Exploring the Economic Consequences of Oil Price Volatility and Production Rates

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Abstract

This paper explores and examines the effect of oil price and production on world economic. In other word, different research topics related to oil prices and productions such as how oil production affects the prices, which countries produce the oil the most, how US economy is affected by oil prices and production, what are the factors that influences oil prices, and oil production will be discussed. Prior to presenting the existing research findings, the paper starts with introducing the importance of economy in a country and explores several peer-reviewed published research articles related to the topic of oil price, production and its effects on economy. A large number of studies had been researched to determine how the oil production and prices influence on the world economy using different methodologies with different time period data. The conclusion reached from the studies and their statistical methods are briefly noted. The paper also discusses key findings and results from the data mining using the datasets from British Petroleum and International Monetary Fund. The results from the data mining imply that oil price, and oil production could have some relationship with world economy. However, since data mining is done on 10 years period, statistical analysis and data mining of more than 10 years would bring to the answer of whether there is a real relationship among them. Overall, this paper will give different aspects of research findings to see if oil prices and production have importance on the economy, and data mining results of oil related datasets were discussed.

Keywords: oil price, oil production, economic growth in US, world economic, OPEC countries

Introduction: Importance of Economy

Economy is considered the backbone of the country and its growth is determined by many factors. It shows the wealth and resources of a country or region in term of production and consumption of goods or services, which in other way displays how stable a country is.

Economic growth, which is a rise in real gross domestic product (GDP), leads to increase in employment, tax revenue, and consumption. GDP is a measure that represents all the services and growth produced within a country in a period of time. Economic growth can be measured by GDP.

While there are many factors affecting the Economy, the relationship of oil and economy is examined and analyzed to see how it influences or impacts on economy in this paper.

Oil price: Factors affecting oil price - Literature Review

Before getting the results from researching the possibility relationship of oil price on economy, the factors affecting the oil price are explored. According to Energy Information Administration(EIA), while there are many factors that influences the price of oil, the supply and demand come as the main factors of price increase and decrease.

The prices of oil has fluctuated greatly many year before although the rate changes of different oil are similar. The prices of the gas comes to as it is because of refining, tax, transportation and retailing, which over 40 percent of the gas price that we are paying. In United States, the taxes of each state has some influences on the diesel fuel prices as well.

Supply, demand, financial market, commodities market, speculative and geopolitical. Supply and demand is thought to be the main factors that is causing fluctuating in oil prices. In the article “Influential factors in crude oil price forecasting,” factors affecting oil prices are identified, and supply and demand were the variables to be determine to see if there is

an effect on oil prices. Lasso regression modelling method is used to shrink the parameter, which can improve the forecasting accuracy of prices, and mean-squared error were measured. The finding suggests that demand , commodities market factors, financial market factors and geopolitical factors are among the most influential parameters in changes of oil prices (Miao, et al., 2017).

Emerging vs developed countries. Dependence of oil prices on the demand of emerging and developed counties are researched and reviewed in the article " What Drives Oil Prices? Emerging Versus Developed Economies. " Aastveit, Bjornland, and Thorsrud, (2015) examine whether emerging or developed counties has more impact on the oil prices changes.

They created a factor-augmented vector autoregressive (FAVAR) model, and the finding of their research suggests demand shocks in emerging and developed countries accounts for 50 to 60% of the fluctuation of oil prices in past two decades. Demand shocks of emerging countries in Asia has more impact on oil prices than the developed countries. In other word, The real price of oil increase by 20% vs 10% compared emerging country vs developed country demand shock. Moreover, countries characteristic such as high investment as a share of gross domestic product (GDP) and high degree of openness are important in determining the oil prices as they have influences on and affect differently to oil prices based on those characteristics. Furthermore, adverse oil market shocks are greatly affected by Asia and South America, while North America and Europe are negatively affected (Aastveit, et al., 2015).

