

# Trends in the Global Petroleum Industry

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**Abstract**— The petroleum industry provides the largest source of energy needs across the global world. As a result many economies are heavily influenced by the petroleum industry. The Organization of Petroleum Exporting Countries (OPEC) has a significant market share and strives to influence crude oil pricing to help support their interests. Recent trends in the petroleum industry have seen the influence of OPEC diminish. The extent to which OPEC can influence the crude oil market as well as the motivations behind their decisions are explored in this research. Evidence is presented that OPEC does not meet the strict definition of a cartel but they still have an impact on the market. Their actions have components of profit maximization and political motivations. When OPEC makes a decision to alter production levels, particularly with a cut or maintain position, it has an overall impact on crude oil pricing. Dramatic swings in crude oil pricing, referred to as oil price shocks, have macroeconomic impacts on stock markets and other economic measures both domestically as well as globally. Predicting future oil prices is challenging. This paper looks at various methodologies used in trying to explain and forecast future crude oil prices.

**Keywords**— Crude Oil Prices, Global Energy, Non-Renewable Resource, OPEC, Petroleum Industry.

## 1. Introduction

The petroleum industry has played a pivotal role in addressing the world's global energy requirements. Since the 19th century, the start of the modern era of the petroleum industry, the world has increased its reliance on crude oil. Even though petroleum is a non-renewable form of energy, there are still considerable amounts of identified oil fields and the industry is continually improving techniques for more efficient extraction of oil resources. For the foreseeable future, oil will play an important role as an energy source and driver of global economies. The petroleum industry has experienced the change of the dominant influencer over the market change over time. In the early years, the US played the role as the dominant force

and influencer of crude oil price. This power rested in the hands of a limited number of major oil companies. These oil companies were global in nature and made agreements with oil resource rich countries for rights to extract the petroleum. In time, it became apparent to these oil rich countries the true value of their resources and they started to take back control of these resources during the 1960's and 1970's from the oil companies. The creation of OPEC brought major oil producing countries together for a common purpose to influence the price of oil by together banning to restrict oil through production quotas.

## 2. Literature Review

Rose (2004) and Bremond, Hache, Radetzki (2012) provide a historical look at the petroleum industry and the role of OPEC in the industry. OPEC's decision on oil extraction quota is not entirely based on profit maximization, but contains a political element by providing low oil prices for its citizens as contended by Kisswani (2014). Mensi, Hammoudeh and Yoon (2014) also looked at the impact of OPEC conference meetings and any resulting volatility of markets that these meetings might bring. Other recent studies include Colgan (2014), Herwartz and Plodt (2015), Le and Chang (2015), Filis and Chatziantoniou (2013), Forni, Gerali, Notarpietro, Pisani (2015), and Cunado, Jo, and Perez de Garcia (2015).

## 3. Changes in the Petroleum Industry and OPEC's Role

The petroleum industry has seen some significant changes over the past decade. OPEC's ability to directly manipulate crude oil prices through constraining supply or increasing supply has diminished. Recent developments in the shale oil in the US has brought increased competition in the market place and put OPEC on the defensive, as its market share has diminished. As such, OPEC has consciously made the decision to increase supply to push down prices and force shale oil plays to shutdown to try and gain back its market share and ability to manipulate crude oil prices. Thus, there has been an increasing amount of crude oil price swings in the industry, with its impact felt across the globe. As a collective group, they account for

nearly two-fifths of the global crude oil and nearly three-fifths of crude oil that is traded internationally (Loutia, Mellios, Andriospoulos, 2016).

