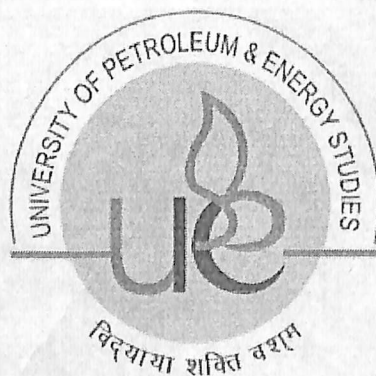


A
DISSERTATION REPORT
ON
FACTORS AFFECTING CRUDE OIL PRICES AND ITS IMPACT ON
INDIAN ECONOMY

Under the Guidance of:
Mr. N. Bhanu Prakash
Assistant Professor (SS), CMES

By
Ankur Rana
Integrated B.Tech (APE) +MBA (UAM)
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April, 2012

COLLEGE OF MANAGEMENT AND ECONOMIC STUDIES
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This is to certify that dissertation report on 'Factors Affecting Crude Oil Prices And Its Impact On Indian Economy' completed and submitted to UPES, Dehradun by 'Ankur Rana' in partial fulfillment of requirements awarded the Integrated B.Tech(APE)+MBA(UAM), is bonafide work carried out by him under my supervision and guidance.

To the best of my knowledge and belief the work has been based on investigation made, data collected and analyzed by him and this work has not been submitted anywhere else for any other university or institution for the award of any degree or diploma.

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Mr.N.Bhanu Prakash

Assistant Professor (SS), CMES

DECLARATION

I, Ankur Rana student of Integrated B.Tech (APE) +MBA (UAM) management at UPES declare that work done on “FACTORS AFFECTING CRUDE OIL PRICES AND ITS IMPACT ON INDIAN ECONOMY” is original. Any references made in this project are duly acknowledged. The analysis of past present and future as documented in this project is thereby the copyright of the author. This report should not be reproduced without permission of the author. To the best of my knowledge and belief the subject matter here is original and has not been submitted to any other university till date.

Ankur Rana

Dehradun

30th April, 2012

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With deepest sense of gratitude I wish to place on record my sincere thanks to my project guide Mr.N.Bhanu Prakash for leading & mentoring me throughout the project tenure. I wish to thank him for insightful conversations during the development of the ideas in this report, and for helpful comments on the text.

At last I am also thankful to staff of UPES & specially Library for providing the reference material on timely basis.

Ankur Rana

Dehradun

30th April, 2012

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1.1 Motivation

Being in the oil sector and particularly working in the corporate planning group, volatility of oil price and its impact on the economy has always attracted me. I am strongly convinced that oil will be the dominant fuel for at least next 25 years and its price volatility will affect the growth rate and inflation. However, the effect is expected to gradually come down considering the decrease in energy consumption per US\$ of GDP over the years. Further, whether the increase and decrease of crude oil price has the same effect on the economy or has totally different effect? If difference, why? These are some of the issues which have been topic of discussions among the experts for years.

It is also interesting to observe the strategy of the oil and gas companies with regard to capital investment on exploration and production linked to the crude oil price. It is a known fact that growth of most of the upstream companies takes place both through its own exploration for new reserve accretion as well as acquisition of new reserves through farm in by buying the equity or acquisition of a company or merger of two or more companies. At high price, whether the Companies should be going for such acquisition or not is the debate going on among the experts.

I thought it would be interesting to go into this very exciting topic of oil business which has a major impact on the future of oil business as well as the economy. This has motivated me to select the topic

“Factors affecting crude oil prices and its impact on Indian Economy”

as my project work.

1.2 Methodology

The study will cover the qualitative aspect as well as the quantitative work as far as possible. The study is divided in six parts which are :-

- Understanding the events affect the oil price over the years
- Relationship between output and oil consumption
- Theory which links the oil price with GDP
- Formulation of econometric model to find out empirical relationship between oil price and GDP
- Oil Price vis-à-vis strategy of Oil and Gas Companies
- Study link of oil price with Indian Economy.

The study first finds out the various events which had affected the oil price over the years. In the chapter aspect of method of oil pricing and its trading has also been covered. It explains in details the different types of oil being traded and how are they prices.

The strategies of oil and gas companies are mainly considered on the qualitative aspect due to lack of availability of data. The mergers and acquisitions in oil and gas companies with their purpose have been briefly covered with analysis of few such mergers and

acquisitions in oil and gas companies and their timing. However, the elasticity of oil price and capital investment by oil and gas companies has been studied through graphics

1.3 Summary of the Chapter

In this chapter, a brief detail was presented on the work carried in the project. It covers in brief the world's every requirement and economic growth. Energy is required for fueling the growth of the economy. Whereas the developed countries are growing at the rate of 3 to 4%, the developing countries are growing at much faster pace of around 7 – 10%. Hence, the energy requirement of the developing countries is increasing at a faster rate. The growth in oil consumption in the developing countries like China and India have been 6.5% and 5.7% respectively whereas the same in USA has been 1.7% in the last ten years.

The importance of oil in the energy mix of the world and working in the oil sector motivated me to take project topic as

“Factors affecting Oil Prices and its impact on Indian Economy”

Methodology to be used has been covered in details in the chapter. The report has been divided into six parts to understand the history and reasons for changes in crude oil price, link between oil consumption and macro economy, theoretical understanding of why oil price should affect macro economy, strategies of upstream companies with respect to increase in oil price and impact on the Indian economy of oil price increase.

CHAPTER 2: CRUDE OIL PRICING

2.1 Background

Crude oil prices behave much as any other commodity with wide price swings in times of shortage or oversupply. About 53% of oil being produced is traded internationally. The crude oil price cycle may extend over several years responding to changes in demand as well as OPEC and non-OPEC supply (William – 2005).

In the post World War II era oil prices at the wellhead have averaged at around \$30 per barrel adjusted for inflation to 2005 dollars. Over the same post war period the median for the adjusted world price of crude oil was \$22.90 at 2004 prices. That means that only fifty percent of the time from 1947 to 2004 have oil prices exceeded \$22.90 per barrel.

The very long term view is much the same. Since 1861 the crude oil prices adjusted for inflation have averaged \$ 23.88 per barrel. Fifty percent of the time prices were below the median oil price of \$ 15.71 per barrel.

Crude oil is sold through a variety of contract arrangements and in spot transactions. Oil is also traded on futures markets but not generally to supply physical volumes of oil, more as a mechanism to distribute risk. These mechanisms play an important role in providing pricing information to markets. Pricing of Physical Crude Oil Trades generally is based on a formula approach where marker crude is used as the base and then a quality differential as well as a demand/supply (premium/discount) is added depending on the crude being purchased.

2.2 Historical Perspective

Prior to the present high oil price scenario following five events have a major impact on the crude oil prices since the Second World War:-

Nov., 1956	Suez Crisis	Leading in drop in crude oil Production of 10.1%
Nov., 1973	Arab-Israel War	Leading to drop in crude oil Production of 7.8%
Nov., 1978	Iranian Revolution	Leading to drop in crude oil Production of 9%
Oct., 1980	Iran-Iraq War	Leading to drop in crude oil Production of 7.2%
Aug. 1990	Persian Gulf War	Leading to drop in crude oil Production of 8.8%

Crude oil prices ranged between \$2.50 and \$3.00 from 1948 through the end of the 1960s. The price oil rose from \$2.50 in 1948 to about \$3.00 in 1957. When viewed in 2004 dollars an entirely different story emerges with crude oil price fluctuating from \$15 to \$17 during the same period. The apparent 20% price increase was just keeping up with inflation.

From 1958 to 1970 prices were stable at about \$3.00 per barrel, but in real terms the price of crude oil declined from above \$16 to below \$13 per barrel. The decline in the price of crude when adjusted for inflation was amplified for the international producers in 1971 and 1972 by the weakness of the US \$.

2.2.1 Formation of OPEC and its impact

OPEC was formed in 1960 with five founding members Iran, Iraq, Kuwait, Saudi Arabia and Venezuela. By the end of 1971 six other nations had joined the group : Qatar, Indonesia, Libya, United Arab Emirates, Algeria and Nigeria. From the foundation of the Organisation of Petroleum Exporting Countries through 1972 member countries experienced steady decline in the purchasing power of a barrel of oil.

In March 1971, the power to control crude oil prices shifted from the United States (Texas, Oklahoma and Louisiana) to OPEC. A little over two years later OPEC would through the unintended consequence of war get a glimpse at the extent of its ability to influence prices.

2.2.2 Yom Kippur War- Arab Oil Embargo

In 1972 the price of crude oil was about \$3.00 per barrel and by the end of the 1974 the price of oil had quadrupled to over \$12.00. **The Yom Kippur War started with an attack on Israel by Syria and Egypt on October 5, 1973.** The United States and many countries in the western world showed strong support for Israel. As a result of this support several Arab exporting nations imposed an embargo on the countries supporting Israel. Arab nations curtailed production by 5 million barrel per day (MMBPD) about 1 MMBPD as made up by increased production in other countries. The net loss of 4 MMBPD extended through March of 1974 and represented 7 percent of the free world production.

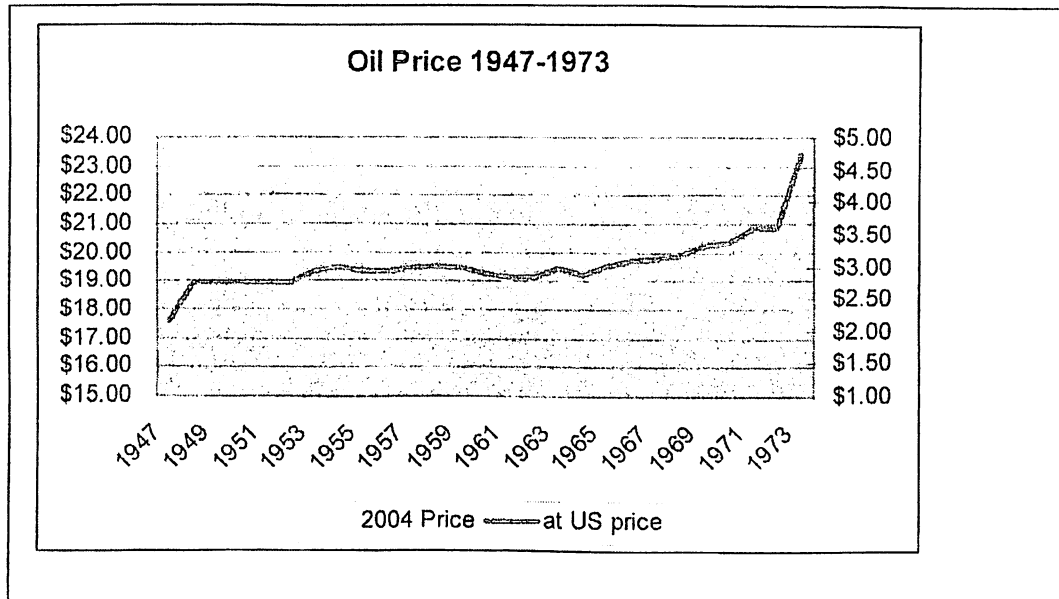


Figure 2.1

2.2.3 Crises in Iran and Iraq

From 1974 to 1978 world crude oil prices was relatively flat ranging from \$10 per barrel to \$15 per barrel. When adjusted for inflation the price over that period of time exhibited a moderate decline.

Events in Iran and Iraq led to another round of crude oil price increases in 1979 and 1980. The Iranian revolution resulted in the loss of 2 to 2.5 million barrel of oil per day between November, 1978 and June, 1979. At one point production almost halted.

Further, Iraq invaded Iran in September 1980 by November the combined production of both countries was only a million barrels per day and 6.5 million barrel per day less than a year before. Worldwide crude oil production was 10 per cent lower than in 1979.

The combination of the Iranian revolution and the Iraq/Iran War resulted in crude oil prices more than doubling from \$14 in 1978 to \$35 per barrel in 1981.

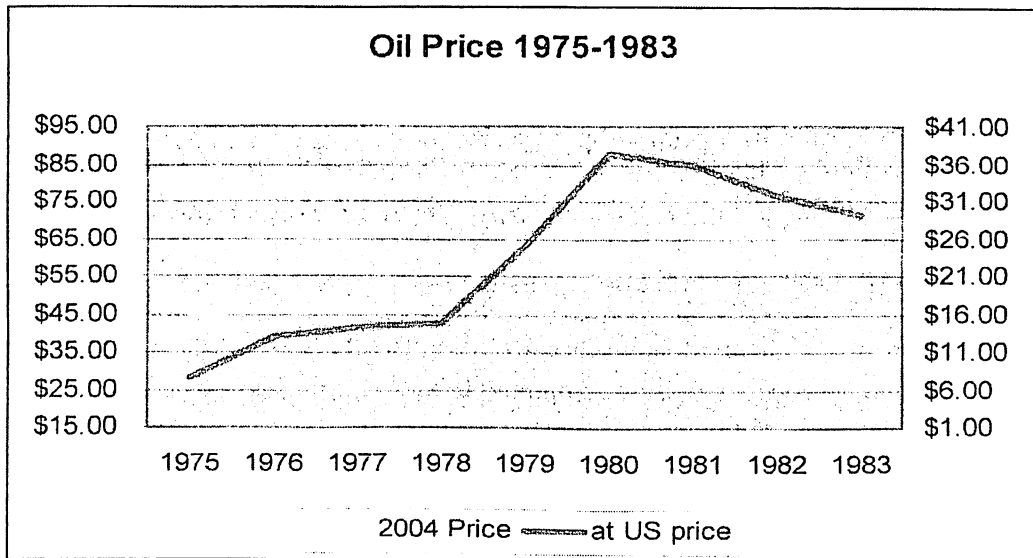


Figure 2.2

2.2.4 OPEC's Failure to Control Crude Oil Prices

The rapid price increase of 1979 and 1980 served to accelerated consumer's moves towards efficiency. They also fueled an increased in non OPEC production. This was compounded by the deregulation of domestic crude oil prices in the United States. U.S. producers experienced the effects of increases in World price plus the additional increase brought on by price deregulation. By 1981 the effects of seven years of increased prices had taken its toll on demand in the form of more energy efficient homes, industrial process, and in substantial increases in automobile gasoline mileage. Surging, prices caused several reactions among consumers: better insulation in new homes, increased insulation in many older mileage. These factors along with a global recession caused a reduction in demand which led to falling crude prices. Unfortunately for OPEC only the global recession was temporary. Nobody rushed to remove insulation from their homes of

to replace energy efficient plants and equipment – much of the reaction to the oil price increase of the end of the decade was permanent and would not respond to lower prices with increased demand for oil.

The higher prices also results in increased exploration and production outside the OPEC. From 1980 to 1986 non-OPEC production increased 10 million barrels per day. OPEC was faced with lower demand and higher supply from outside the organization.

