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The SEEDS of oil price fluctuations: A management perspective

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In view of unreasonable oil price fluctuations, this paper reviews past researches to propose a SEEDS framework to analyze the forces that influence oil price fluctuations. The SEEDS framework discusses oil price fluctuations from the supply side, environmental protection side, economic side, demand side and substitute side. According to SEEDS, we believe the rapid increase in oil price is not good for both net oil exporters and net oil importers. Of course, nobody doubts that crude oil reserves are limited. We also believe that oil prices would continuously increase, but not double or triple within one year. The global economy cannot endure sharp increase in manufacturing costs and product prices. This would reduce consumption and production at the same time, followed shortly by financial market crisis. Recognizing the symbiosis of net oil exporters and net oil importers is very important; we believe that this framework will help people understand that rapid increases in oil price are dangerous to world economics. The SEEDS framework can also be applied to analyze the price fluctuations of bulk commodities.

Key words: SEEDS, oil price, price fluctuation.

INTRODUCTION

It would not be a wise decision for net oil exporters to keep oil prices at high levels by decreasing oil production. Net oil exporters must know that even the oil price fall from USD143 per barrel to USD60 per barrel presents high profit margins because the average price never exceeded USD60 per barrel, mostly under USD35 per barrel from 2000 - 2004. However, they may say that \$60 is the bottom line and we should keep the oil price within a reasonable price range. What is a reasonable price range? We have a serious global economic recession, marked by the bankruptcy of giant companies, stock disasters in the markets that never happened before in recent history. Do net oil exporters (NOE, e.g., Saudi Arabia, Kuwait, and Venezuela) still think net oil importers (NOI, e.g. Japan, Taiwan, and Singapore) can afford higher oil prices than those in the period from 2000 - 2004? We agree that rapid economic development, especially from India and China, is a major reason why the oil price has soared over the past three years. However, oil prices should not be four or five times the average price. No one can deny that the high oil price is also a reason for the reduction in the economies of developed and developing countries. During the economic recession, most countries cannot

afford high oil prices. If NOI tries to maintain high oil prices, it would endanger the global economy and in the end NOI will not enjoy high oil prices for long because of weak demand.

Many people understand that oil resources are limited and we must do more to reduce resource waste and increase energy use efficiency. In the US, some public places used to waste energy, such as the light bulbs always on, air conditioners or heaters always free. Now, they have begun to think and save more energy for our earth and save more money.

This paper reviews past researches (Aguilera et al., 2009; Chen, 2010; Hamilton, 1983; Hamilton, 2009; Kesicki, 2010; Martinsen et al., 2010; Mork, 1989; Naccache, 2010; Radetzki, 2006; Ran et al., 2010; Shi, 2010) to propose a SEEDS framework to analyze the forces that influence oil price fluctuations. The SEEDS framework discusses oil price fluctuations from the supply side, environmental protection side, economic side, demand side, and substitute side. We believe that this framework will help people to understand that rapid increases in oil prices are dangerous to the world economy.

SEEDS FRAMEWORK

In this section, SEEDS framework would be described from five dimensions including supply side, environmental protection side, economic side, demand side, and substitute side. In this section, we would explain five dimensions one by one. With these five dimensions, we would have a comprehensive understanding of causes and impacts of oil price fluctuations.

Supply side

We all know that crude oil reserves are limited. The crude oil reserves create fortunes for NOE. NOI tries to avoid price competition by controlling oil production. However, every oil country wants to sell its crude oil for the best price and meet its own best interest. When the price is going up, NOE may try to constrain oil shipments to wait for a higher price. Conversely, when the price is going down, nobody wants to sell it for the lower price. When the profit margin per barrel increases, they want to invest in high-cost production facilities to explore for new oil sources. Previously they won't do this because of the high capital expenditure. That is, they change the cost structure and increase their production cost. When the oil price is falling, they reduce production to prevent the price from going down. High-oil prices are one of the key drivers in the global economic recession. NOI should not try to constrain shipments to keep the oil price level. If NOI artificially inflates oil prices there will be a short bounce followed by a price plunge again. Some NOE will then begin to ship more oil, leading to a further price cut. While there is incentive for both consumers and the cartel to negotiate international supply agreements, there still remains incentive for producers to break their agreements, subsequently causing mistrust and potential conflict. Even the best solution for the cartel can be subverted, ruining cartel credibility unless the cartel can bind itself to fulfill the plan. Without binding contracts, the cartel will likely depart from the initial plan to seek self-interest at some future date (Newbery, 1981).