#### **4. Trend of Increasing Price Volatility in the Petroleum Industry**

The petroleum industry is an essential component of many economies throughout the world. The change in crude oil prices can have a substantial rippling effect throughout the world economies. This is most evident during periods of rapid price spikes or drops in crude oil prices, which are referred to as oil price shocks. There are various drivers for oil price shocks are the impact of demand shocks, OPEC supply shocks, non-OPEC supply shocks, and speculative shock based on futures trading on crude oil prices. Herwartz and Plodt (2015) stressed the importance of understanding the effects of oil price shocks on business cycles and consumer prices to frame the appropriate fiscal and monetary policies to stabilize economies. Their study also indicated that the impact on consumer price index is not uniform across all economies and differences occur in economies like China versus the US or the EU region. This shows that the impact on individual country economics varies and each countries level of exposure to the petroleum industry results in the level of impact that is felt with price changes. Not only does a crude oil price shock impact consumer price indexes, it also has a significant impact on the stock market. The impact on both short term and long term effects of crude oil price fluctuations on the stock market was the focus of Le and Chang (2015). The results suggest that both the oil exporting and oil refining economies had a similar positive response to oil price shocks. Oil importing economies had positive responses to oil price shocks as well, but with a much lower level of statistical significance. The analysis showed that the overall impact does vary between different markets and across different time periods. These results would seem to indicate that changes in crude oil prices do have an impact on the stock market but that impact can change across time periods. It shows that economies that are more closely tied to the petroleum industry through exporting or refining have a greater level of exposure to the potential fluctuations in crude oil pricing than countries that are just importers of the commodity.

The US is the largest economy in the world and the impact of the US stock market has an influence that is felt across the globe. It is important to

understand the major components of the stock market to better understand the changes in the stock market. Kilian and Parker (2009) examine the impact that oil price shocks have on the US stock market. The results of this study showed just how integral the petroleum industry is to the US stock market. It is important for companies in a wide range of industries to understand the fundamentals behind crude oil and the impact that price changes can have on their specific industry. The impact of oil price shocks is not exclusively felt in the US, but can be seen globally. Forni, Gerali, Notarpietro and Pisani (2015) investigated the impact of crude oil shocks in the European region of the world. This research showed how influential the petroleum industry was to the overall European economy and that crude oil has a significant presence in the economy to impact their gross domestic product when pricing fluctuations occur.

#### **5. Recent Trend Implications for the Future**

The current trend of increased oil price volatility makes it more relevant than ever for companies and countries to try and predict what oil prices will do in the future. Before one can predict future prices for a commodity it is important to understand the underlying factors that have driven pricing in the past. Hamilton (2009) provided an overview of different methodologies used to try and explain the fundamental drivers for crude oil prices. The analysis looked at using correlation analysis, the use of economic theory for predictive behaviour, and lastly a look at fundamental determinants for supply and demand to try and explain crude oil price changes. Hamilton suggested that from a correlation analysis stand point, crude oil prices changes have historically been lasting, hard to forecast, and influenced by different governing bodies over time which makes predicting prices through this means challenging. From an economic theory stand point, three different approaches are used to explain the price setting mechanism for crude oil. Looking at the fundamental drivers of supply and demand for an answer was the last approach used by Hamilton (2009). The results showed that over time the price elasticity of demand regarding crude oil pricing had reduced. On the supply side, the characteristics of OPEC as a cartel is challenging and supply expansion requires long lead times and can misalign with growing demand resulting in fluctuating pricing. Based on the research, Hamilton ultimately believed that not one theory can explain the crude oil market pricing. It is believed that to some degree all the theories play a part. Low price elasticity of short term supply and demand, potential for supply disruptions and increase in US

oil production have all contributed to the behaviour we've seen in the crude oil market since 1970. A final interesting point that Hamilton brought up was that while it has not been fully observed that scarcity rent is impacting crude oil prices in historical data, it could start impacting pricing in the future. Hamilton's study showed just how complex the crude oil industry is and the difficulty involved in trying to forecast future pricing.

The idea of scarcity rent applying to crude oil was further explored in the work of Bentley and Bentley (2015). This work focused on the supply side of the industry to help try and explain crude oil pricing. They contended that past research had failed to incorporate several critical factors regarding crude oil supply which included the need for reliable data for oil discoveries and utilizing the concept of peak at mid-point for the oil fields. A model that uses inferior data to try and forecast results will inherently provide inferior outputs. Most data used in past research utilized public-domain proven oil reserves, but Bentley and Bentley contended that the appropriate data that should be used was industry backdated proved-plus-probable data. They suggested that the public-domain proven data can be misleading and result in errors in analysis. This type of data has probably been used in the past because it is much easier to obtain and industry backdated proved-plus-probable data is expensive to obtain. The other area that the paper pointed out that has not been considered is the concept of peak at mid-point for oil fields. This means that in the current conventional oil fields, it becomes more difficult to extract the remaining oil in the field after roughly half of the oil has been taken from the field and the extraction rate peaks at the mid-point. It was theorized that most of the major conventional oil fields were approaching their peak at mid-point levels which will impact overall supply of crude oil in the market place. The research concluded that oil prices before the 2000s were low due to oversupply of crude oil in the market. It puts forward that recent higher prices can be partly attributed to the mid-point peak affecting existing fields and that high oil prices will be needed to support higher cost unconventional oil fields that have higher extraction costs. The level of production of conventional oil field production will not be sufficient to meet the global demand and will require supply from more expensive fields, which will require the price of oil to increase to cover the marginal extraction cost.