From 1982 to 1985 OPEC attempted to set production quotas low enough to stabilize prices. These attempts met with repeated failure as various members of OPEC would produce beyond their quotas. **During most of this period Saudi Arabia acted as the swing producer cutting its production to stem the free falling prices. In August of 1985, the Saudis tired of this roll. They linked their oil prices to the post market for crude and by early 1986 increased production from 2 MMBPD to 5 MMBPD. Crude oil prices plummeted below \$10 per barrel by mid-1986.**

A December 1986 OPEC price accord set to target \$18 per barrel was already breaking down by January of 1987. Prices remained weak. The price of crude oil spiked in 1990 with the uncertainty associated Iraqi invasion of Kuwait and the ensuing Gulf War, but following the war crude oil prices entered a steady decline until in 1994 inflation adjusted prices attained their lowest level since 1973.

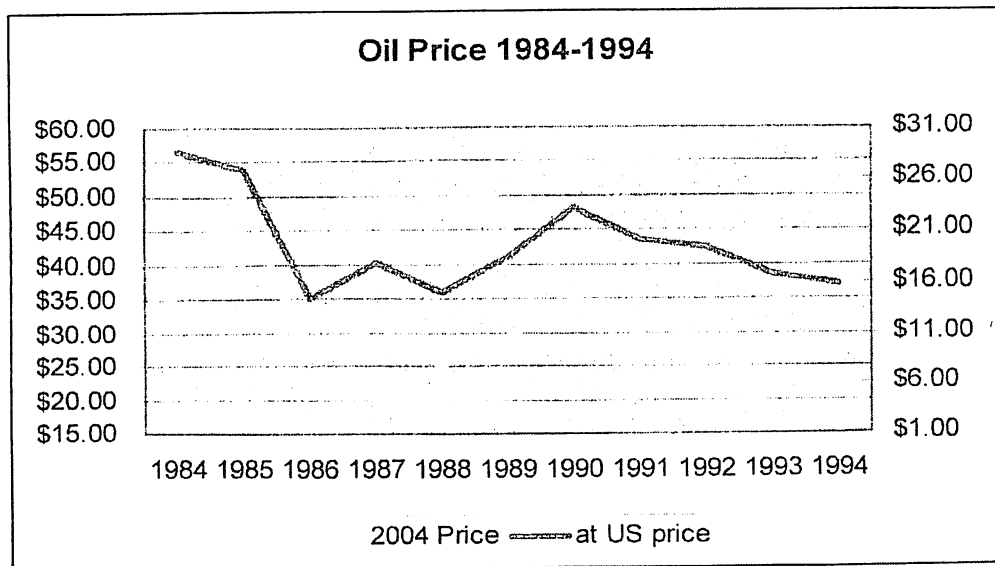


Figure 2.3

2.2.5 Present Price Scenario

The price cycle had since then turned up. **The United States economy was strong and the Asia Pacific region was booming. From 1990 to 1997 world oil consumption increased 6.2 million barrels per day. Asian consumption accounted for all but 300,000 barrels per day of that gain and contributed to a price recovery that extended into 1997.**

The price increases came to a rapid end when the impact of the economic crisis in Asia was either ignored or severely underestimated by OPEC. In December, 1997 OPEC increased its quota by 2.5 million barrels per day (10 percent) to 27.5 MMBPD effective January 1, 1998. The rapid growth in Asian economies had come to a halt and in 1998 Asian Pacific oil consumption declined for the first time since 1982. The combination of lower consumption and higher OPEC production sent prices into a downward spiral. In response, OPEC cut quotas by 1.25 million b/d in

April and 1.335 million in July. Price continued down through December 1998. Prices began to recover in early 1999 and OPEC reduced production by another 1.719 million barrels in April 1999. As usual not all of the quotas were observed but between early 1999 and the middle of 1999 OPEC production dropped by about 3 million barrels per day but was sufficient to move prices above \$25 per barrel.

With minimum Y2K problems and growing US and world economies the price continued to rise throughout 2000 to a post 1981 high. Between April and October three successive quota increases totaling 3.2 million barrels per day were not able to stem the price increases. Prices finally started down following another quota increase of 500,000 effective November 1, 2000.

By yearend oversupply was not a problem. **Problems in Venezuela led to a strike at PDVSA causing Venezuelan production to plummet. In the wake of the strike Venezuela was never able to restore capacity to its previous level and is still about 900,000 barrels per day below its peak capacity of 3.5 million barrels per day.** OPEC increased quotas by 2.8 million barrels per day in January and February, 2003.

On March 19, 2003, just as some Venezuelan production was beginning to return, military action commenced in Iraq. Meanwhile, inventories, remained low in the U.S. and other OECD countries. With an improving economy U.S. demand was increasing and Asian demand for crude oil was growing at a rapid pace. The loss of production capacity in Iraq and Venezuela combined with increased production to meet growing international demand led to the erosion of excess oil production capacity. In

mid 2002, there was over 6 million barrels per day of excess production capacity, but by mid 2003 the excess was below 2 million. During much of 2004 and 2005 the spare capacity to produce oil has been less than one million barrels per day. A million barrels per day is not enough spare capacity to cover an interruption of supply from almost any OPEC producer. In a world that consumes over 86 million barrel per day of petroleum productions that add a significant risk premium to crude oil price and are largely responsible for prices in excess of \$50 per barrel.

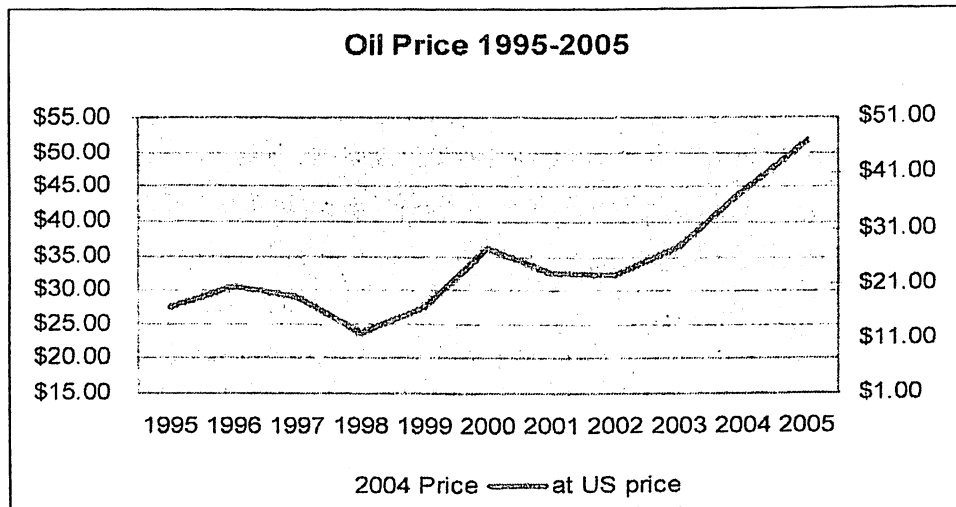


Figure 2.4

2.3 Pricing of Crude Oil

The number and variety of crude oils that are traded on the international market has steadily increased over the past years, partly as a response to the desire to diversify sources of supply and partly because increasing global demand has encouraged production in less well known oil-producing areas. Currently more than 150 crude grades are described in *The International Crude Oil Market Handbook* (2004). The oil industry classified "Crude" by the location of its origin (e.g., "West Texas Intermediate, WTI." Or

“Bent”) and often by its relative weight (API gravity) or viscosity (“light”, “intermediate” or “heavy”); refines may also refer to its as “sweet” which means it contains relatively little sulfur, or as “sour”, which means it contains substantial amounts of sulfur and requires more refining in order to meet current product specifications. The various types as given in Petroleum Encyclopedia are:-

- **Brent Blend**, comprising 15 oil from fields in the Brent and Ninian systems in the East Shetland Basin of the North Sea. The oil is landed at Sullom Voe terminal in the Shetlands. Oil production from Europe, Africa and Middle Eastern oil flowing West tends to be prices off the price of this oil, which forms a benchmark.
- West Texas Intermediate (WTI) for North American oil.
- Dubai, used as benchmark for Middle East oil flowing to the Asia-Pacific region.
- Tapis (from Malaysia used as a reference for light Far East oil)
- Minas (from Indonesia, used as a reference for heavy Far East oil).
- The OPEC Basket consisting of
 - Arab Light Saudi Arabia
 - Bonny Light Nigeria
 - Fateh Dubai
 - Isthmus Mexico (non-OPEC)
 - Minas Indonesia
 - Tia Juana Light Venezuela

Although the prices of these difference crude oils move broadly together, two features are very important. First, the differentials (or discounts) between certain crude oils are very large; and second, the size of the differentials between given pairs of crude oils appears to

change as the general oil price increases. Figure 5 below illustrates the magnitude of the differentials between Arab heavy (from Saudi Arabia) and Brent blend (from the U.K. North Sea) and between Tapis blend (from Malaysia) and Brent blend, and also how these changed during the period January 2001 to April 2005. The differentials can also be compared to the price of Brent which is shown on the same figure.

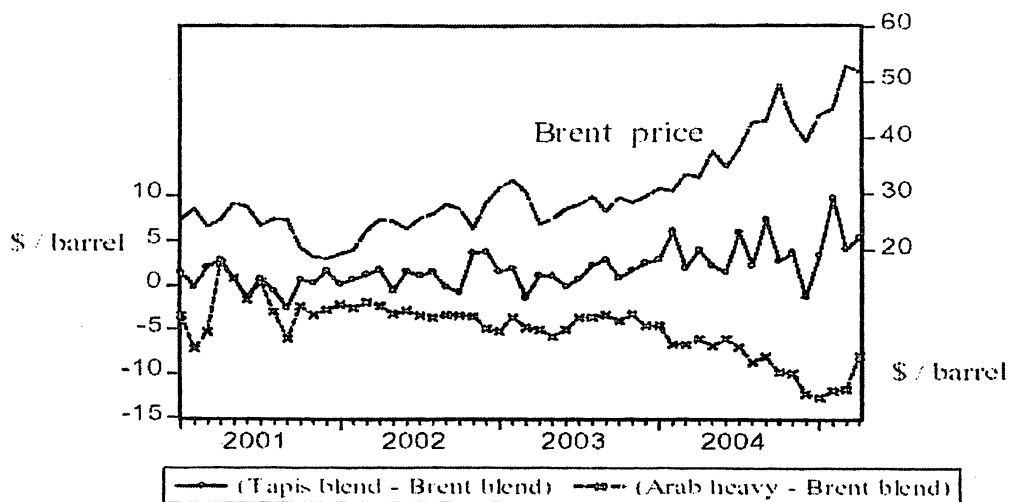


Figure 2.5 (Source Bacon & Tordo (2005))

Although crude oils can vary in a very large number of quality characteristics, which have to be taken into account in running them in a refinery, price analysts have focused on two principal quality (namely API gravity and sulfur content) differentials between crude to explain inter crude price differentials. Indeed, oil traders, buyers and sellers of crude oil use price adjustments based on quality differentials when the quality of oil received differs from that assumed on the basis of the name on the cargo. For new crude, where there is no historic price data on their specific crude, expected sale prices is sought by looking at the situation of similar crudes, as defined by quality and yield.

2.3.1 Fixing of Crude Value based on quality

To estimate relative crude values several methods have been developed. The methods most commonly used by industry operators can be grouped under two categories (a) assay 2-based valuation; and (b) gravity and sulfur based valuation (*Bacon & Tordo – 2005*).

The first method, normally used by refiners, estimates the crude value based on its properties and their relation to product specifications. Premium and discounts are applied to each distillation fraction to reflect the difference between the quality of the fraction and the specifications of the final product. The configuration of the refinery, the refinery operation, and the markets determine the relative value of crude. As refining is a continuing operation, the value of a crude oil, or better its opportunity cost, is also influenced by the type and quantity of the crude oil that are already being processed.

The second method relates price differentials to differences in API American Petroleum Institute) gravity number and sulfur content of the two crudes.

The price differential between light (high API) and heavy (low API) crudes, and between sweet (low sulfur) and sour (high sulfur) crudes depend on a number of factors, including the demand for various petroleum products the costs and availability of refineries able to run various crude oil to produce the products most in demand, refinery capacity

utilization, transportation costs, and the relative supply of the difference crude oils. If the demand for all petroleum products increased proportionately, and all product prices and the general crude price also increased proportionately, then that crude oil producing the largest proportion of high value products would increase in price relative to those crude oil with a lower proportion of high value produces. This effect would be magnified if the demand for the higher value products increased relatively more, so that the price of high value products rose faster than that of low value product. At the same time, the costs of refining and the availability of refineries able to produce high value products are also important. Crudes with high sulfur content are more corrosive and require more expensive process mitigation measures. Sulfur and sulfur compounds are undesirable impurities for the environment and may post health and safety hazards. For those reason, limits on the sulfur content of hydrocarbon products are set by national and international standard specifications. These are often backed by legislation, as is the case in many industrialized nations, including the EU members' states, the United States and Japan. Shortage of refining capacity able to produce these low sulfur products gives an extra premium to those crudes which do not need the most expensive treatment.

2.3.2 Crude Oil Trading

Crude oil is sold through a variety of contract arrangements and in spot transactions. Oil is also traded on future markets but not generally to supply physical volumes of oil, more as a mechanism to distribute risk. These mechanisms play in important role in providing pricing information to markets.

In fact the pricing of crude oils has become increasingly transparent from the 1990s onwards through the use of marker crudes such as West Texas Intermediate (WTI – USA), Brent (Europe and Africa), Dubai and Oman (Middle East), and Tapis and Dubai (in Asia). The main criteria for a marker crude is for it to be sold in sufficient volumes to provide liquidity (many buyers and sellers) in the physical market as well as having similar physical qualities of alternative crudes. In addition the marker crude provides pricing information.

WTI does this through its use on the New York Metals Exchange as the basis of a futures contract where trade is equivalent to many hundreds of millions of barrels per day, even though physical WTI production is less than 1 million barrels per day. A futures contract for crude oil is a promise to deliver a give quantity of crude oil but this rarely occurs as participants are more interested in taking a position on the price of the crude oil. Futures markets are a financial instrument to distribute risk among participants with the side effect of providing transparency on the pricing of crude oil.

Brent offers pricing information based more on the physical trading of oil through spot trading, and forward trading but also offers futures trading but not to the same extent as WTI.

Dubai and Oman pricing is based more on the physical trades of Dubai and Oman. In Asia there is no futures exchange where crude oil is traded and which would provide pricing information to the same extent as WTI and Brent. In Asia the pricing mechanism for say Tapis, a marker for light sweet crudes in the region, is based on an independent

panel approach where producers refiners and traders are asked for information on actual trades and where there have been none, their best guess (any estimates that are wildly high or low are discarded and the quoted price is then an average of views on the market price for Tapis).