Economic News. When it comes to oil prices increase and decrease within a day, In the article "Jumps in Oil Prices: The Role of Economic News," the research studied if there is "Jumps" in oil prices when the economic news releases. The "jumps" in the article means relatively large movements in the conditional mean of (log) oil prices over arbitrarily short

intervals. The intraday data and Jump test proposed by Lee and Mykland (2008) is used to determine the intraday jumps. The finding show that there are four -interval jumps that occurs during the days. The time when four Jumps occurs are 8:30 am and 10:30, when the morning domestic news release, and the 5:00am when Europe economic new releases, and the 9:00 am, when the opening of trading in the pits. The results shows that there is strong links in jumps of oil prices and the release of economic news. In particular, the time when news related to crude oil inventories causes large jumps in oil prices. This research provides that fact that large jumps in oil prices are happening because of pertinent economic information (Elder, et al., 2013).

Oil production: Where do oil come from and factors affecting oil production.

As the technology got advanced, the production of oil increases. From 2008 to 2014, the production of oil increased by 73%. OPEC is an Organization of Petroleum Exporting Countries of 14 nations, and it produces 44 percent of the world's total oil production as of 2016. The top three producers of oil has been Russia, Saudi Arabia (an OPEC) and the United States.

OPEC and Non-OPEC. The oil that we are using today comes from OPEC and Non-OPEC. OPEC, Organization of the Petroleum Exporting Countries is an organization of 14 nations , which are Algeria, Angola, Ecuador, Equatorial, Gabon, Iran, Iraq, Kuwait, Libya, Nigeria, Quarter, Saudi Arabia, United Arab Emirates, and Venezuela. While the rest of the countries in the world that produces oil are considered Non- OPEC. Crude Oil are predominately comes from OPEC countries and they have significant impact on the world crude oil market. 5 of these countries - are five highest crude oil reserve and one third of the world crude oil comes from there (Matsumoto, et al., 2012).

Non-OPEC oil production seems to have effect on OPEC oil production. Ratti & Vespignani (2015) reported in the journal titled "OPEC and non-OPEC oil production and the

global economy" that the growth in non-OPEC oil production causes the growth on OPEC oil production.

OPEC and its export capacities. As OPEC play such important role in the crude oil, it oil production and export capacity is researched. In "Energy Policy" Journal, the article named "Exploring Crude oil Production and export capacity of the OPEC Middle East Countries," the authors developed a scenario and created model to predict crude oil export and production. The result explains that the peak of oil export and production were in early of this century in OPEC countries Middle East countries, and they were the highest in export and production before and after the peak point. The research concluded that the OPEC Middle East will produce most of the crude oil of the world and they will be the key players in crude oil. The prediction from this model expect that OPEC Middle East production will be highest from 2018 to 2032, and it export capacities will peak from 2010 to 2033 (Matsumoto, et al., 2012).

Economic determinants of oil production. Oil prices and demand of oil in the world are one of the factors that influences the production of the oil. As reported in the article " On the economic determinants of oil production: Theoretical analysis and empirical evidence for small exporting countries," the research found that although there is a strong relationship between oil production and changes in oil consumptions of the world, changes due to oil prices are very low (Cologni and Manera, 2014).

Oil price and production on the country's economy

Oil is one of the commodities that effect the world economy according to the article "Influential factors in crude oil price forecasting." The article extend explaining that oil and gas makes up 3% of the global GDP, and The oil prices have a great impact on the world economy at various level from family budgets to corporate earning and to the national economy. 10%

increase in oil prices causes 0.2% drop in global GDP. This debate of oil prices effect on global economy has been since 1983 when Hamilton published an article called " Oil and macro economy since World War II" Many research studies have been performed with many different models to determine the impact oil price fluctuation has on the economy (Miao, et al., 2017).

In the article "How Oil Prices Impact the U.S Economy" by Andrew Beattie, it explained that while decrease in oil prices causes gas prices for transportation go down, leading airline tickets got cheaper, currently it causes the U.S economy go down because U.S is now the top producer of oil and gas.

Oil prices and US economy. Oil prices affect the economic of the country several ways. Higher oil prices can lead to higher output on the supply side, and lower output in the demand side. The Journal article "The relationship between oil prices and US economy revisited" the effect of oil prices on US economy is investigated by creating the Quantile Regression model, and it results concludes that there is a supply-driven link between price and economic growth In a short run. However in a long run, the demand-driven link dictate for price and economic growth. It also extends that future economy in US depends on the oil price in a way that oil is used for energy inputs. For example- US agricultural sector depends on oil for energy input which in turn lead to the price increase in agricultural products and other commodities (Das, et al., 2017).