The rise of oil prices and increased volatility in the early part of the 21<sup>st</sup> century has increased the need to try and forecast crude oil prices. One method that is being used in practice today is crude oil futures prices as an indicator as to what the

future spot price of crude oil will be. Alquist and Kilian (2010) researched the relationship between crude oil futures pricing with future spot prices. The findings indicated that the futures contracts are not the greatest predictor of future spot price. The results are driven by the inconsistency of futures prices about the spot price, shown by the oil futures spread. The findings are concerning since many countries rely on futures pricing for crude oil as a gauge of future oil prices and use this to drive fiscal and monetary policies. It is also shown how the markets expectations around the future availability of supply has an impact on the oil futures spread and the market's ability to forecast supply shortages is not great.

Parsons and Espinasa (2010) investigated the run up and subsequent drop of crude oil in 2008. There were varying views as to what drove this spike up followed by a rapid decent in pricing. Some theorized that it was attributed to an increase in the amount of speculators in the market. The research showed that open interests in oil futures increased from 350,000 in 1995, valued at \$6.2 billion, to over 1,280,000 in 2008, valued at \$180 billion. There was also evidence that market fundamentals may have been at play that drove the price change. It was shown that other commodity prices rose during that time, even ones that do not have futures markets associated with them. A spike in global demand, primarily in booming economies like China, could account for the shift in the supply and demand balance during this time period. Parsons and Espinasa believed that both market fundamentals and increased speculation in the market could have played a role in price swings witnessed in 2008. They also proposed that regulators should push for increased visibility in trading and if possible limit the amount of speculation that takes place in the market.

Oil price volatility was the focus of McNally and Levi's (2011) study. It looked at the underlying supply and demand fundamentals and how the market was slow in adapting to a changing environment and the lengthy time it takes for the market to reach back to equilibrium. The slow nature of market fundamental responses results in crude oil prices swinging either higher or lower until the market forces take effect. On the supply side it is very costly to develop new fields and extract crude oil. When demand slows down there is not a nozzle that can be instantaneously cut off to bring the supply and demand back into balance. Shutting down an oil field is costly and takes time. When prices rise, typically there is not a significant and immediate response on the demand side because there are limited amounts of alternative sources as a substitute for crude oil. Generally, consumers will absorb the price increase for a

while before new and more efficient ways of using crude oil is found to help push prices back down by reducing overall demand. McNally and Levi (2011) provided a history of how Texas used to serve as the swing producer to help keep crude oil pricing in check and that swung to Saudi Arabia in the 1970s. This excess capacity has allowed the swing producer to increase production in times of increased demand to keep prices from rising too high and providing an incentive for additional competition to enter the market. Saudi Arabia's over hang capacity could be as low as 2%, which is not a large enough spare capacity to effectively cover surges in demand to help moderate crude prices. As a result, they contended that continued volatility in the crude oil market is here to stay for a while. An impact of volatility in crude oil prices is that it restricts capital investments that are made not only in the petroleum industry but in other industries that have some exposure to crude prices. If a company is not comfortable with a forecast for a return on their investment because of variability, it reduces the level of capital investment. The result of this is it constrains growth.

## 6. Summary and Conclusion

The petroleum industry plays a crucial role in satisfying the world's energy needs. It is the single largest provider of energy for the globe. The petroleum industry is an integral piece of global economy. It is an industry that has seen the power shift over the past century from the big oil companies to OPEC. Predicting future crude oil prices can be a challenging task. Differing theories have been explored to try and understand what drives crude oil pricing.

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