Oil

Newgate Perspectives
December 1, 2011

Of all commodities, oil is the one we are most familiar with. We know essentially where it comes from, how it is used and its price. We buy it once a week or so in the form of gasoline or diesel; some of us heat our homes with it. Yet for all the apparent simplicity of oil, its extraction, refinement and subsequent usage are extremely complex. The United States imported oil from over 20 countries in 2010, in addition to its domestic production. Grades and quality of crude vary widely. So do its uses, from familiar ones like gasoline and diesel to lesser known such as asphalt, kerosene and a host of other petrochemicals.

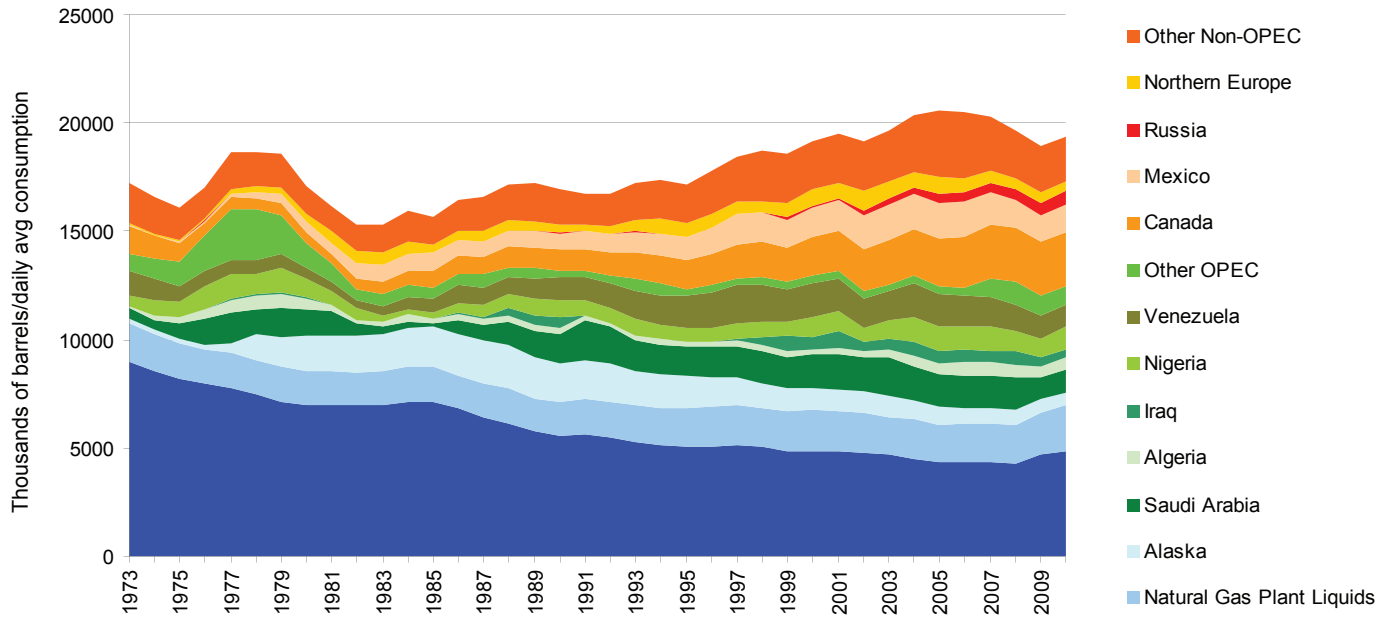
This report is focused on the production and consumption of oil. The details regarding the various aspects of the oil market have significant impact on investors. Just as the oil industry is multifaceted, the investment opportunities inherent in oil's production process are equally complex.

Use of Oil. The United States remains the single largest consumer of oil, though emerging Asian economies collectively now use more oil than the US. The annual increase in US oil consumption is remarkably steady, more so than one might think given the extreme volatility in oil prices. US oil consumption has grown at a compounded annual rate of 1.1% since 1965, with a 3.5% standard deviation. By contrast, during the same period Chinese consumption grew at an annual rate of 8.7%, but with a standard deviation of 9.8%. As one would expect, consumption declines when prices are high and when the economy is slow or in recession. Both countries saw oil consumption decline in the early 1980s. US consumption had also declined in 2008 and 2009 but rebounded in 2010, while Chinese consumption increased steadily during that period.

The annualized standard deviation of the price of oil is over 20% (varying only slightly by grade of crude). Given the fairly stable demand and the high level of price volatility, it would appear that actual US demand is only a small factor in oil pricing[1]. As demand from other parts of the world (notably emerging Asia) grows in absolute terms and as a percentage of total demand, it is reasonable to expect that US demand will have a declining importance in the price of oil.