Oil price and Chinese economy. In China, oil prices increase has adverse effect on economy as developing countries. To put it another way, oil prices increase negatively affects output and investment and positively affects inflation rate and interest rate as describes in the article "Oil price shocks and their short- and long-term effects on the Chinese economy." The

structural vector auto-regression model is developed to explain this difference in oil prices impact on Chinese economy (Tang, et al., 2010).

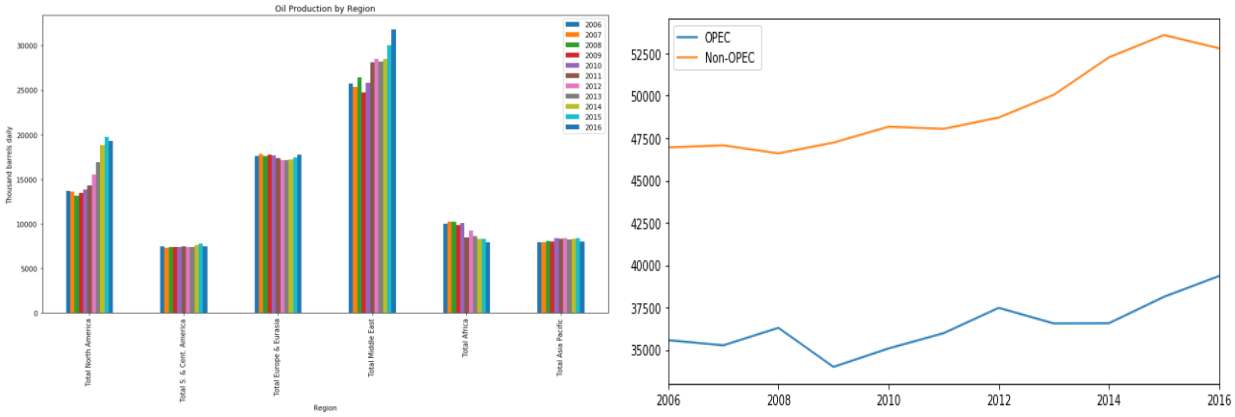
Oil Price and Global economy. The article "Oil prices and the global economy: A general equilibrium analysis" reported about the study that use multi-county, multi-sector, recursive dynamic, global CGE model to determine the impact of oil to the global economy. They used the model that includes 25 countries with 28 sectors and commodities in each country and region. The study found that in countries with emerging economies like China, India and Thailand experience GDP losses while Middle Eastern and North Africa region would gain the most with the increased price of oil (Timilsina, 2015).

Oil Production and Economic growth on OPEC. When figuring out if there is cointegration and causality relationship of oil production and economic growth in the OPEC countries, it is found that oil production and economic growth are cointegrated, and the author further concludes that there is a significant effect on oil production which has positive effect on the economic growth in OPEC countries based on the article "The Impact of Oil Production On Economic Growth In OPEC Countries: Evidence From the Panel Approach." (Djelloul, et al., 2017).

Oil Production and the global economy. OPEC and non-OPEC oil production has different effect on the economy before 1996 and after 1996 according to the article " OPEC and non-OPEC oil production and the global economy." In the article, the author states that Hamilton identifies 1973 to "the age of OPEC," and 1997 to the present as "a new industrial age." While in the age of OPEC, OPEC oil production decrease with the increase in non-OPEC oil production. However, in new industrial age, OPEC oil production increase with the increase in oil prices. This growth in OPEC oil production has growth in global GDP (Ratti, 2015).