Final pricing is generally based on a formula approach where market crude is used as the base and then a quality differential as well as a demand/supply (premium/discount) is added depending on the crude being purchased. Thus in times of tight supply this premium will rise and gradually drag up the Marker crude price, whilst in times of surplus supply, a reduced premium or even a discount will drag down the Marker crude price. Of course big changes/announcement/events that can significantly influence crude supply levels will sometimes result a large steps change in the prices of crudes (eg. OPEC announcements; a war; major refinery outages). This is crudes being purchased do not always slavishly follow marker crudes. Marker crudes are indicators of what is happening in markets.

Key Crude Oil Spot Prices in US Dollars/barrel

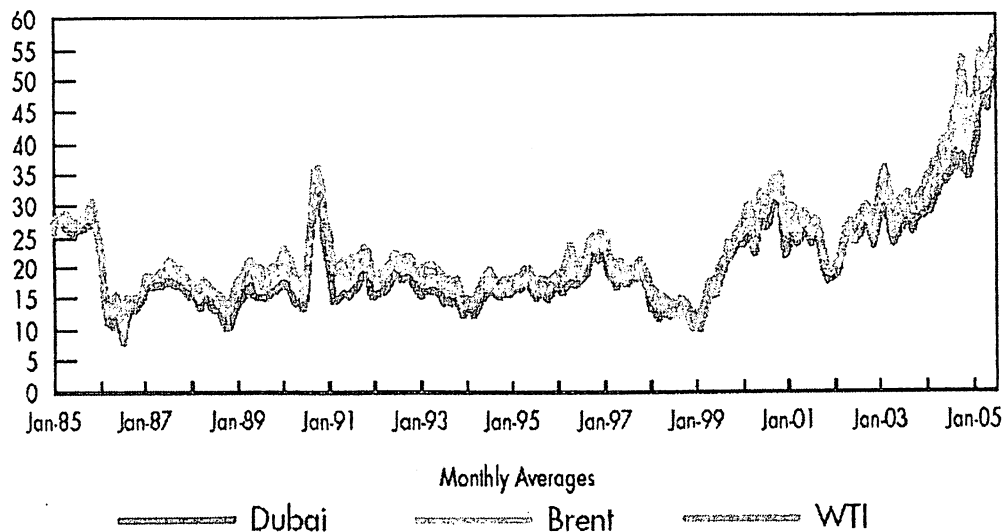


Figure 2.6

2.4 Crude Oil as an Input Cost to Refiners and product cost to consumers

It is true to say that the cost of crude oil is the major input cost for refiners. However, the relationship between such a cost and the final price for a product produced from that crude such as petrol or diesel is not as direct as one would think. These are for instance, additional petroleum product markers which give a guide to prices. **Prices are not just a function of cost push, but are also strongly influenced by demand pull.** These are also a number of other variables which affect the price of products such as petrol including the policy of the Government. In addition the perception of the purchasers and sellers in the market as to the price risk over time can also add or subtract premiums to the product marker price.

Prices of crude oil markers and petrol markers are affected by a myriad of factors from overall supply/demand for crude oil, supply/demand for petrol, freight rates and competition in the crude markets, and competition in the regional and domestic markets for petrol. They all have a role in determining the final price charges to consumers and the role that each of these elements plays can change over time. It is this very complexity in markets which makes it very difficult to determine a theoretical price as part of regulation in markets because there may be a perception that because the theoretical price is different from the market price that the market price is "not fair" for some reason.

2.5 Chapter Summary

The chapter gives a background of the crude oil prices over the years since the second world war. Five major events namely Suez Crisis Nov., 1956. Arab-Israel war in Nov., 1973, Iranian Revolution in Nov. 1978. Iran-Iraq war in Oct. 1980 and Persian Gulf War in Aug. 1990 and major impact on the crude oil prices. Crude oil price increase in the recent years has been caused both by reduction in supply in 2003 (Venezuela and Iraq factor) as well as increased demand mainly from the growing Asian economy particularly China and India.

The rapid price increase in 1979-1980 resulted in countries taking steps to improve energy efficiency resulting in more energy efficient homes, industrial process, and in substantial increases in automobile gasoline mileage. The higher prices also resulted in increased exploration and production outside of OPEC. During the period 1980 to 1986

non-OPEC production increased 10 million barrels per day. These resulted in lower demand and higher supply from outside the OPEC.

The chapter also discusses about the spare capacity which is one of the controlling factor for crude oil price for the exporting countries. The capacity which was in the range of 6 Million barrels/day and now come down below 1 million barrels/day due to increase in consumption in last 2-3 years indicating clearly the price is being pulled by the demand.

Another aspect which has been discussed in the chapter is that of crude oil pricing. There are about 150 grades of crude oil being traded now. The increase in the grade has been on account of desire to diversify source of supply as well as production in the least well known oil-producing areas. Although the prices of these different crude oil move broadly together however the differential between certain crude oil prices are large and also the differential increases with the increase in the oil price.

The methods most commonly used by industry for determining the crude oil value are basically under two categories : (a) assay 2-based valuation; and (b) gravity and sulfur based valuation. The first method estimates the crude value based on its properties and their relation to product specifications. The second method relates price differentials to differences in API (American Petroleum Institute) gravity number and sulfur content of the two crudes. The price also depends on the demand for various petroleum products, refinery capacity utilization, transportation costs and relative supply of the different crude oil.

The pricing of crude oils from the 1990s onwards is being done through the use of market crudes such as West Texas Intermediate (WTI – USA), Brent (Europe and Africa), Dubai and Oman (Middle East), and Tapis and Dubai (in Asia). The pricing is generally based on a formula approach where a market crude is used as the base and then a quality differential as well as a demand/supply (premium/discount) is added depending on the crude being purchased. There are additional petroleum product markers. Prices of these markers are affected by factors varying from overall supply/demand for crude oil, supply/demand for petrol, freight rates and competition in the crude markets, and competition in the regional and domestic markets for petrol. These also play an important role in determining the final price charges to consumers and the role that each of these elements plays can change over time.

Chapter 3: Oil Consumption and Macro Economy

3.1 Background

Before going further, it will be interesting to understand the trend of oil consumption, GDP, their growth, oil consumption and price and consumption of oil under various economies particularly with reference to world trend, China, India and USA. Oil, Gas and Coal are the three major sources of energy. Out of this oil is the dominant fuel in the primary energy mix, with a share of around 38% in the world. The chart below gives the energy consumption of world vis-à-vis India.

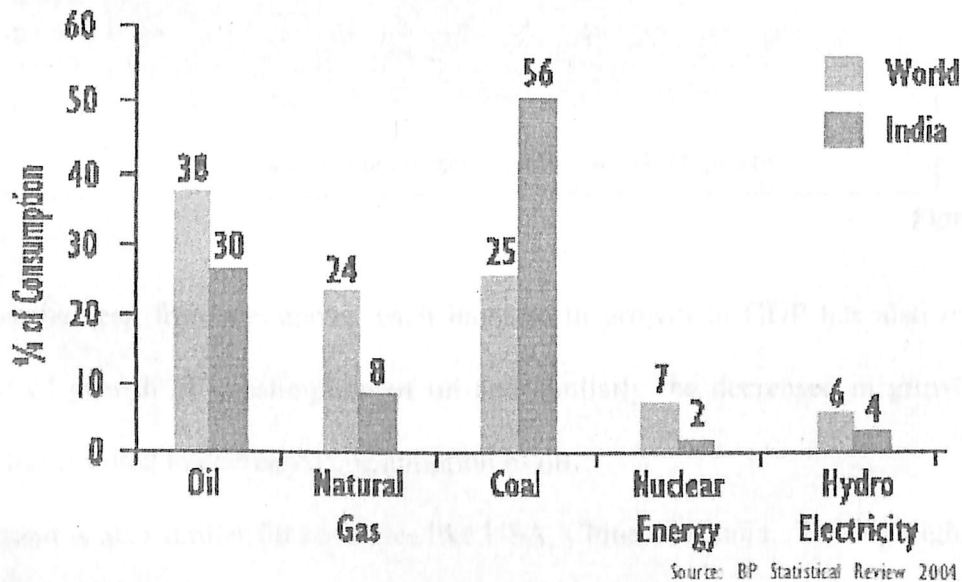


Figure 3.1

As can be seen from above, oil is the dominant energy source in the world and in India; it is the second major source of energy. World today consumes about 82 Million barrels of oil per day whereas consumption in India is of the order of 2.50 Million barrels/day and that in USA and China are 23 Million barrels/day.

3.2 Growth of Oil Consumption and Economy

The average growth of crude oil consumption in the world is about 1.7% in the last ten years. During the same period the world GDP has grown by 3%. Figures below gives the plot of oil consumption growth vis-à-vis GDP growth.

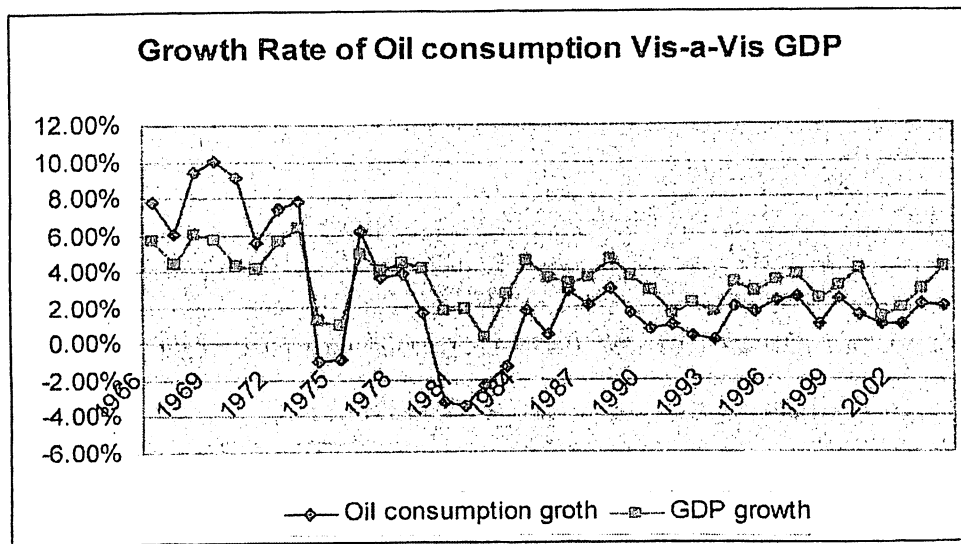


Figure 3.2

As can be seen from the above, each increase in growth in GDP has also resulted in increased growth of consumption of oil and similarly the decreased in growth rate of GDP has resulted in decreased consumption of oil.

The trend is also similar for countries like USA, China and India. The highlight of these economies are in the figure

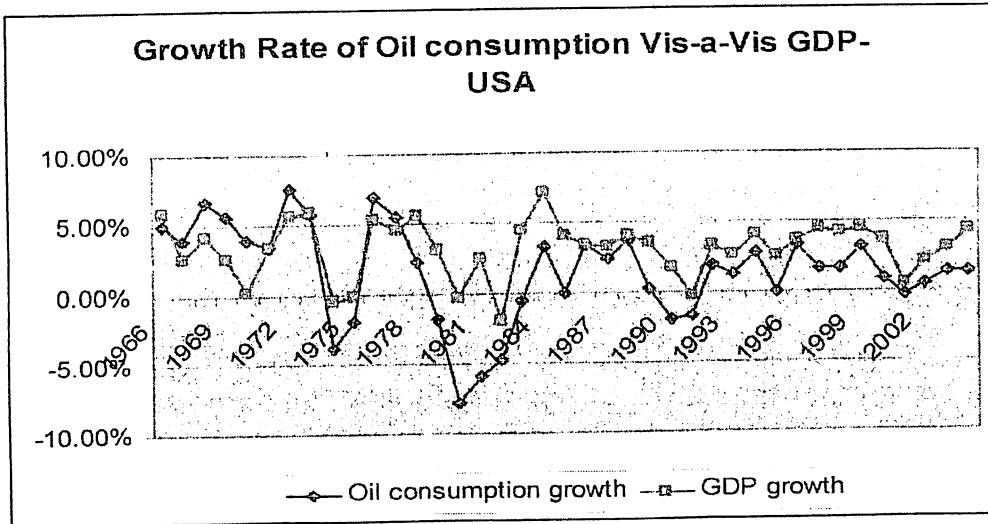


Figure 3.3

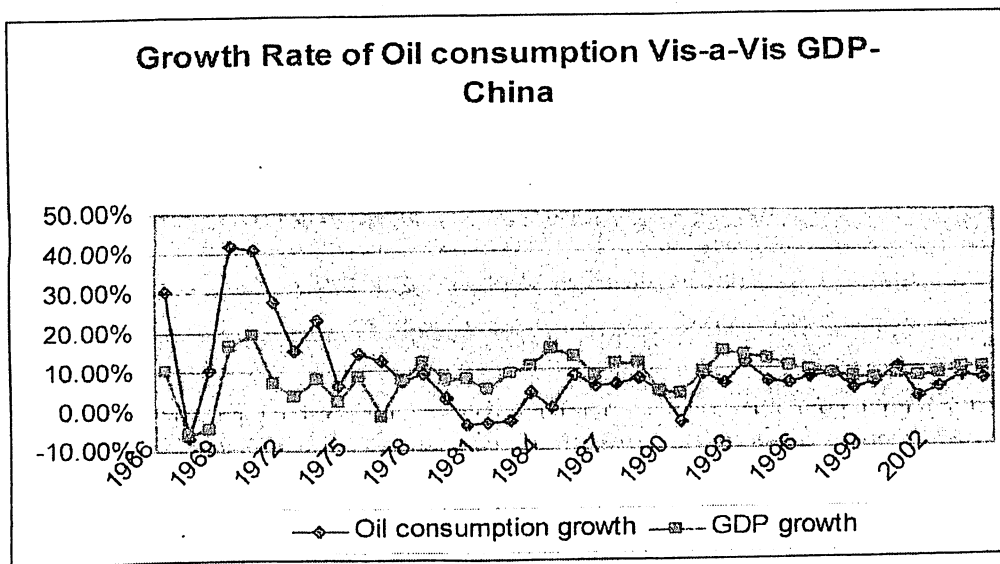


Figure 3.4

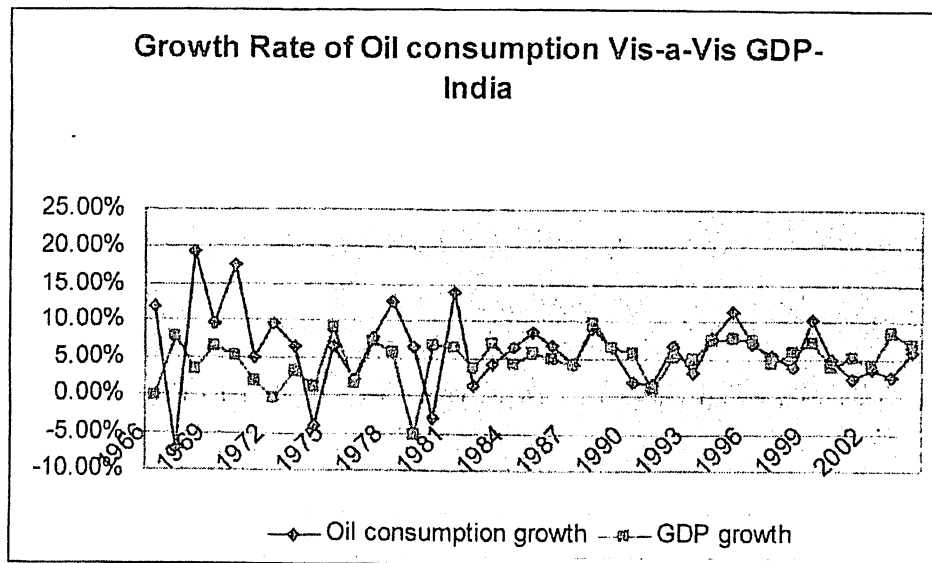


Figure 3.5

If we see the above figures all the above shows almost the same trend except for one or two aberrations. In case of India, these aberrations are in the later part of 60s and early part of 70s.