Sources of Oil. The news media and politicians frequently refer to American dependence on foreign oil, with particular attention paid to oil imported from countries considered unfriendly to Western interests generally and US interests in particular. Chart 1 below shows the source of oil consumed in the US. Despite common perceptions, the US remains a significant producer of its own oil, though production has clearly declined in absolute and relative terms from its highs. The US imports less oil (as a percentage of total consumption) than it did in 2005, due to both increased domestic production and overall declining

Chart 1: Source of US Oil Consumption



Source: U.S. Energy Information Administration August 2011 Monthly Energy Review

1 Regression of change in US oil demand against change in WTI price produces an R squared of .02. Annual data from 1977-2010 were considered. Due to seasonal effects, more frequent data were not considered.

demand. Most US oil imports come from countries with which we have good relations, such as Canada, Mexico and Northern Europe.

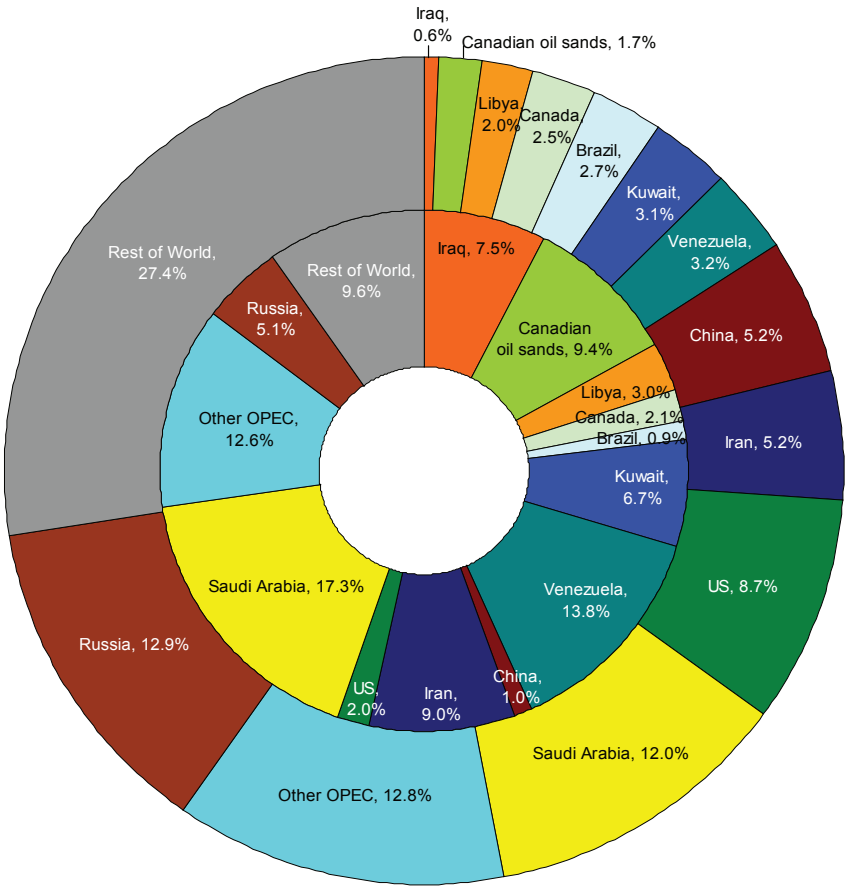
Chart 2 shows where oil is located and produced globally. Again, there are important distinctions. For example, Iraq has a lot of oil but has seen production curtailed by the military conflict and internal strife. Conversely, the US and China are "overproducing" oil relative to the size of their reserves.

A closer look at the chart reveals several political/economic fault lines. More than 75% of the world's oil reserves (the source of future production) are located in just 8 countries. Most are in the Middle East and are highly vulnerable to political unrest. Libya has already gone through a revolution. Venezuela, a country currently dominated by a leftist government, has a large portion of the remaining oil. Furthermore, much of Venezuela's oil is low quality, requiring more processing than traditional grades of crude to become usable products. Russia has shown a willingness to use its energy resources as a tool in an aggressive foreign policy. Canada has large amounts of oil, but mostly in the form of tar sands. Although abundant, they are challenging to extract from an environmental perspective and expensive to fully exploit.