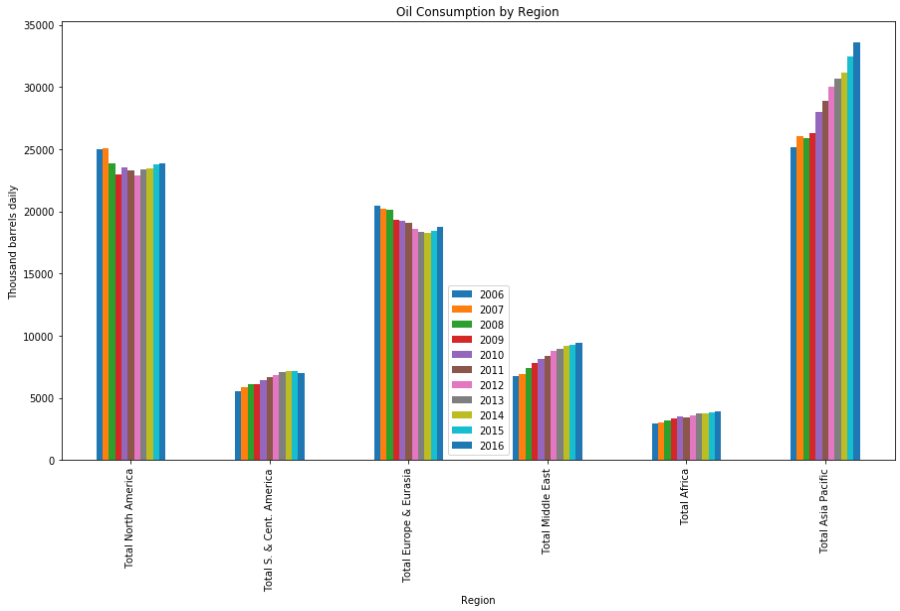
Key Findings

Using the datasets from British Petroleum, which is the world's six largest British multinational oil and gas company, and International Monetary Fund, Oil price, Oil production, and their effects on economy is data mined and researched, and the results' visualizations and interpretations are addressed below.

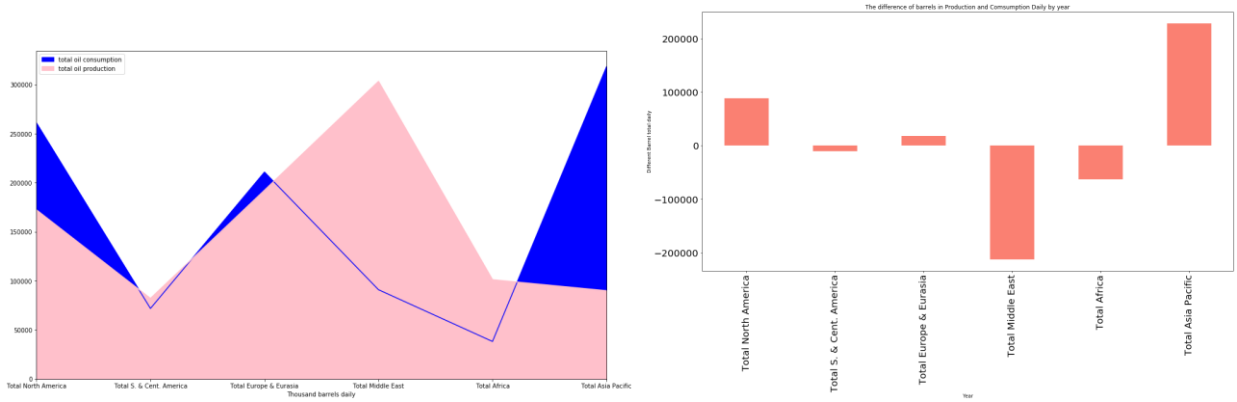


Oil production by region graph (left) shows that oil is produced the most in the Middle East part of the world. Compared to past 10 years of oil production, this graph also shows that the oil production is highest in 2016 in middle east countries. The total oil production of Europe and Eurasia, Central America and Asian Pacific seem to be constant over past 10 years. Total Oil Production of North America is increasing while Africa is decreasing year by year.

The graph comparing the OPEC and Non-OPEC oil production shows that number of barrels OPEC countries (14 countries) produced is a lot compared to the amount that were produced by all the other Non-OPEC countries.