3.3 Oil consumption growth and GDP growth

Oil Intensity of various economies

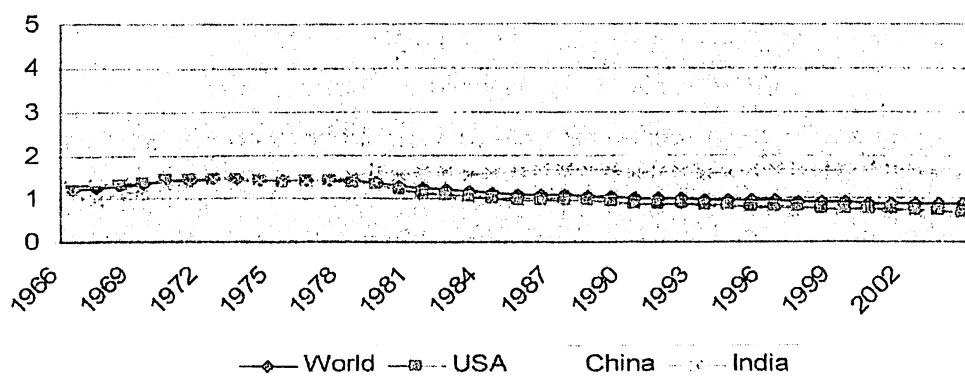


Figure 3.6

As can be observed from above whereas in USA as well as world in general, starting 1966, showed increasing trend of oil intensity but probably the oil price shock caused by Arab Israel was in Nov. 1973 subsequent shock caused by Iran revolution in Nov. 1978 followed by Iran Iraq war in Oct. 1980 necessitated measures to improve the energy efficiency resulting in drop in oil intensity. The China whose systems seems to be highly inefficiency also necessitated action for improvement of the efficiency which resulted in drastic reduction in oil intensity but is still much higher than the world average. **India as it emerges showed no sign of energy alertness. In fact the realization seems to have come very recently which has resulted in showing reduction in from level of 1.648 in 2002 to the level of 1.544 during 2004.**

3.4 Summary of the Chapter

Following points emerges based on the above discussions:-

- a) Oil is one of the major sources of energy.

- b) Economy growth will lead to increased requirement of oil. There is a strong positive relationship between GDP growth and oil consumption growth.
- c) Three oil shock between 1970 to 1980 necessitated actions by developed countries to make its system more energy efficient. These are reflected by both the empirical relationship as well as the oil intensity.
- d) Oil intensity of all the developing countries are much above the world's average indicating, they require higher amount of oil for '000 US\$ GDP.
- e) As the oil is one of the important resources for economic growth, any variation in its price is likely to have impact on the economy growth. However, these impacts are likely to vary at different times due to improvement in oil intensity in most of the economies.

Chapter 4: Oil Price and its Impact on Macro Economy

4.1 Crude Oil Price increase/decrease – Both due supply and demand side affect

As discussed in the Chapter 2 on Crude Oil Pricing, the price of the crude oil has been affected by the both demand and supply. As emerges from the above chapter, the oil prices have generally been affected on account of following reasons:-

- Supply shocks due to curtailment of production caused by political activity and or political instability including the five major events as mentioned in Chapter 2.
- Formation of cartel by the oil exporting countries.
- Recession leading to decrease in oil consumption and hence, leading to reduced demand.
- Improved energy efficiency leading to reduction in demand for same level of output.
- Increased supply particularly due to quota violation by OPEC members.
- Increase in demand by fast growing economies like India and China.

We will try to understand the impact of supply and demand fluctuation on the price of crude oil in the frame work of Marshal's economic theory.

4.1.1 Supply and Demand theory and oil price

The theory of supply and demand describes how prices vary as a result of a balance between production availability at each price (supply) and the desires of those with purchasing power at each price (demand). The Figure 4.1 below depicts an increase in

demand from D_1 to D_2 along with the consequent increase in price and quantity required to reach a new market clearing equilibrium point on the supply curve(s).

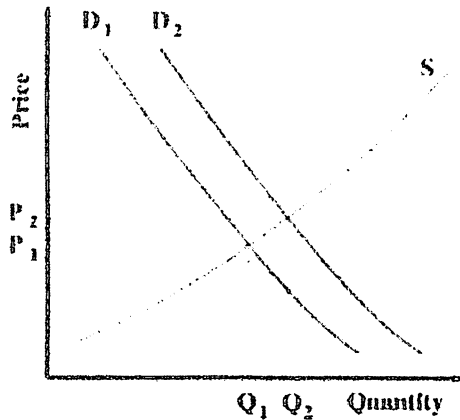


Figure 4.1

The slope of the demand curve (downward to the right) indicates that a greater quantity will be demanded when the price is lower. On the other hand, the slope of the supply curve (upward to the right) tells us that as the price goes up producers are willing to produce more goods. The point where these curves intersect is the equilibrium point. At a price of P producers will supply Q units per period of time and buyers will demand the same quantity. P in this example is the equilibrating price that equates supply with demand.

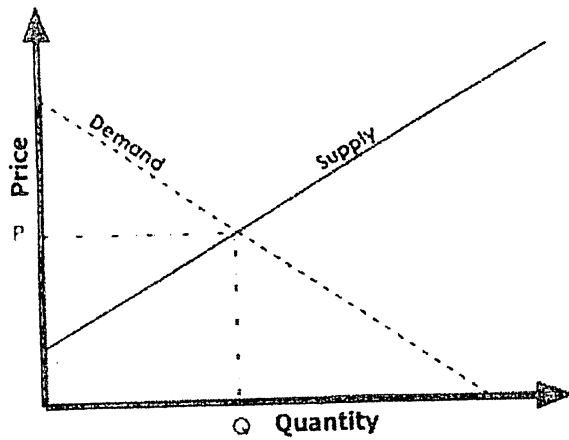


Figure 4.2

4.1.1.1 Effect of being away from equilibrium point

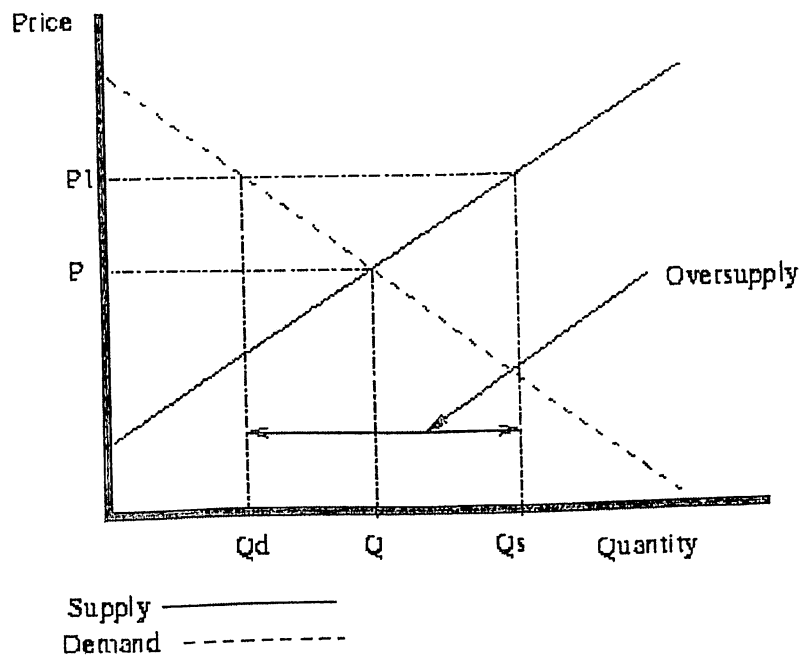


Figure 4.3

The price and quantities point tend to move towards the equilibrium. If the price is set too higher, such as at P_1 in the diagram to the right, then the quantity produced will be Q_s . The quantity demanded will be Q_d . Since the quantity demanded is less than the

quantity supplied there will be an oversupply (also called surplus or excess supply). The fall in price of crude oil in mid 1980s and during 1998 were due to higher price and oversupply. On the other hand, if the price is set too low, then too little will be produced to meet demand at that price. This will cause an undersupply problem (also called a shortage). Exporters will respond by adjusting their price (and quantity) levels and this will eventually restore the quantity and the price to the equilibrium. From 1982 to 1985 OPEC attempted to set production quotas low enough to stabilize prices. However, these attempts met with repeated failure as various members of OPEC produced beyond their quotas.

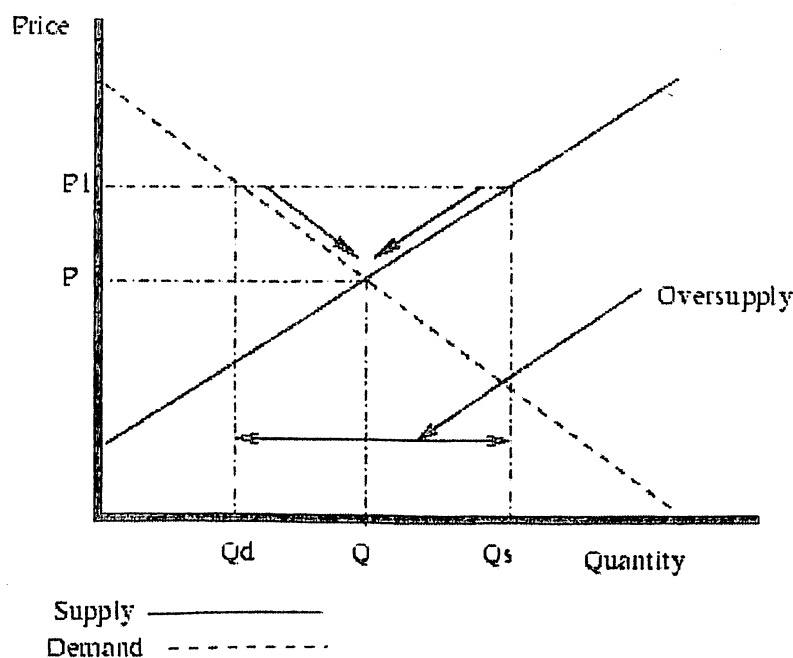


Figure 4.4

In the case of too high a price and oversupply as indicated above, the exporters of oil will soon have too much excess inventory, so they will lower prices (from P_1 to P) to reduce this. Quantity supplied will be reduced from Q_s to Q and the oversupply will be eliminated. IN the case of too low a price and undersupply, importers will likely compete

to obtain the good at the low price, but since more importing countries would like to buy the goods at the price that is too low, the exporters would raise the price to the highest they can, which is the equilibrium point. In each case, these actions of importers and exporters cause the quantity and price to move towards the equilibrium point.

4.1.1.2 Demand Curve Shift

When economy is in a growth path, the quantity of oil demanded at all prices will tend to increase. This can be referred to as an *increase in demand*. Increased demand will shift the curve right, because at each price point, a greater quantity is demanded. Present oil price rise is mainly on account of high demand by few fast growing economies. This will cause the demand curve to shift from the initial curve D_0 to the new curve D_1 . This raises the equilibrium price from P_0 to the higher P_1 . This raises the equilibrium quantity from Q_0 to the higher Q_1 . In this situation, we say that there has been an increase in demand which has caused an extension in supply and also leading to the increase in price. Conversely, if the demand decreases particularly during recession as well as due to increased energy efficiency, the opposite happens. If the demand starts at D_1 and then decrease to D_0 , the price decreases as well as the quantity supplied - a contraction in supply. The quantity supplied at each price is the same as because the demand shift (at both Q_0 and Q_1). The reason that the equilibrium quantity and price are different is the demand is different.

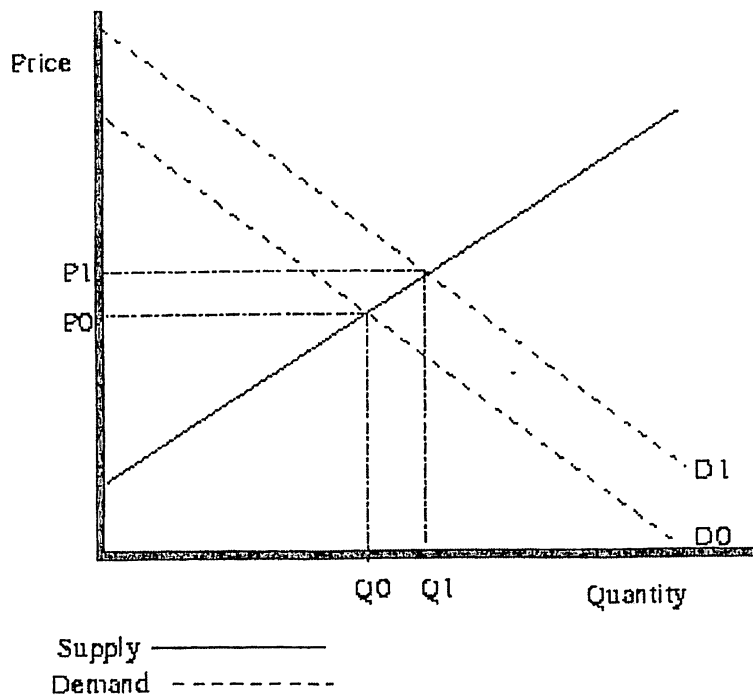


Figure 4.5

4.1.1.3 Supply side theory

When the exporter's suppliers' costs change the supply curve will shift. Producers, will be willing to supply more at every price and this shifts the supply curve S_0 to the right, to S_1 an increase in supply. This cause the equilibrium price to decrease from P_0 to P_1 . The equilibrium quantity increases from Q_0 to Q_1 as the quantity demanded increases at the new lower prices.