The announcement of a production decrease would not help a lot because collusion will not work when price is falling. NOI will make a fortune in the short run but force global governments to find solutions to resist high oil prices.

Environmental protection side

Due to the serious problems caused by the greenhouse effect, people have more environmental consciousness than before and try to reduce energy waste. More importantly, more people with high eco-awareness would like to use clean energy to save our planet. The high oil price will also strengthen their will to take action. The opportunity

cost for adopting clean technologies is decreasing because of high oil prices. Therefore, high oil prices simulate clean energy market growth.

Governments, especially NOI, will have more pressure to secure energy supplies and meet environmental protection protocols, with clean energy becoming their key alternative. They can be more energy independent if they encourage or create more clean energy. Germany, Japan, and the US have increased their clean energy budgets to encourage or develop clean and alternative energy sources. With more resources put into clean energy, we can expect a technology breakthrough with low-cost commercialization there after.

To meet the environmental protection demand of customers, green marketing is becoming a trend. The green car is a good example. The Toyota Prius was the most popular green car in 2008. Toyota plans to increase Prius domestic output to 60 percent to 450,000 a year by 2009. By 2015, Goldman Sachs expects the hybrid-vehicle market (including plug-in hybrids) to grow to 2.5million, up from half a million in 2007 (Caryl and Kashiwagi, 2008). Because of the 2008 economic crisis, the U.S. government might subsidize the Detroit auto makers to get through this crisis by requiring them to increase the percentage of fuel efficient or hybrid cars in return (White, 2008). It's not easy to calculate the direct economic impact of the green-car race at this point. However, nobody questions that green cars will dominate the car industry in the near future.

There are environmental protection leagues or agreements that governments have to follow. For example, the Kyoto Protocol will have restrictions on carbon-dioxide emissions for countries. WEEE and RoHS will have regulations on products exported to European countries. Governments and companies will have to follow increased regulations just to be globally competitive.

Economic side

Past research has demonstrated that oil price changes have asymmetric effects on the macro-economy. Oil price increases have had a significantly negative impact on GNP growth, while oil price decreases did not lead to increased output growth (Mork, 1989; Mork, Olsen and Mysen, 1994; Ferderer, 1996). Besides, oil price volatility also has impact on the macro-economy (Ferderer, 1996). Sadorsky (1999) used a vector auto-regression method to confirm that oil prices and oil price volatility both play important roles in affecting economic activity. Changes in oil prices impact economic activity, but changes in economic activity have little impact on oil prices. The estimated results suggest that positive shocks to oil prices depress real stock returns (Sadorsky, 1999). Oil prices generally rise prior to recessions. With a higher oil price, the cost of capital utilization rises and firms reduce output. This reinforces the negative income effect of the rise in oil

prices. Lower capital utilization also reduces the marginal productivity of labor. Meanwhile, the fall in output leads to an increase in the commodity price and the inflation rate (Leduc and Sill, 2004). High oil prices increase the operating costs of firms. In the beginning, firms try to transfer their extra cost burden to consumers by raising the product or service price.

However, not all consumers can endure higher living costs for a long time and some consumers will inhibit their demand. When the oil price continues to go up, the living cost goes up simultaneously. Declining product demand ultimately leads to shrinking profits. This vicious circle then speeds up. Since the current recession has begun, bankruptcies of large companies, unemployment, default risk, mortgage risk, and financial crisis have followed. When a global economic disaster occurs, both non-oil and oil-countries suffer.

Hamilton (1983) first revealed that there was a statistical relationship between oil price variations and GDP. Many researchers tried to explore the relationship between oil price fluctuations and economy. (Hamilton, 1996; Hooker, 1996; Kesicki, 2010; Lee et al., 1995; Mork, 1989; Naccache, 2010; Ran et al., 2010).

Several researches discussed the relationships between oil prices and stock market indexes (Chen, 2010; Kaul and Seyhun, 1990; Jones and Kaul, 1996; Sadorsky, 1999). Some found that the impact of an oil price shock should be absorbed fairly quickly into stock prices and returns. That is, the stock market would respond to the oil price shock rapidly (Jones et al., 2004). There seems to be a connection between oil prices and the 2008 financial market disaster.