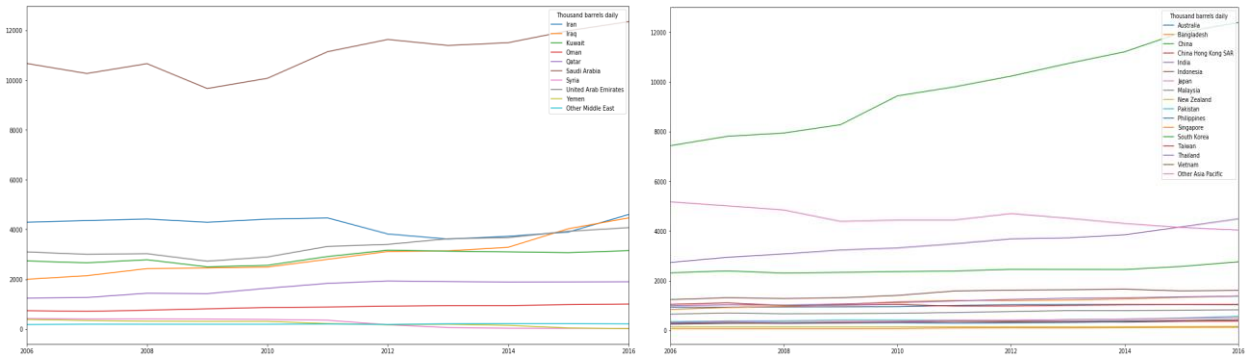


Oil consumption by region graph demonstrates that oil consumption is highest in Asian Pacific Countries, and its consumption rate is increasing very fast. Europe and Eurasia region's consumption rate of oil is decreasing over past 10 years. Central America, Middle East, and Africa have increase in oil consumption with a different rate in each region.



The above two graph compared 10 years production and consumption of oil by region. The right graph show that the North America and Asian Pacific use more oil than they produce, and Africa and Middle East produce more oil than they consume. The amount of Central

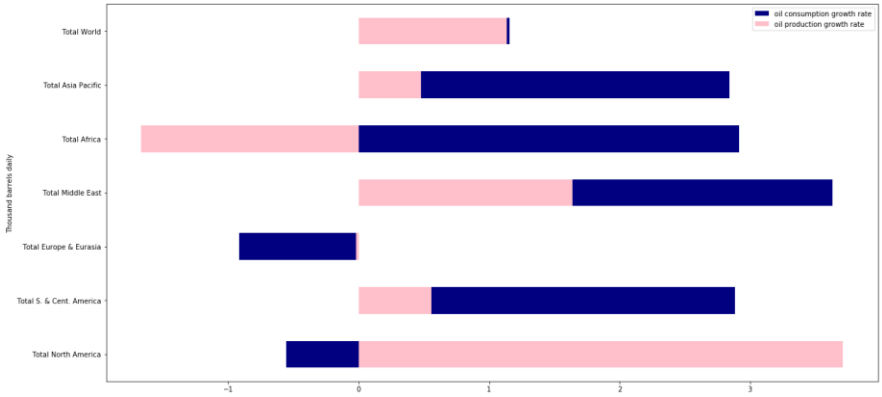
America's oil production and consumption is very close. The left graph compared the difference of oil production and consumption by barrels in six regions.



Interpretation from the earlier graphs ensure that Middle East produce and Asian Pacific consume the most oil, therefore further exploration on which country in Middle East produce and which country Asian Pacific consume the most oil is explored here.

