute not only to shifts between energy sources, to the advantage of gas and the disadvantage of oil and coal, but also to strengthened efforts to increase energy efficiency.
- To the extent that subsidies for fossil-fuels – which are important in a number of developing countries, including India – are removed or reduced, this will tend to reduce the demand for oil, and lower the oil price.

Bottom line: oil demand globally seems set to rise steadily, driven, in large part, by the transport sector in developing countries, with China expected to be the largest consumer by 2035. The IEA predicts that oil demand will rise from its 87 mb/d in 2012 to 101 mb/d in 2035.¹⁵ Demand in OECD countries, by contrast, is expected to fall, due to increased energy efficiency and substitution.

Conclusion

Oil prices seem more likely to halve than to double

There are too many uncertainties for it to be meaningful to purport to predict the development of oil prices over the coming decade with any degree of certainty. But, being economists, we find persuasive the argument that high prices, such as those over the past decade, encourage supply; encourage efficiency; and encourage substitution.

Taking all the various currently-known factors into account, we would be less surprised to see the oil price halve than to see it double. ■

Endnotes

¹ Helpful and much appreciated comments on this paper have been received from Professor Nick Butler and James Hirst. Responsibility for all errors and omissions rests, however, with the authors.

² The first two sections of this paper are a condensed, but also extended, version of a White Paper produced for Puma Energy: see Llewellyn, J, Hansen, B., and Llewellyn, P., (2013). *The Changing Face of the Oil Industry*, available at http://www.llewellyn-consulting.com/resources/PUM9_0015_Puma_Energy_White_Paper_130710.pdf

³ This section draws particularly on the excellent Yergin, D., 2012. *The Prize*. London: Simon & Schuster.

⁴ In 1906, the Roosevelt Administration took action against Standard Oil, under the Sherman Antitrust Act arguing that it was conspiring to reduce trade. Standard Oil was dissolved in 1911, and divided into several entities – see Yergin, D., 2012. *The Prize*, pp. 91, 94. London: Simon & Schuster.

⁵ Data from the OPEC Annual Statistical Bulletin.

⁶ Majors include BP, ExxonMobil, Total, Royal Dutch Shell, and Chevron. See OPEC Annual Statistical Bulletin (2012 and 2013)

⁷ See IEA, World Energy Outlook (2013), Chapter 14, Prospects for oil supply, Table 14.8, p. 498.

⁸ While trading houses are acquiring new assets and diversifying their revenue streams, they recognise (as do the IOCs) the need to strike a balance between integrating and getting bigger on the one hand, and maintaining a quick-acting and adaptable structure on the other. Richard Elman, the Chairman of Noble Group: "We have ... tried to be big enough to remain well-capitalised to survive the capital drought, yet not too big that we can't change, adapt and be managed" – see Burton, M., 2012. Commodities traders must be diverse to flourish - Noble. Reuters [online] Available at: <<http://www.reuters.com/article/2012/10/15/lme-week-idUJSL6E8LA2VD20121015>>

⁹ World crude oil production was 55.68 mb/d in 1973 and 55.72 mb/d (1974): see US Department of Energy, Energy Information Administration, International Energy Statistics website, May 2013.

¹⁰ Thus, in economists' parlance, the income elasticity of demand is taken to be around 1: but to "peak oil" advocates this parameter has the status essentially of an engineering, rather than an economic, relationship.

¹¹ In 1978 IEA Executive Director Lanske and Executive Deputy Director Hopkins proposed, essentially on the basis of the "Geological School" argument, that in the future oil would have to be rationed.

¹² See Baker Institute (2011), *The Status of World Oil Reserves*, p.17.

¹³ See IEA, World Energy Outlook, (2013), table 14.4, *World oil production by type in the New Policies Scenario (Central Scenario)*, pp.471. OPEC oil production is expected to increase from 37.6 mb/d in 2012 to 45.2 mb/d in 2035; non-OPEC oil production is expected to grow from 49.4 mb/d in 2012 to 52.9 mb/d in 2035.

¹⁴ IEA, World Energy Outlook (2013), Chapter 7 *Energy efficiency outlook, highlights*, p.231.

¹⁵ See IEA, World Energy Outlook (2013), table 15.2, *Oil demand by region in the New Policies Scenario*, p.505. Demand of oil in OECD countries is expected to drop from 40.8 mb/d in 2012 to 32.8 mb/d in 2035.

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