Conversely, if the quantity supplied decreases, the opposite happens. If the supply curve starts at S_1 and then shifts to S_0 , the equilibrium price will increase and the quantity will decrease. The quantity demanded at each price is the same as before the supply shift (at both Q_0 and Q_1). The reason that the equilibrium quantity and price are difference is the supply is different.

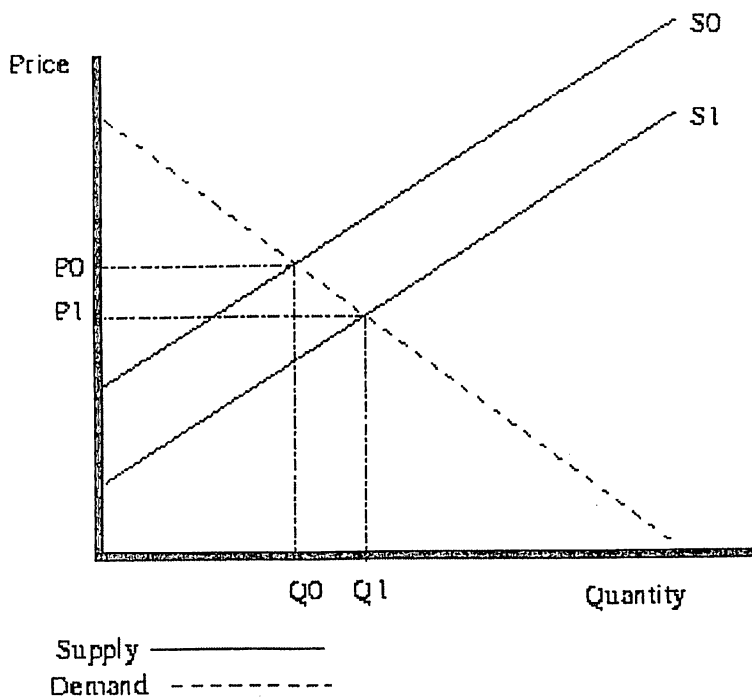


Figure 4.6

Figure below gives the plot of price vis-à-vis world consumption of crude oil for the 1970 to 1990. As can be seen from the plot the consumption pattern with regard to price perfectly matches the theory given below. The consumption has gone down each time there has been sharp increase in price and similarly, the consumption has gone up when there is sharp decline in prices. Period from 1970 to 1990 have been taken as during that period number of such sharp fluctuation were there including the five major shocks.

Based on the above theory, it is clear that both the increase or decrease in demanded as well as increase or decrease of supply effect the price of oil. Crude supply shock – an increase in crude oil price, shifts the Aggregate supply curve upwards. In the figure below, As curve shift upwards to AS', the equilibrium of economics moves from E & E'. The immediate effect of supply shock is rise in price level and reduction in level of

output. However, the economy move from E' back to E. The employment at E' forces wages and thus the price level down. The adjustment takes along the AD curve, with wages falling till E is reached. (Dornbusch, Fischer and Startz -2004).

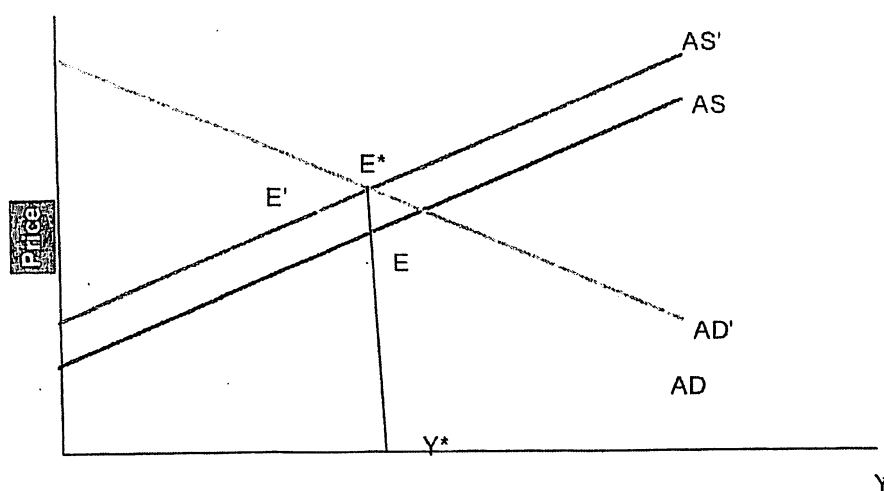


Figure 4.8

4.2 Impact of Crude Oil price on GDP – theoretical framework

4.2.1 Transmission Mechanism

The transmission mechanisms through which oil prices have an impact on real economic activity include both supply and demand channels. The supply side effects are related to the fact that crude oil is a basic input to production, and consequently an increase in oil price leads to a rise in production costs that induces firms to lower output. Oil prices changes also entail demand-wide effects on consumption and investment. Consumption is affected indirectly through its positive relation with disposable income. The magnitude of this effect is in turn stronger the more the shock is perceived to be long-lasting. Moreover, oil prices have an adverse impact on investment by increasing firms' costs. It is worth noting that, in addition to the impacts of oil prices on supply and demand, oil

price changes influence foreign exchange markets and inflation, giving thus rise to indirect effects on real activity.

Overall, an oil-price increase leads to transfer of income from the importing to the exporting country through a shift in the terms of trade. The net impact on world economic growth is, in general, negative. For net oil-importing countries, an increase in oil prices directly reduces real national income, because spending on a constant amount of oil rises relative to income and there is less national income available to spend on other goods. The magnitude of the direct effect of a given price increase depends on the share of the cost of oil in national income, the degree of dependence on imported oil and the ability of end-users to reduce their consumption and switch away from oil.

4.2.2 Energy as factor for output

One simple framework for thinking about what the effects of energy supply disruptions should be comes from examining a production function relating to output Y produced by a particular firm to its inputs of labour N , capital K , and energy E (Hamilton – 2005):

$$Y = F(N,K,E)$$

Suppose that output is sold for a nominal price P dollars per unit, labour is paid nominal wage W , energy's nominal price is Q , and capital is rented at nominal rate r . The profits of the firm are given by

$$PY - WN - rK - QE$$

A price-taking profit-maximizing firm would purchase energy up to the point where the marginal product of energy is equal to its relative price,

$$FE(N,K,E) = Q/P$$

Where $F_E(N,K,E)$ denotes the partial derivative of $F(.)$ with respect to E . If we multiply both sides of the above equation by E and divide by Y , we find

$$\frac{\partial \ln F}{\partial \ln E} = \frac{QE}{PY}$$

In other words, the elasticity of output with respect to a given change in energy use can be inferred from the dollar share of energy expenditure in total output. However, this dollar share for the economy is increasing. For example, during 2001-02, India imported 78.71 MMT of oil. At average crude oil price of US\$23/bbls, crude oil import was 2.9% of GDP. With the rapid price increase, during the year 2004-05 the import of crude oil was 4.2% of GDP.

One would arrive at a similar prediction if one thought of the oil shock as an exogenous change in the price of oil rather than a decrease in the quantity supplied. Faced with an increase in fuel costs, one option a given consumer would always have would be to keep on buying as much oil as before but just pays the higher price decreasing other expenditures as needed. The value of what you lose if you behave in this way is given by $F \Delta Q$, or, expressing this relative to total income PY ,

$$\frac{E \cdot \Delta Q}{PY} = \frac{QE}{PY} = \frac{\Delta Q}{Q}$$

In other words, the percentage change in oil prices is again multiplied by energy's value share QE/PY . This actually places an upper bound on the value of what the consumer loses, because, insofar as the consumer opts to reduce E rather than hold E fixed, it must be because the latter strategy is in face an inferior option.

Hence, if these oil shocks did contribute to economic downturns, it would have to be attributed to the movements they induced in other factors of production rather than the value of the lost energy-inputs per se.

4.2.3 Role of Policy Response

Another explanation for the correlation between energy prices and output that has been offered has to do with the role of monetary policy. Researchers believe that a monetary expansion was the cause of much of the 1973-74 oil price increase, and that this monetary expansion also set the stage for a subsequent decline in output. (Awerbuch & Sauter – 2004). Researchers took the view that the oil shocks were exogenous, but Bank responded to them by raising interest rates in order to control inflation, this monetary contraction itself the principal cause of the downturns. However, few researchers believe that monetary policy makes only a modest contribution. More empirically oriented studies also concluding that the oil shocks were more important than any monetary contraction. A different class of explanations emphasizes the frictions in reallocating labor or capital across different sectors that may be differentially affected by an oil shock. For example, one common consequence of an oil price shock is sudden drop in demand for certain kinds of cars, which leads to lower capacity utilization at affected plants. Because labor and capital cannot move costless to alternative productive activities, the result is idle resources that can significantly multiply the effects described above.

Adjustment effects, which result from real wage, price and structural rigidities in the economy, add direct income effect of an oil-price increase. Higher oil price lead to inflation, increased input costs, reduced demand for goods and services other than oil and lower investment in net oil importing countries. Tax revenue fall and, due to rigidities in

government expenditure, the budget deficit increases driving interest rate up. Because of resistance to real declines in wages, an oil price increase typically leads to upwards pressure on nominal wage levels. Wage pressure together with reduced demand tends to lead to higher unemployment. The effects are greater the more sudden the price increase and are magnified by the impact of higher oil prices on consumer and business confidence.

The economic and energy-policy response to a combination of higher inflation, higher unemployment, lower exchange rates and lower real output also affects the overall impact on the economy over the long term. High contractionary monetary and fiscal policies to contain inflationary pressures could worsen the recessionary income and unemployment effects. On the other hand, expansionary monetary and fiscal policies may simply delay the fall in real income necessitated by the increase in oil prices, stoke up inflationary pressures and worsen the impact of the price shock in the long run.

While general mechanism by which prices affect economic performance is generally well understood, the precise dynamics and magnitude of these effects – especially the adjustments to the shift in the terms of trade are uncertain.

4.3 Literature Survey on relationship of oil price and economic growth (GDP)

Number of research work has been done on the relationship of oil price and GDP. Some of the researches on impact of oil price on macro economy published are Oil Price Shock and real GDP growth from Rodriguez and Sanchez (2004), Oil and the Macro Economy by Hamilton (2005), Shock – testing for Non-linearity, by Rodriguez (2004), OECD economic outlook No. 76, Understanding impact of Oil Shock by Conraria & Wen (2005), IMF publication on the impact of Higher Oil Price on the Global Economy

(2000). **Exploiting the Oil GDP effect to Support Renewable Deployment by Awerbuch and Sauter (2004) etc.)**

Rodriguez and Sanchez – 2004 – in their research paper has assessed empirically the effects of oil price shocks on the real economic activity of the main industrialized countries. Multivariate VAR analysis is carried out using both linear and non-linear models. The latter category includes three approaches employed in the literature namely, the asymmetric, scaled and net specifications. The authors find evidence of a non-linear impact of oil prices on real GDP. In particular, oil price increases are found to have an impact on GDP growth of a larger magnitude than that of oil price decline, later being statistically insignificant in most of the cases. Among oil importing countries oil price increases are found to have a negative impact on economic activity in all cases but Japan. Moreover, the effect of oil shocks on GDP growth differs between the two oil exporting countries, with oil price increases affecting the UK negatively and Norway positively.

Hamilton in his recent publication “Oil and the Macro-economy”(2005) mentions that the Recent civil unrest in Venezuela in December 2002 led to a drop in production of 2.3 million barrels a day, representing 3.4% of world production at the time. The oil price reflected a surge in crude oil prices 20% above their previous 3-year high. Nevertheless, there was no discernible drop in GDP. Another surge in of 18% occurred in the 3rd quarter of 2004, accompanied by a 1.3% increase in world production, and a third surge of 21% in 1st quarter of 2005, accompanied by a 0.2% increase in production, with no recession. It is clear from the last two examples in particular that demand increases rather than supply reductions have been the primary factor driving oil prices over the last several years. In so far as these demand increases resulted from global income growth, one would not expect to see the sharp drop in consumer spending on other key items. At a

minimum, the failure of a recession to result from the oil price increases of 2003-2005 suggests that there is not simply a mechanical relation, even a nonlinear one, between oil prices and output.

Ceylon in the publication 'The Impact of Oil Price Shocks on The Economic Growth of the Selected MENA Countries' (2005) examines how oil price shocks affect the output growth of the selected MENA countries that are either net exporters or net importer of this commodity but are small to affect the oil prices. The restriction of no command on world oil prices is imposed into the dynamic Vector Autoregressive (VAR) setting. The study suggest that the effects of the world oil price on GDP of Algeria, Iran, Iraq, Jordon, Kuwait, Oman, Qatar, Syria, Tunisia and United Arab Emirates are positive and statistically significant. However, evidence on Bahrain, Djibouti, Egypt, Lebanon, Morocco, and Yemen are not statistically significant.

Awerbuch and Sauter in his public 'Exploiting The Oil-GDP effect to Support Renewable Deployment' (2004) has observed that in percentage terms, the Oil-GDP effect is relatively small, producing losses on the order of 0.5% of GDP for a 10% oil price increase. However, in absolute terms even a 10% oil price rise – and oil has risen at least 50% in the last year alone – produces GDP losses. The paper summarizes to show that by displacing gas and oil, renewable energy investments can help nations avoid costly macroeconomic losses produced by the Oil-GDP effect.

Rodriguez paper 'Oil Price Shocks : Testing for Non-linearity' presents evidence of a non-linear relationship between GDP growth and oil price changes in the US economy. We also argue that this non-linearity is not merely due to the use of data from the mid 1980s onwards as other authors seem to believe. The paper find the existence of non-linearity with the use of data earlier than 1984, and even before 1977.

OECD economic outlook 76 observes that the likely impact on oil price hike on the output of OECD is relatively moderate in the short run. The article mentions that the low price elasticities of global demand and non OPEC supply makes oil price highly sensitive to supply and demand shift. The paper also mention that the pass through from oil price increase to core inflation is very limited in recent years.