Saudi Arabia remains the dominant force in the oil markets. Thus far, it has been immune to the "Arab Spring" revolutions and other forms of political unrest. It is naïve to assume that the country can remain isolated from these events. The recent death of Crown Prince Sultan bin Abdel Aziz Al Saud, the heir to the Saudi throne, has thrust to the forefront the question of who will succeed King Abdullah. For the first time, the Allegiance Council will determine the next Crown Prince. The two most likely successors to ailing King Abdullah are each in their mid to late 70s. The future beyond these two men is increasingly muddled, with a large number of family members as potential claimants to the throne.

There is considerable disagreement as to the reliability of the estimates of Saudi oil reserves. In his book, *Twilight in the Desert*, noted oil researcher Matthew Simmons accused the Saudi government of vastly overstating the size of its reserves and its ability to increase production. Published in 2005, it created an uproar and leant

Chart 2: Oil Production/Reserves



Production (Outer circle) Top Five

Russia
Saudi Arabia
United States
Iran
China

Reserves (Inner circle) Top Five

Saudi Arabia
Venezuela
Canadian Oil Sands
Iran
Iraq

Source: BP Statistical Review of World Energy June 2011

support to Peak Oil Theory (discussed below). However, Simmons was not specific with respect to the timing of his predictions. It now appears that Simmons was too pessimistic regarding the forecasts of Saudi oil production. Saudi Arabia has been able to maintain a high level of oil production. While it has not matched its peak production of 2005, demand growth has been lackluster due to economic conditions. Simmons' supporters in the Peak Oil community continue to promote his and other pessimistic viewpoints[2]. Regardless of the short term accuracy of his predictions, the true productive capacity of what is purported to be the largest source of oil remains a closely guarded state secret. Saudi Arabia will become a more important source of hydrocarbons than it is today provided that its resource base is accurately stated and it can increase production. Should either of these assumptions be wrong, as Simmons suggests, oil prices would likely move much higher.

US Production. Table 1 lists the largest domestic oil reserves. This list contains conventional oil and oil shale. However, it only includes "proved reserves" of oil, numbers far lower than the larger numbers frequently reported in the media. "Proved reserves" are estimates of the amount of oil recoverable using existing technology and where the extraction is economically feasible. The concept of "resources" allows for additional technology and can be defined by a range of oil prices and extraction costs. So the amount of oil considered a "resource" is greater, though with less certain probability regarding whether that oil will ever be extracted.

The Bakkan formation illustrates these technical issues. Table 1 shows proved reserves for North Dakota[3] at just over one billion barrels. The US Geological Survey lists the resources at approximately four billion barrels. Yet unofficial estimates of oil in the field can approach 500 billion barrels. To some extent, all those estimates are correct. What changes is the underlying assumptions regarding price of oil, cost of extraction and the willingness to sacrifice all other interests – agricultural, residential and environmental – to extract the oil.

Table 1: Domestic Oil Reserves

US Oil Reserves	Proved Reserves (million barrels) 2009
Lower 48	17,116
Gulf of Mexico (offshore)	3,791
West Texas	3,736
San Joaquin Basin (onshore)	2,095
North Dakota	1,046
Alaska	3,566
Total US	**20,682**

Source: US Energy Information Administration August 2011 Monthly Energy Review

The possible extraction methods for unconventional oil (including oil shale and tar sands) also highlight the complexities of the oil market. Historically, oil shale has been mined in a process similar to coal mining, then processed offsite. This process is referred to as *ex situ* (off site), though the actual distillation of the shale into oil is known as *retorting*. However, major oil companies have been expanding the research and development programs to increase *in situ* (at site) methods of extraction. In situ methods include breaking down shale while underground ("fracking") and the heating of the shale underground to release oil, which is then pumped out using conventional techniques.

The economic viability of unconventional oil (and the determination of extraction methodology) will hinge on a number of economic and technical factors. The most important is likely to be Energy Returned on Energy Invested (EROEI). The name itself, while unwieldy, is fairly self-explanatory. Do we get sufficient energy out of the project to justify the energy put in? Current unconventional oil projects in Canada are profitable as Canada has large amounts of natural gas nearby, and often associated with, the oil fields being developed. This would likely be true for the Bakkan field, at least initially.

Assuming that the geology behind the 500 billion estimate is technically correct, to extract that oil would require almost unlimited resources – energy to run equipment, water to inject underground and bring oil to the surface, the ability to dispose of waste water, and most importantly, large amounts of money.

One may reasonably expect that as technology develops and the price of oil rises, more and more of the oil in the Bakkan formation (and in similar fields) will be recategorized, first as resources then as reserves. But even the man who discovered the Bakkan field and dedicated most of his life to it thought that only 50% of the oil would be recoverable[4] .