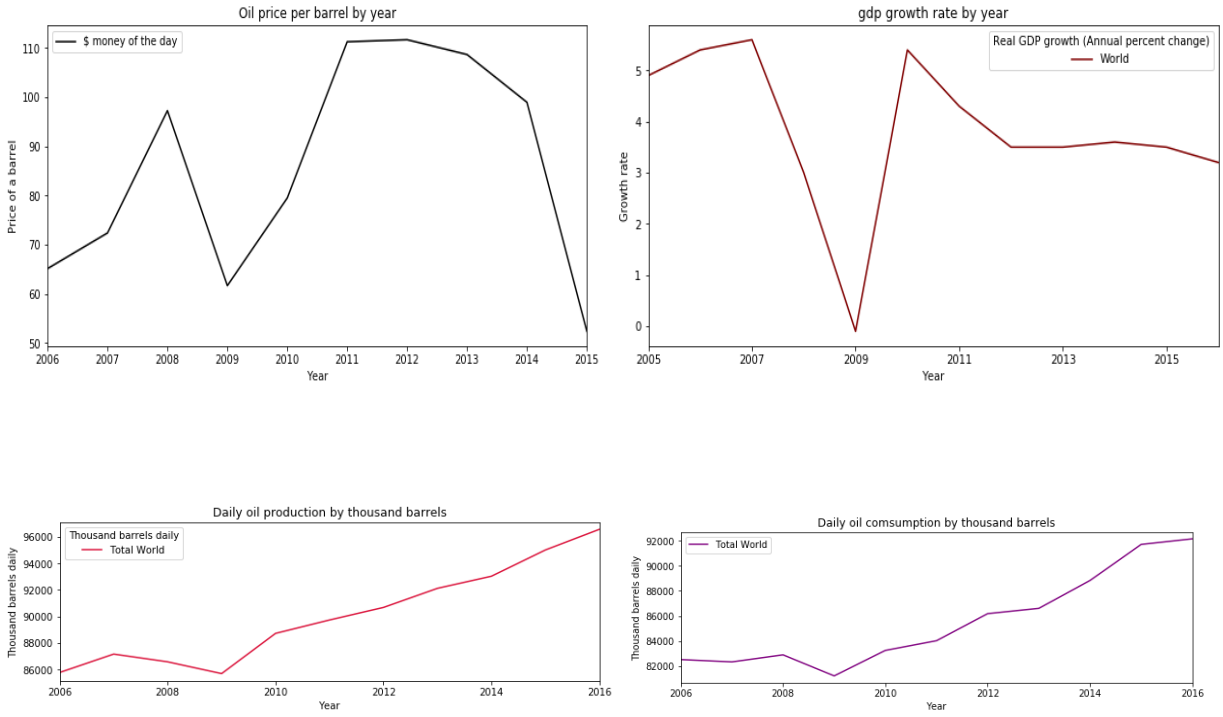
We can infer from the above two graphs that Saudi Arabia produce, and China consumed the most oil over past 10 years and the amount of its' production and consumption are increasing steadily year by year. Japan is second highest oil consumption in Asian Pacific over past ten years, however, it consumption is declining in a low rate.

The growth rate of oil consumption and oil production are compared in the below graph. The graph below shows the growth rate from 2005 to 2015 in six different regions of the world.



Even though, the earlier graphs showed that Asian Pacific consumed and Middle East produced the most oil, North America has the highest growth rate in oil production, and Middle East has highest growth rate in oil consumption when it comes to growth rate.

To see how the oil price and production has effect on economic, GDP growth rate data is used to compared if there is relationship between them. The four visualizations demonstrate if there is a relationship between them.



The upper(left) graph shows oil price per barrel by year. Starting from 2011, the price of oil keep decreasing. In 2015, the price of oil per barrel drastically decreased from being above 95 per barrel to around 53 per barrel.

Daily oil production and consumption by thousand barrels graph describe that oil production and consumption keep increasing since 2009 without going down than the previous years.

Comparing the oil price per barrel graph to GDP growth rate graph, the GDP growth rate decreases as the oil price per barrel decreases, but they are not in the same rate. In 2011, the GDP growth rate started to decline even though the oil price keep raising.

Recommendation

The results from the data mining can be interpreted as there could be a relationship in oil price, oil production on economic; however, with more statistical analysis and looking over many years instead of 10 years, we might be able to see if there is a real relationship or not in oil price, oil production, oil consumption on economy.

Conclusion

Overall, The findings from the literature suggest there are relationship among Oil Price, Production on Economic. Oil Prices are influenced by Demand, Financial market, Commodities market, and Geopolitical. Emerging countries and developed countries has different impact on oil prices, and economic news also have effect on oil prices. Oil production is also influenced by demand, and oil prices. Moreover, it has different influences based on whether it is OPEC countries or not. Oil price have influence on the Economy, and how it influence depends on each country. The economy can go up or down with the oil price increase and decrease. Oil production also have influence on the Economy. However, in the case of oil production, different time frame has different influence because of increase or decrease in oil production.

Similar to the literature finding, the data mining results of past 10 years period results show that there is a possible relationship between them as explained in the key findings.

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