Demand side

The rising price might restrain the demand for oil directly and indirectly. Oil price is highly related with manufacturing costs and CPI. Meanwhile, high oil price would also stimulate the development of renewable energy technologies. In this section, we would like to discuss oil demand from different points.

An oil price increase will increase industry manufacturing and operating costs. Enterprises will control oil use with higher standards to reduce waste.

Oil price increases will result in higher CPI and reduce the global demand for products and services. This will hurt economic growth.

The demand from developing countries will decrease because the global demand for their manufacturing services is reduced. Meanwhile, high oil prices increase their production costs. This makes market competition more fierce and some companies will be forced out of the market.

Governments and consumers change their thinking. Renewable energy will be emphasized. More government budgets and enterprise resources will be put into the

development of renewable energy and power saving devices. Consumers will have higher intention to adopt renewable energy or buy power saving devices. Energy policy is also important to the economic development and national security of a country. There are many components of energy policy, in particular the challenges of network security in supply, long-term contracts and the environmental constraints (Helm, 2002). There are two main types of institutions associated with energy policy: government departments and regulatory offices.

Substitute side

Oil is a very important energy source to the world. When the oil price is relatively high for a long time, it stimulates governments and industries to think more about substitutes. Traditional substitutes are nuclear energy and coal. Renewable energy includes solar energy, wind energy, biomass energy, ocean energy, and fuel cells. These technologies receive more attention than before. Japan, Germany, Spain, US, China, and Denmark etc all have ambitious plans to reduce oil dependence. USD 100 per barrel crude oil reminds them that they should develop renewable energy technology as soon as possible to prevent them from suffering from high oil prices. This accelerates technology breakthroughs in renewable energy and more efficient devices (power saving).

From the learning perspective, unit manufacturing costs decrease with increasing experiences. We call this kind of technological progress "a learning curve, progress curve, experience curve, or learning by doing" (Dutton and Thomas, 1984; Argote and Epple, 1990; Argote, 1999; McDonald and Schrattenholzer, 2001). Cost is reduced over time for individual energy technologies (Capros and Vouyoukas, 1999; Nakićenović et al., 1998; McDonald and Schrattenholzer, 2001).

U.S. President Barack Obama said that he will "strategically invest \$150 billion over 10 years" in a "clean energy economy" that will "help the private sector create 5 million new green jobs." Obama also announced to accelerate the commercialization of plug-in hybrid cars, promote renewable energy projects, encourage energy efficiency, invest low-emission coal plants and advance the next generation of biofuels (Dickey and McNicoll, 2008).

In November the International Energy Agency will issue a collection of comprehensive reports that declare in no uncertain terms, "a global revolution is needed in the ways that energy is supplied and used." The U.S., China, Japan, Germany, and the UK, etc have all started to invest more in substitute energy technology for the near future to reduce the negative impact of high oil prices.