'The Impact of Higher Oil Prices on the Economy', a paper by **IMF Research Department** observes that a permanent price increase of about \$5/bbl imply a permanent transfer of about 0.25% of GDP from Global Oil importers to oil exporters with additional transfer of income from oil consumers to oil producers within the countries. Paper further observes that such a terms of trade shock would affect the global economy through supply and demand effects as well as via second-round effects on inflation, for example, through higher wage claims. This in turn would affect the extent to which central banks raise interest rates to offset inflationary pressures, and therefore the impact of the oil price increase on real activity. The impact on asset prices and financial markets would provide additional channels. The size of the impact on demand and activity depends critically on these factors. The paper also confirms the view of other researcher that the latest data suggest that the impact on core inflation in advanced countries has been relatively modest to date and there is little sign of feed through into wage claims. The paper observes that in developing countries, the impact of a sustained \$5/barrel oil price increase would vary widely across countries and would be the largest in Asia, where there are relatively few oil producers. Higher oil prices would likely to be unwelcome brake on activities in these countries. The authors feel that the impact would generally be smaller in the Latin American countries, while many of the HIPC and several CIS economies would be quire seriously affected. The paper suggest that the

monetary policy in advanced countries need to prevent second round price effects which would ensure that there is only a price level effect, but not a continuing impact on the rate of inflation. On the microeconomic side, the suggestion is that any adjustment of taxes on gasoline and other petroleum products would need to be considered in terms of what is appropriate from the overall fiscal and macroeconomic situation. If the oil price increase appears to be temporary, there would appear to be little merit in adjusting taxes. However, if prices remain, or are expected to remain, at a higher level and ad valorem taxes generate revenue increases greater than required for fiscal policy considerations, there is bound to be some rethinking of the best use of the revenue windfall. The appropriate strategy will depend upon the tax structure of the country concerned. Research also observes that the macroeconomic policy implications for oil importing developing countries are similar to those for advanced economies in terms of monetary policy and the fiscal response, with the appropriate macroeconomic response also depending upon the cyclical situation, existing policy stance, and exchange rate regime. Author feels that it is particularly important oil importing countries minimize budgetary costs by passing through the hike in oil price onto administered energy prices. Unlike in oil-importing countries, the main policy issue in the major oil-exporters in ensuring that the fiscal and terms-of-trade benefits of higher oil prices do not lead to an excessively procyclical policy stance. Given the high volatility of oil prices, it is particularly important to ensure that government spending is not increased rapidly to levels which may become unsustainable if oil prices fall in the future.

As emerging out from the literature survey, Energy being one of the major components of growth, it is obvious that the any volatility on the price of it will have major impact on the economy. From the middle of twentieth century onwards, crude oil has become one

of the main indicators of economic activity worldwide, due to its outstanding importance in the supply of the world's energy demands. The importance of oil exceeds even the economic aspects and affects social life in general. One of the issues that the public has been particularly concerned about is oil price fluctuations and these fluctuations have become one of the current affairs published on the front pages by the vast majority of the world's newspapers, mainly from the Yom Kippur War (October 5, 1973) on. Thus, the prevailing view among economists is that there is a strong relationship between the growth rate of a country and oil price changes. Precisely what form this relationship takes, and how it might be modified and other such questions are issues of outstanding value.

As various researches suggest that oil price fluctuations have considerable consequences on economic activity. These consequences are expected to be different in oil importing and in oil exporting countries. Whereas an oil price increase should be considered good news in oil exporting countries and bad news in oil importing countries, the reverse should be expected when the oil price decreases. (Reference Working Paper Series 362 May 2004). The transmission mechanisms through which oil prices have an impact on real economic activity include both supply and demand channels. The supply side effects are related to the fact that crude oil is a basic input to production, and consequently an increase in oil price leads to a rise in production costs that induces firms to lower output. Oil price changes also entail demand-wide effects on consumption and investment. Consumption is affected indirectly through its positive relation with disposable income. The magnitude of this effect is in turn stronger the more the shock is perceived to be long-lasting. Moreover, oil prices have an adverse impact on investment by increasing firms costs. It is worth noting that, in addition to the impacts of oil prices on supply and

demand, oil price changes influence foreign exchange markets and inflation, giving thus rise to indirect effects on real activity. (Conraria & Wen – 2005)

Several experts have concluded that there is a negative correlation between increases and oil prices and the subsequent economic downturns in the United States. The relationship seems weaker, however, when data from 1985 onwards is included. Nevertheless, the role of the break-date, 1985-86, has been only considered by a very few researchers, most of whom argue that the instability observed in the relationship may well be due to a mis-specification of the functional form employed. The linear specification might well misrepresent the relationship between GDP growth and oil prices. This misrepresentation of the linear specification has led to different attempts to re-define the measure of the oil price change. These attempts are based on non-linear transformations of the oil prices, in an effort to re-establish the correlation between GDP growth and oil prices. On the one hand, few researchers find asymmetry between the responses of the GDP to oil price increases and decreases, concluding that the decreases are not statistically significant. Thus, their results confirm that the negative correlation between GDP and increases in oil price is persistent when data from 1985 onwards is included. Few researchers however, report that the response of the GDP to an oil price shock depends greatly on the environment of oil price stability. An oil shock in a price stable environment is more likely to have greater effects on GDP than one in a price volatile environment. These authors thus propose a measure that takes the volatility of oil prices into account. They find asymmetry in the effects of positive and negative oil price shocks, but they also manage to re-establish the above-mentioned negative correlation.

(Averbuch & Sauter-2004)

Another potential macro economic effect of oil price shocks is on the inflation rate. The long-run inflation rate is governed by monetary policy, so ultimately this is a question about how the Government responds to the oil shock. It has been observed in few researches that oil shocks made a substantial contribution to U.S. core inflation before 1981 but have made little contribution since.

Chapter 5: Oil Price and its impact on Output (GDP)

5.1 Relationship between Oil Price and GDP

As emerged from the literature survey as well as the theoretical frame work, the energy has a major role to play in growth of GDP. The crude oil is major source of energy with about 38% in the energy mix in the world. Hence, any impact on the price of crude oil is likely to have the impact on the growth. However, these impacts depend on whether the increase is sudden or gradual. The crude oil price increase is expected to have negative impact on the GDP of importing country and positive on the exporting country. It also emerges from the literature survey that the impact is not symmetric as increase in price has not having the similar impact as that of decrease in price.

Chapter 6: Oil Price and Strategy of Upstream Companies

6.1 Background and Literature Survey

The project also tried to examine the strategy of the upstream Exploration and Production (E&P) companies with regard to acquisition of new reserves/company for reserve growth with regard to change in prices as well as the capital investment in exploration and production. It has been observed that about 40% reserves of the upstream companies come through merger or acquisition. In the year 2000, the US\$53 billion out of the total capital investment of 124 billion world's over were the acquisition of unproved or proved properties. (*Petrole-2001*). In the period 1998-2000 number of mergers and acquisitions activities took place for consolidation particularly keeping in view the low price, which was cutting the margins of the Company. Merger of Exxon Mobil was an example of such merger for consolidation. (Weston – 2004). Further growth in the petroleum companies in the recent years have not by the mega companies but by the petropreneurs (Bleaky, Gee & Himle – 1997). Over the past five years, the revenues of the majors have grown by only 2 percent per year on average. But the petropreneurs can boast an average annual growth rate of more than 20 percent, and the creation of almost \$40 billion in new revenues. Cairn Energy is a good example of this. These diverging fortunes hint at the way in which the petroleum industry is “atomizing”, or “breaking up into niches where focused competitors can gain competitive advantage. This is a story of how skills have become more important than scale or scope, and strategic insight and foresight more important than structural position. It is also a cautionary tale for players in any business who imagine that legacy assets, vertical integration, or the sheer size of their balance sheet will insulate them from industry changes and new forms of competition.

This brings us to the question of strategies of upstream oil companies. Question arises when to invest more on Exploration for new reserves and what is the right opportunity for Companies to acquire property. Is it during the period when prices are low or during the period when oil prices are high. Majors are looking for high margins and consolidation

and hence ready to wait for right opportunity. At the other hand, petropreneurs who are basically niche players may go for acquisition at much lower margin compared to majors as long as the property is giving them marginal return.

Further, according to most oil companies, alliances will play an important role in reshaping the industry over the next five years. A survey conducted in 1997, it was observed that 84 percent of senior managers from leading US and Canadian oil companies expect alliances rather than internal operations to be the main source of performance improvements. Alliances are often preferred to acquisitions and divestitures because they bypass or reduce the valuation, tax, and regulatory issues associated with outright changes in control, and allow both parent companies to retain oil reserves as a hedge against price increases. For some participants, alliances are away to build strengths, shore up weaknesses, extract latent value from assets, and make preemptive moves to retain or regain leading market positions. For others, they offer an opportunity to improve performance when the scope for cutting internal costs and reengineering business processes has been exhausted (*Ernest and Steinhilber – 1997*).

Study will dwell upon the strategies of upstream companies on capital investment and acquisitions with relation to the price. Is crude oil price is an important driver for capital investment/acquisition or some other parameters are the key drivers.

6.1 Trends in upstream

International trends analysis has proven that companies all over the world – both big and small use a balanced mix of acquisition and exploration and development to accrete resources. A survey carried out by Andersen of 155 companies (*Petroleum-2001*) came out with following conclusion:-

- Over 48% of the companies have invested more than 20% of their total capital expenditure (includes exploration, development, unproven property deals and proven property deals) on acquisition of proven properties. Totally 79% of all companies have gone for some level of acquisition.

- Over 43% of the companies have acquired 20% or more of the reserve accretion through acquisitions. Totally 73% of the companies have acquired some producing property or the other.
- Approximately 35% of all reserves were added through acquisitions, while 33% came from exploration and 32% came from reserve revisions, enhanced recovery, etc.
- There has been no connection between size of the company and the trend towards or away from acquisition.
- Of the Big 6 oil companies, 2 have gone in for over 50% of reserve accretion from acquisition, 2 have not acquired at all and 2 more have acquired reserves which are between 15 to 20% of the reserve accretion.
- Some of the largest acquirers in % age terms have been mid size companies, which have gone for a combination of farm ins, purchase of proven properties and acquisition/merger of companies to build up reserves and production capacities.

Many literatures has reported spurt of mergers and acquisitions during the 1980s and late 1990s when the oil price were down. In fact year 1998 when oil prices were at their lowest, there were number of mega mergers like Exxon Mobil, Total and Petrofina, and BP and Amoco. Similarly 1980 to 1985 there were number of acquisition activity in the oil sector. Some of which are:

Year	Acquirer	Acquired	Value (billion US\$)
1979	Shell Oil Co.	Belridge Oil Co.	3.60
1981	Dupont	Conoco	7.80
1982	US Steel	Marathon Oil	5.90
1982	Occidental	Cities Services Co.	4.10
1983	Texaco	Getty	10.0
1984	Chevron	Culg Oil	13.2
1984	Mobil	Superior Oil	5.7
1985	Exxon	Hunt Oil	0.50
1985	Occidental	Midcon Corp	
1987	BP	Sohio	7.90

Further, these mergers and acquisitions were very active during 1990s. In fact year 1998 when oil prices were at their lowest, there were number of mega mergers like Exxon, Mobil, Total and Petrofina, and BP and Amoco (Weston -2004). The making of these mergers are summarized below:

- Exxon Mobil
Exxon
Mobil (1998)
- Royal Dutch Shell Group
Royal Dutch
Shell T & T
Equilon (2001)
Fletcher Challenge NZ (2000)
Woodside 35% - 2001)
Enterprise Oil (2002)
- Total Fina Elf
TOTAL
Petrofina (1998)
Elf Aquitaine (1999)
- BP
BP
Amoco (1998)
Arco (less Alaska – 1999)
Vaster (1999)
Burma Castrol (2000)
- Chevron Texaco
Chevron
Texaco (2001)
Caltex (2001)
- Conoco Philips
Philips
Arco (Alaska – 2000)
TOSCO (2001)
Conoco (2002)
Gulf Canada (2001)

If we look at the above mergers and acquisitions and the crude oil price, it is observed that most of these mergers and acquisitions took place when prices were relatively low.

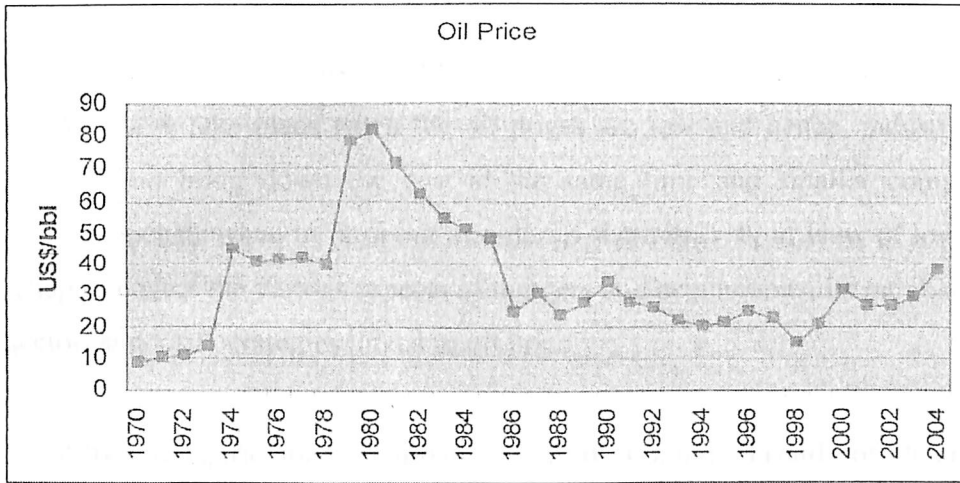


Figure - 6.1

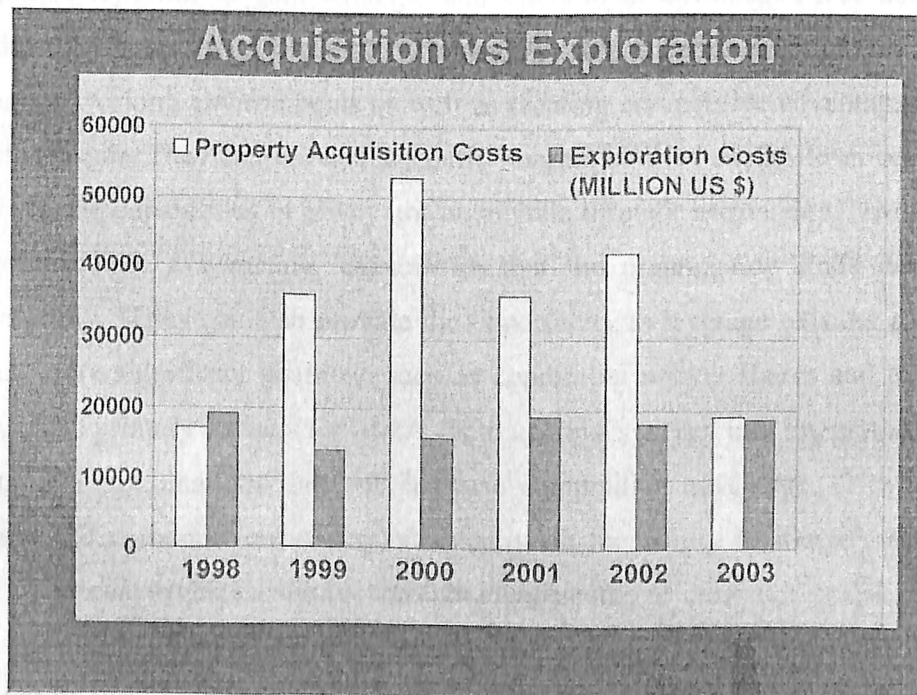


Figure 6.2

Further, the figure below gives the scenario of acquisition of reserves vis-à-vis establishment of same through own efforts, during the period of low oil price.