Understanding these distinctions is key when evaluating energy policy and investment opportunities. In addition to impacting US environmental regulations, securing access to oil is a significant component in foreign policy. Increasing domestic production of oil is frequently an issue in national elections, with significant debate regarding environmental regulation. For example, the 2010 failure of the Deepwater Horizon rig focused public debate on offshore oil drilling. However, the bulk of domestic oil reserves are onshore.

2 Simmon's reputation was diminished considerably after his statement regarding the Deepwater Horizon's explosion and oil leak in the Gulf of Mexico. Simmons insisted that the problem could not be contained with conventional means, suggesting nuclear bombs be used to close the leak. Simmons died in August, 2010.

3 Most of the Bakkan shale is in North Dakota, and most of North Dakota's oil is in the Bakkan. The field itself extends into Montana and Canada, though the bulk of the oil is located under North Dakota. However, most of the current production from the Bakkan field technically comes from Montana.

4 Unpublished paper by Leigh Price, available from the Energy & Environmental Resource Centera at www.undeerc.org/Price.

Also important is our sense of what oil (and therefore the products that we buy directly) should cost. The price of oil typically referenced is West Texas Intermediate (WTI), a very high quality grade of oil. But as Chart 1 suggests, not much oil is actually produced (or shipped) through that region, and therefore purchased at that price. Oil on the East coast is imported largely from Northern Europe and it is priced as a function of Brent Crude prices. Recently, the price of Brent Crude has far exceeded WTI. Consumers are often confused by this, as they may see gasoline prices stable when WTI prices decline.

Are We Running Out? What About Peak Oil? Peak Oil Theory was conceptualized in 1956 by M. King Hubbert, a geologist for Shell Oil. More formally, Hubbert theorized that once 50% of a reserve base was consumed, production from that field would decline regardless of investment or field management techniques5. Reduced to its simplest formulation, Peak Oil Theory points out the tautology that any finite resource is, in fact, finite.

The world is much more complex than that. It is not enough to say that eventually the world will run out of oil. The timing matters on both a micro and macro level. The micro level involves companies deciding when to continue to extract oil from a field and when to completely abandon it. Typically less than half the oil is extracted from a given field. Given higher prices and advanced technology, companies are going back to fields abandoned decades ago to extract oil previously considered non-economical.

On a macro level, countries must create energy policy based on assumptions regarding their domestic oil reserves and the costs of exploiting those reserves compared to importing oil. When the oil will run out; whether with respect to a particular field, country or globally, is a matter of great importance.

Critics of Peak Oil Theory note that oil continues to be discovered, frequently in large quantities. They also point out that new technologies are allowing for increased production. Peak Oil Theorists (and others) often note that these new discoveries, however vast, are often difficult to access and contain oil in non-liquid forms such as shale or tar sands. The continued development of oil in a variety of new fields and forms had led one prominent Peak Oil Theorist to comment:

> "Let's all loudly agree: we are not running out of oil! But we are rapidly depleting the high quality relatively easy-to-extract-and-refine oil that has fueled a tremendous expansion of the world economy since the dawn of the petroleum age. Yes, petroleum companies may continue to make money developing new resources, especially if rising global demand helps drive high fuel prices. But overall "energy profits" for society – the energy returned from invested resources – are shrinking rapidly, even as oil prices and corporate profits may rise[6]."

Conclusion. The oil market is unique in that it is the one (outside of agriculture) that almost everyone participates in directly. The oil market is highly fragmented by geography and geology. It is also impacted by the economic and technological resources necessary to refine oil to its usable forms and transport it to the major sources of consumption. The promise of vast quantities of domestic petroleum is appealing. The reality is that most of the oil that we will consume for the foreseeable future will come from conventional sources in countries with which the United States has a strained relationship. There are two investment implications for these facts. We should assume there will be a high degree of oil price volatility driven by geopolitics. We should also assume that the drive to convert resources into reserves will continue regardless of the current price of oil. Understanding the complexities of this market should help investors better modify their portfolios in order to capture the opportunities these markets present. ◈

5 In that way, Peak Oil, or Hubbert's Peak, resembles Moore's Law about development of semi-conductors.

6 Yergin Is Half-Right About Oil, But Other Half Is What Matters Posted By ASPO-USA • on September 19, 2011 Jan Lars Mueller is Executive Director for the Association for the Study of Peak Oil & Gas USA

Newgate
Capital Management LLC

Published by Newgate Capital Management LLC
One Sound Shore Drive, Greenwich, CT 06830 • Telephone 203-661-0700 • Fax 203-661-4005
www.newgatecapital.com