SEEDS FRAMEWORK

We propose the SEEDS Framework, Figure 1, including

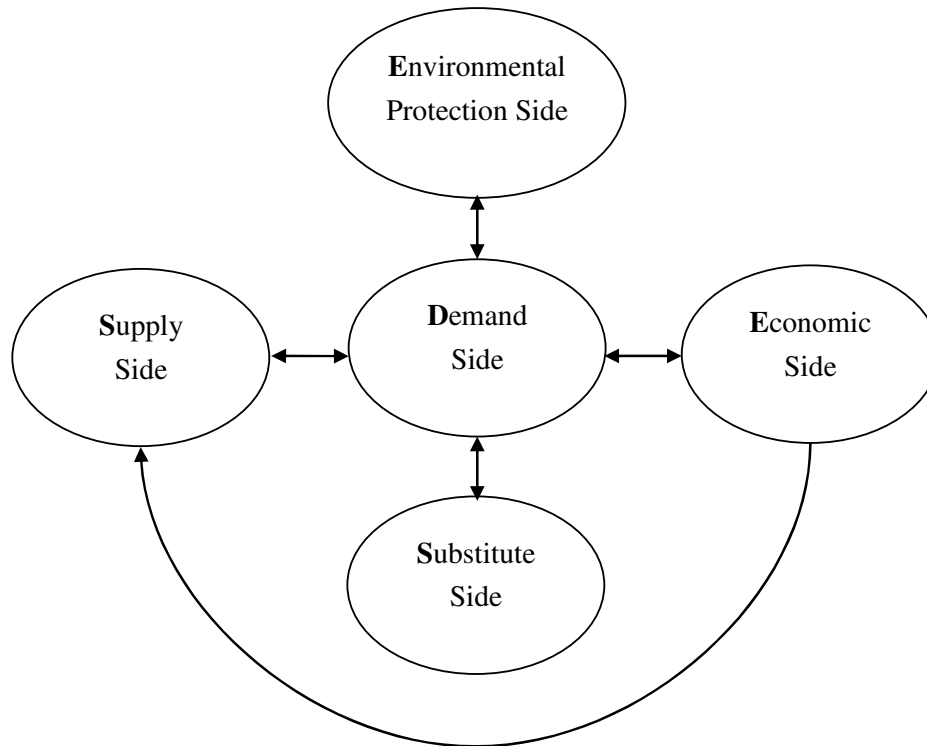


Figure 1. SEEDS framework.

supply side, environmental protection side, economic side, demand side, and substitute side to analyze oil price fluctuations. Using the SEEDS framework, we can understand how oil prices are influenced by various factors. This framework can also be applied to bulk commodities such as agricultural products or metals. When applying this framework to bulk commodities, the users should pay attention to the different components of each side for various research targets. For example, the environmental protection side might focus side effects of biotechnology when discussing agricultural products.

CONCLUSIONS AND SUGGESTIONS

The SEEDS framework provides a comprehensive analysis of oil price fluctuations. According to SEEDS, we believe the rapid increase in oil price is not good for both NOE and NOI. Of course, nobody doubts that crude oil reserves are limited. We also believe that oil prices would continuously increase, but not double or triple within one year. The global economy cannot endure sharp increase in manufacturing costs and product prices. This would reduce consumption and production at the same time, followed shortly by financial market crisis. Recognizing the symbiosis of NOE and NOI is very important.

According to our research, we propose the following suggestions to NOE, NOI, and enterprises.

Suggestions to NOE

Invest in renewable energy

As we know, oil is a valuable resource but limited. Therefore, NOE should think more about their future. They should make good use of their fortunes from crude oil to invest in renewable energy technologies to sustain their business as energy supplier. It is very clear that fossil fuel will be replaced by some new energy in the future. Investing in alternative energy sources would be good choices for NOE to remain key players in the energy business.

Adequate expansion

Over \$100 per barrel crude oil is attractive to NOE in producing more oil. However, excess expansion would cause the oil price to decline and manufacturing costs to increase. Adequate expansion to meet the new demand from emerging countries is necessary to keep the oil price within a reasonable price range.

Suggestions to NOI

Encourage environmental protection products

There will be more environmental regulations that

countries will have to follow in the future because of the greenhouse effect. To obey the Kyoto protocol, countries must reduce carbon-dioxide emissions. Encouraging the use of environmental protection products would be helpful in reaching the target.

Encourage the development of clean technology

Clean technology is good for the Earth but its' relatively high cost inhibits people from adoption. Clean technology includes solar energy, fuel cell, and wind energy, etc. Some countries, e.g., Germany, Japan, and Denmark, are putting a lot of efforts to enhance their industry competitiveness in these areas. Government support would help in the development of clean technology. If countries invest more in clean technology now, they will pay less for energy in the future.

Suggestions to enterprises

Efficient manufacturing process

Production facility re-layout, automation and reducing unnecessary manufacturing steps would save more time and energy for enterprises. Maximum use of materials by virtue of appropriate specification would save money for enterprises. For example, AUO's environmental package for TFT-LCD panels not only satisfies environmental protection but saves space which lowers transportation costs.

Power saving devices/plan

Several countries encourage enterprises to install power saving devices or propose power saving plans to decrease energy consumption. Governments might provide financial incentives, such as tax credit, subsidy, and project budget to enterprises to use energy more efficiently. Some companies even build green buildings or green factories, not only reduce energy waste but enhance corporate reputation. This would save operating cost for enterprises. More enterprises implementing power saving plans would be good for the environment.

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