The above brings to the focus whether these mergers and acquisitions are related to oil price. Are these take place when the oil prices are low and hence, industries want to consolidate and bring down the cost at the same time and smaller companies with reserves on pockets when to farm out in order to share the risk in view of low oil prices. The chapter covers the various aspects of mergers and acquisitions, its purpose in oil and gas sector, and E&P strategies linked to oil price.

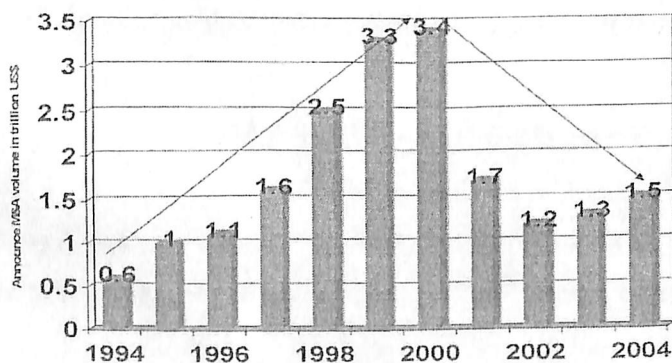
6.2 Why Mergers and Acquisitions and Global Trend of Mergers and Acquisitions

Mergers and Acquisitions have a unique potential to transform firms and to contribute to corporate renewal, to gain strategic and operational advantages that neither firm can achieve on its own. Corporations merge to obtain better positions in turbulent and dynamic working environments as well as creating competitive advantages against other market sector. They can provide an ability to gain all the benefits from combining assets and sharing capabilities in a way not obtainable through partnership. However, M&A's can bring into a company, capabilities that the organization finds hard to develop organically. They can also provide the opportunity to leverage existing capabilities into much more significant positions such as combining market shares and technical know-how. The primary reasons for M&As is to achieve synergy by integrating two business units in a combinations that will increase competitive advantage. However, financial access and competitiveness depend directly on the ability to identify and capture the merges or cost savings available through integration.

Where at the multitude of different reasons why M&Ss are undertaken, the potential benefits vary accordingly. According to four different main categories of M&S benefits can be distinguished are:

- a) *Operational resource sharing* can create economies of scale and scope. A typical sample is the use of common distribution channels or a common sales organization.
- b) *The transfer of functional skills* can improve the competitive position of one or both of the partner in an M&S process. Thus, if one firm possesses superior capabilities in, for example, manufacturing or R&D, the associated skills may be transferred to the other.
- c) **Transfer of general management skills** with M&A can be used in order to increase the competitiveness of the new organization.
- d) M&Sa can also create advantages without capabilities transfer. *Combination benefits occur*, for example, therefore increased market power, enhanced reputation, or greater financial leverage. According to a Well known and often quoted definition, transferring technical capability involves the capacity to develop new technology and transfer of scientific knowledge. It entails “the ability to modify and further develop imported technology – in involves learning how to learn as well as to use what others have learned”.

With these background, let us look at the volume of mergers and acquisitions between 1994 to 2004.



Literature suggest that the increased volume of Mergers and Acquisitions from 1994 to 2000 have been fueled by following factors.

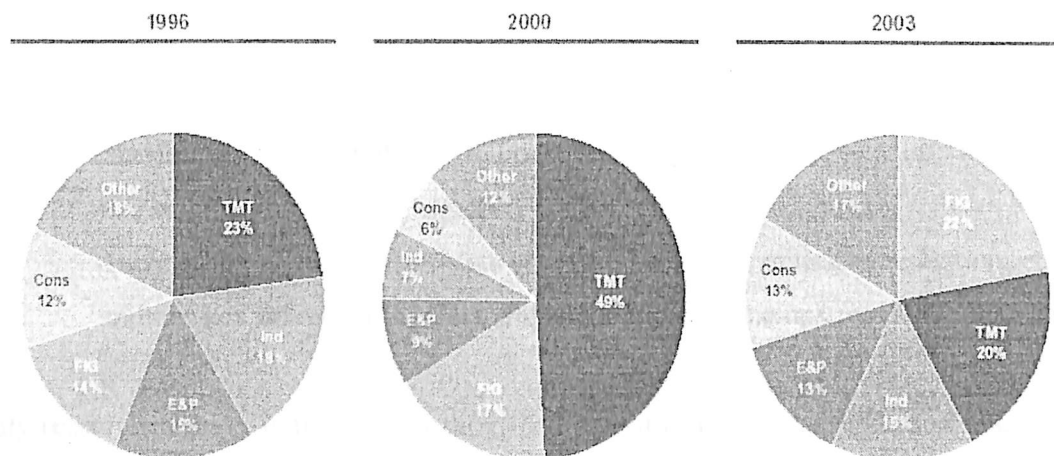
- Robust economic and profit growth
- Strong Equity Market Performance particularly in technology, media and telecom
- Accommodating regulatory environment
- Globalization of certain industries
- Technological Convergence
- Desire for scale and scope
- Quest for earning growth

However, subsequently due to economic slow down, dramatic decline in equity values, corporate scandals and regulatory scrutiny, large “failed” deals, increased focus on return on capital, and tight credit environment played a spoil sport which resulted in decline in mergers and acquisitions activities.

The point here is the M&A decisions are based on both the internal and external environment. There may be strong internal compelling reasons to go for M&A but external environment with regard to global economy. Government policy, credit environment etc. may force the companies against such move.

6.3 What drives M&A activity in oil & gas sector

The M&A activities in the Oil & Gas Sector have been in the range of 10 to 15%. The figure below gives the share of M&A in E&P during 1996, 2000 and 2003:-



As can be seen from above share of M&A in E&P constitute a major component of mergers and acquisitions in the world. There are various factors which has impact on the mergers and acquisitions in oil and gas sectors particularly in E&P sector. These are :-

- a) Sharing of risk both political and operational and hence, to build portfolio of properties.
- b) With most of the easy area being already discovered for hydro carbon, the opportunities for R&P Companies are mainly two – acquisition of reserves through farm-in and through intensification of exploration which has become technologically challenging and geologically complex.
- c) Opportunity for cost saving due to consolidation and economy of scale. Exxon Mobil claims it has saved over US\$8 billion due to its merger. Oil major BP claims to have saved US\$6 billion due to merger.
- d) Pressures from investors to set and meet aggressive growth target – target that may be very stiff which ordinarily not possible to meet through organic growth. It has been observed that reserves and production growth via acquisition remains less expensive than through exploration and production. However, prices of these acquisitions are linked to the price of crude oil.
- e) Attractive mid and long term demand fundamentals. The demand is expected to grow and prices particularly of natural gas which is presently undervalued in most of the areas expected to go up.

- f) Disciplined capital spending, burgeoning cash flows and improved balance sheet.
- g) Renewed focus on strategic efficiency of the asset and not just the size.
- h) Smaller, successful but growth constraint players see consolidation as cure for market invisibility.
- i) Technology namely drilling, survey, well servicing, emission reduction, etc. is another key driver for mergers and acquisitions in the upstream companies.

Many researchers have indicated that the M&A activities during in 1980s and late 1990s can be viewed as a response to price instability. (Wilson-2002). Oil firms, sought to invest in new technologies to reduce costs. It was observed that the previous restructuring efforts and improvement in technologies have lowered costs to \$16 to \$18 per barrel. Oil price declined as low as to \$9 per barrel in late 1998 and thus, as suggested by few studies, the overriding objective for mergers beginning in 1998 was to further increase efficiencies to lower breakeven levels towards the \$11 to \$12 per barrels range.

6.3.1 Mergers and acquisitions during 1980s

The oil industry was marked with change during the decade of the 1980s. The profitability of oil sector was greatly depressed by the fall in oil prices beginning in 1981. Significant cuts in investment and drilling followed. Three important trends developed during the period:-

- Industry concentration increased because of mergers and acquisitions;
- Large oil companies increased their reserves to production ratio;
- Major oil companies sold number of their refinery asset and concentrated on exploration and production area. However, this may be due to the fact that some of the OPEC countries moved downstream; that is into; refining, marketing and petrochemicals.

There were 12 major mergers and acquisitions in oil sector each costing to Rs. 1 billion and above. As literature reports (Journal of Economic Issues, March 1989), motivations for such mergers were:-

- To consolidate
- Believe that it was less expensive to purchase companies than to make sizeable, more risky investments elsewhere.
- Large number of bankruptcies of small scale domestic producer when prices fail to unprofitable level. Major companies took advantage of low asset value of such small producer in the hope of ripping profit when oil prices are high.

6.3.2 Merger of Exxon and Mobil

The strong motivation between Exxon and Mobil which was completed on 30th November, 1998 seems to be consolidation. The motives seems to be two

- By combining two complementary assets, Exxon Mobil would have stronger presence in the region of the world with highest potential for oil and gas discoveries.
- Combined company would be in a stronger position to invest in programmes involving large outlays with higher prospective risks and returns.

Some of the examples of complementary assets are:-

- a) Combination of Exxon experience of deep water in West Africa with Mobil expertise of production and exploration acreage in Nigeria and Equatorial Guinea.
- b) In the Caspian region, Combination of Exxon strong presence in Azerbaijan with Mobil's similar presence in Kazakhstan including its interest in Turmenistan.
- c) Similarly, complementary exploration and production operation in South America, Russia and Eastern Canada.

Merger estimated operational synergy of US\$2.8 billion two third of which was expected to come from eliminating duplicate facilities and excess capacity. Further, synergy benefit was expected to some from applying each company's best practices across there worldwide exploration.

The basic characteristics of the deal was

	Exxon	Mobil
Market value (Billion) as on 20/11/98	\$175.00	\$58.7
Book Value (Billion) as on 30/9/98	\$43.70	\$19.0
Market Value/Book Value	4.0	3.1
PE Ratio	23.6	17.9
Total paid (billion)	\$74.2	
Premium over market (billion)	\$15.5	
Premium over book value	\$55.2	

The deal terms were as under:-

Pre-Merger

	Amounts		Percentage		
	Exxon	Mobil	Total	Exxon	Mobil
Share Price	\$72.00	\$75.25			
Shares outstanding (Million)	2431	780			
Total Market Value (billion)	\$175.00	\$58.70	\$233.70	74.9	25.1
Exchange terms	1.32 for 1				
No. of shares (million)	2431	1030	3461	70.2	29.8

(Source Weston-2004)

The deal was based on the discounted cash flow NPV calculation which was strongly linked to the oil price as both the cost of acquisition in terms of property valuation as well as the return expected were linked to the crude oil price.

Panel A. Pre-merger

	Market Caps	Ownership Proportions
Exxon	\$ 175.00	74.9%
Mobil	58.7	25.1%
Total	233.7	100%

Panel B. Pre-merger		
Combined Value	\$283.3	
Paid to Mobil	74.2	
Remainder	209.1	
Exxon Premerger	175.0	
Gain from Merger		\$ 34.1
Portion of Exxon 70%		23.9
Portion to Mobil 30%		10.2
Plus Premium to Mobil		15.5
Mobil Total Gain		25.7

As can be seen from above, the merger of Exxon Mobil resulted in gain due to consolidation which resulted in increase in value. Literature leads to the theory that the consolidation was mainly due to decrease in oil price and hence, achieving cost efficiency through better synergy.

6.3.3 Other major Merger in 1990s

The major reasons cited for such mergers are the need for increased efficiency and cost savings. Economic literature also suggests that firms sometimes merge to enhance their ability to control prices. Most of these mergers during the low oil price period led to increase in value of the company which can be seen from the table given below:-

Budget	Acquirer	Announcement Date	Market Cap, - 10days			Value Changes -10,+10)		
			Target	Acquirer	Combined	Target	Acquirer	Combined
Amoco	BP	8/11/98	38.7	79.7	118.4	10.6	1.9	12.5
Petrofina	Total	12/01/98	8.1	29.6	37.7	2.5	(4.7)	(2.2)
Mobil	Exxon	12/01/98	56.7	173.7	230.3	11.7	5.4	17.1
Arco	BP	4/01/99	20.8	161.5	182.3	4.7	7.9	12.6
Elf Aquitaine	Total Fina	7/05/99	41.6	46.2	87.8	5.9	(3.2)	2.7
Texaco	Chevron	10/16/00	29.4	56.6	86.0	3.8	(1.1)	2.7
TOSCO	Phillips	02/04/01	5.0	14.0	19.1	1.2	(0.2)	1.0
Gulf Canada	Conoco	5/29/01	3.0	19.2	22.2	1.1	(0.3)	0.7
Conoco	Phillips	11/18/01	15.5	20.6	36.1	2.3	2.1	4.5
	Total		2188	601.1	819.9	43.8	7.8	51.6

As can be seen from above, except for the case of Total Petrofina, there has been value addition in all the mergers.

The companies Chevron Texaco brought to the table certain practices many of which were in Supply Chain Management which resulted in reduction in cost. The merger gave Chevron Texaco the resources and global reach to compete against such huge rivals as Exxon Mobil and the British Company BP, analysts say. As one of the oil analyst Mark Uptigrove puts it “This was sort of a merger of necessity. In order for Chevron and Texaco not to get left in the dust, they had to come together”. The move made Chevron Texaco the largest producer in some of the world’s most important oil fields, including Kazakhstan, Indonesia and the Gulf of Mexico. The merger also gave the new company a size comparable to the industry’s global giants.

6.3.4 Oil Price and reserve acquisition

As mentioned earlier, the upstream companies built reserves both through acquisition as well as exploration and production efforts. Acquisition of reserves can be through mergers and acquisitions which has been discussed earlier as well as through farm-in which is again acquisition of certain % participating interest in the producing properties. From the buyer point of view, following are looked into:-

- Prospectivity of the properties
- Future Production Potential of the existing reserves
- Upside Potential – Chances of finding more oil in future
- Input required for producing the field in terms of IOR/EOR measures/Infrastructure
- Fiscal policy of the local Government
- Calculation of NPV on the basis of weighted average cost of capital and return expected based on risk premium
- Analysis of Risk and Reward
- Policy about Risk Spread

The ultimate decision is generally based on the cost benefit analysis. The expenditure likely to be incurred including the capital investment, and the projected income are linked to the crude oil price. Valuation of reserves is basically compromise between the cost of finding the reserves and total valuation of the reserves discounting for the development

charges. Buyers look at the conservative oil price in the coming future whereas Sellers look at the optimistic price scenario in future to get the best deal. Motivations of sale of properties are account of following reasons:-

- Core Competence of Seller is in exploration and wants to get best out of the deal from the exploration discovery;
- Seller is a small Company whose profitability is effected when the oil prices are low and hence, find it difficult to survive;
- There is strategic shift in Seller's areas of interest and sharing of risk;
- Political compulsion.

Hence, Crude Oil price is an important determinant both for the seller as well as the buyer for the producing property.

Reserves are also accrued through Company's own effect of exploration and development. Exploration consists of Seismic work and other geoscientific work followed by wild cat drilling based on the prospectivity of the area. The wild cat drilling may or may not lead to discovery of commercial hydrocarbons. Both for Seismic Work and for drilling, there is need for outsourcing of man, material, equipment, technology, etc. Exploration efforts are dependent on the retained profit of the company as well as cost of the inputs mentioned above. In case high oil price, the retained profit goes up but at the same time cost of outsourcing also goes up whereas in oil prices are low, retained profit comes down as well as the cost of outsourcing.

6.3.5 Oil price and Capital Investment for reserves accretion/acquisition

Figure below plot of oil prices vis-à-vis capital investment on exploration which includes expenditure on both acquisition and accretion of reserves.

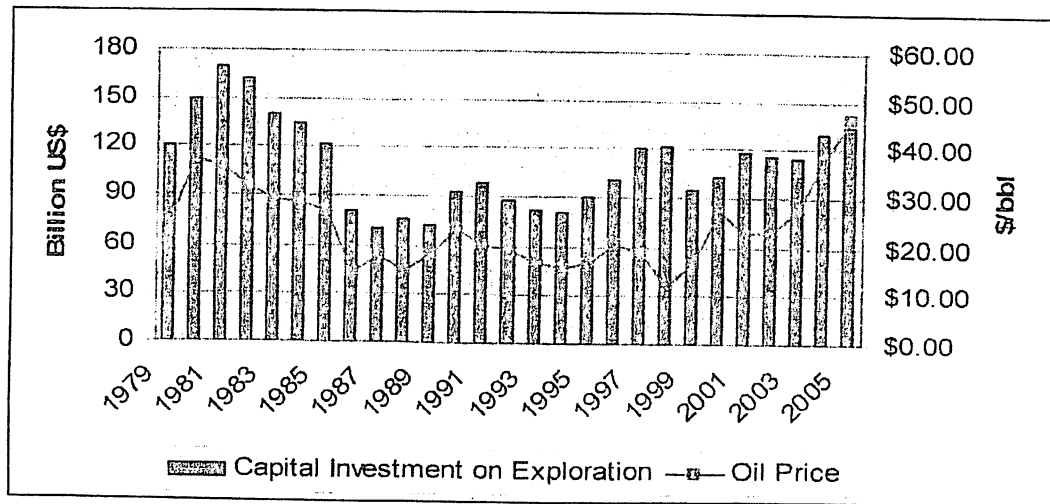
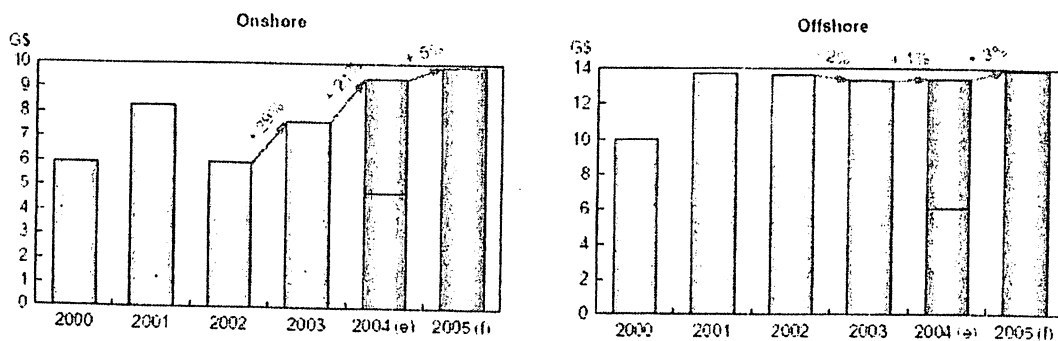


Figure 6.5



(Source IFP/Economic Studies-2004)

Figure 6.6

It emerges from the plot the increase in oil results increase in investment in the exploration activities and similarly the decrease in price results in decline in investment. Various literatures suggest that the effect is mainly one year later.

Further, it may be noted that there has been apparently increase in the drilling activities compared to previous year which seems to be fueled by recent increase in oil price.

It may be noted that prices increased in 2001 and then declined in 2002 which was followed by continuous increase since 2003. Similar, trend can be seen in number of wells drilled also. AS against 56,651 wells drilled in 2001, it came down to 43,809

during 2002 and then increased by 25% to 54,586 in 2003 followed by increase of 11% to 60,681 during 2004.

10% increase in price in the previous year leads to account 4.1% increase in capital investment in the current year. This also seems to be logical as increase in oil price leads to increase in retained earning which helps in pumping more money for the exploration work.

6.3.6 Acquisition Vis-à-vis Accretion of Reserves

Not much data is available as regards to proved property acquisition cost. The data could be collected for only 10 years. The plot below gives trend of % acquisition cost of total investment in E&P vis-à-vis price.

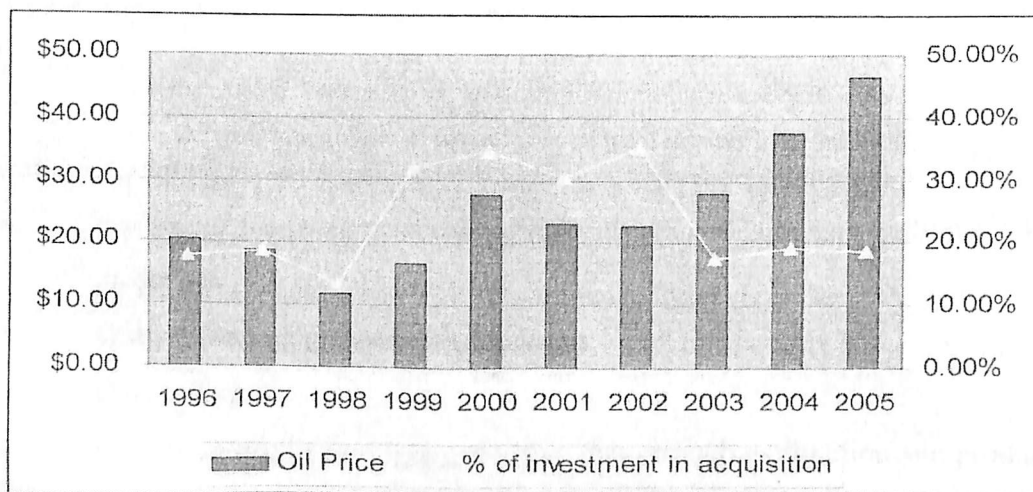


Figure 6.7

As appears from above, the general trend of acquisition is more in the low oil price scenario. However, the %share of acquisition cost seems to go up one year after the oil price increase.

6.4 Chapter Summary

Chapter looked at the relationship between oil price and strategy of the oil and gas companies with regard to mergers and acquisitions. Chapter briefly covered the motive of mergers and acquisitions which can be summed up as:-

- Economies of Scale
- Increased Revenue/Increased Market Share
- Cross Selling
- Synergy
- Geographical or other diversification

If we see the world scenario, the merger and acquisition were at its peak during 2000 when the total volume of mergers and acquisition were around 3.4 trillion US\$ which subsequently declined due to economy slow down, dramatic decline in equity values, corporate scandals and regulatory scrutiny, large “failed” deals, increased focus on return on capital, tight credit environment played a spoil sport which resulted in decline in mergers and acquisitions activities.

The motive for mergers and acquisitions in oil & gas industries are mainly:-

- Sharing of risk both political and operational and hence, to build portfolio of properties
- Growth through acquisition of reserves
- Cost saving
- Growth in acquisition less expensive than through exploration and production particularly when prices are low.
- Attractive mid and long term demand fundamentals.
- Renewed focus on strategic efficiency of the asset and not just the size.
- Technology

History indicates that during the low oil price regime number of mega merger took place particularly during 1980-1986 and 1998-2002. In 1998, when the real oil price was at its lowest, three mega mergers took place namely Exxon Mobil, BP Amoco & TotalFina and

process started for merger of Chevron Texaco. There were 12 major mergers in oil and gas industry from 1980 to 1985 mainly in E&P each costing over 1 billion US\$.

Study of merger of Exxon Mobil indicates that the merger was for consolidation by better synergy of complementary assets of each other. Merger estimates operational synergy of US\$ 2.8 billion two third of which was expected to come from eliminating duplicate facilities and excess capacity. The study indicates that the mergers were indirectly fall out of low crude oil price. Strong motive was to cut the cost through better synergy to maintain profitability. The merger was win-win for both as both the companies gained from the merger. The merger during late 1990s and early 2000 also indicate that the merger was more for survival; consolidation and making best use of each other competence in order to cut cost and hence, increase value. All the mergers resulted in increase in value except for that of Totalfina. It may also be noted the key driver for deal for the above mergers were net cash flow expected in the future which is dependent on the oil price.

Chapter also mentions about the strategy of the upstream companies with regard to reserves acquisition and accretion both of which are linked to oil price. As regards acquisition of reserves, it can be either through merger or acquiring participating interest through farm-in. Buyer as well as the seller both looks at the expected future oil price to get best out of the deal. The exploration requires outsourcing in terms of man, material, equipment and technology. The price of these properties goes up when the oil prices are high. Hence, it emerges that capital investment for acquisition and exploration are linked to the oil price. The elasticity of capital investment on price increase is around 0.42 i.e. 10% price increase results in increase in capital investment of 4.2% one year later.

Summing up, it appears that there are more mergers and acquisitions when the oil prices hits the bottom mainly for consolidation and price cut. There are absolutely no doubt both through historical records of last 25 years, logically as well as through econometric analysis that the capital goes up with the increase in crude oil

price. However, it cannot be conclusively said that the acquisition share of total capital investment goes up when the prices are low in spite of the fact that past ten years indicates towards the same.

Chapter 7: Oil Price and Indian Economy

7.1 Introduction

India is fourth largest energy consumer in the world after USA, China and Russia. Coal and oil are the two major energy resources and the share of oil in the energy mix of India is about 32%. Against the total production of 34 MMT of crude oil, the total consumption of crude oil and petroleum product is of the order of 120 MMT. Hence, country is importing about 95 MMT of crude oil to meet the total refining capacity of 127 MMT. India is one of the top 10 oil consuming countries in the world. The consumption of petroleum products in the country is on the rise and the gap between demand and supply is widening. Graph below gives the demand and supply gap in the last forty years. As can be seen from the graph, the gap of demand and supply which was around 25% in 1984-85hs gone up to present level of almost 70%.

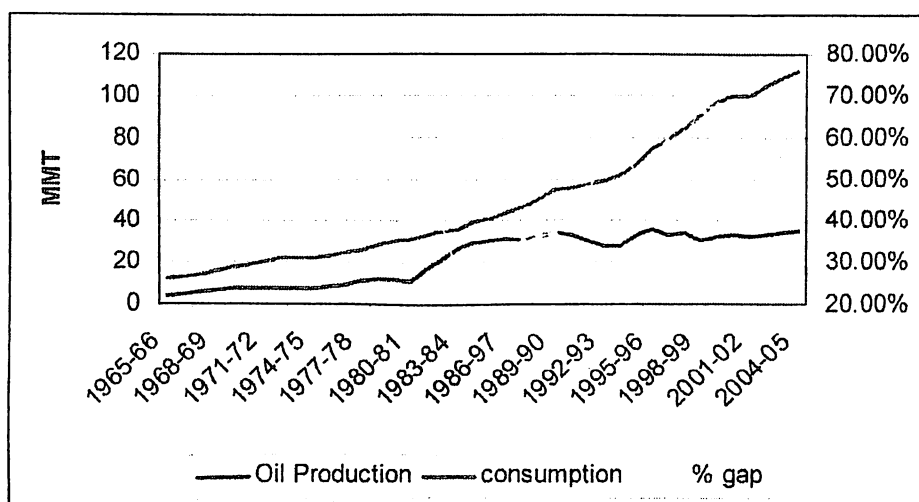


Figure 7.1

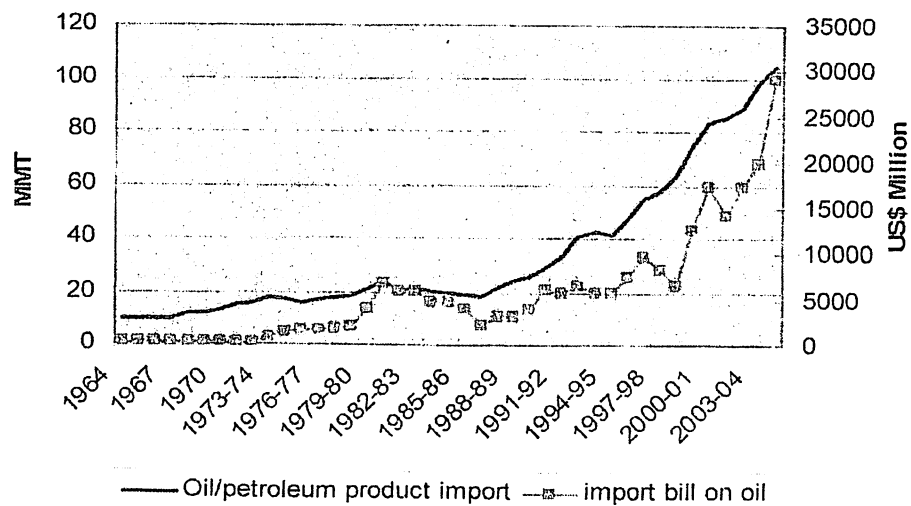


Figure 7.2

Therefore, to meet the demand supply gap, the country has to depend largely on imports. Crude oil is the single largest item on India's import list.

As can be seen from the above plot the demand for oil is continuously increasing. Today, India oil import bills Rs. 1,31,756 crores (US \$106 million) accounts for about 28% of the total import and about 4.5% of GDP.

India ranks fourth in the world in total energy consumption and needs to accelerate the development of the sector to meet its growth aspirations. The country, though rich in coal and abundantly endowed with renewable energy in the form of solar, wind, hydro and bio-energy has very small hydrocarbon reserves (0.4% of the world's reserve). The sub-optimal consumption of commercial energy adversely affects the productive sectors, which in turn hampers economic growth. The distribution of primary commercial energy resources in India is quite skewed. 70 percent of the total hydro potential is located in the Northern and Northeastern regions. On the consumption front, the **Industrial sector** in India is a major energy user accounting for about 52 percent of commercial energy consumption. **Per Capita energy consumption** in India is one of the lowest in the world. But, **energy intensity**, which is energy consumption per unit of GDP, is one of the highest in comparison to other developed and in developing countries. For example,

it is 3.7 times that of Japan, 1.55 times that of the United States, 1.47 times that of Asia and 1.5 times that of the world average.

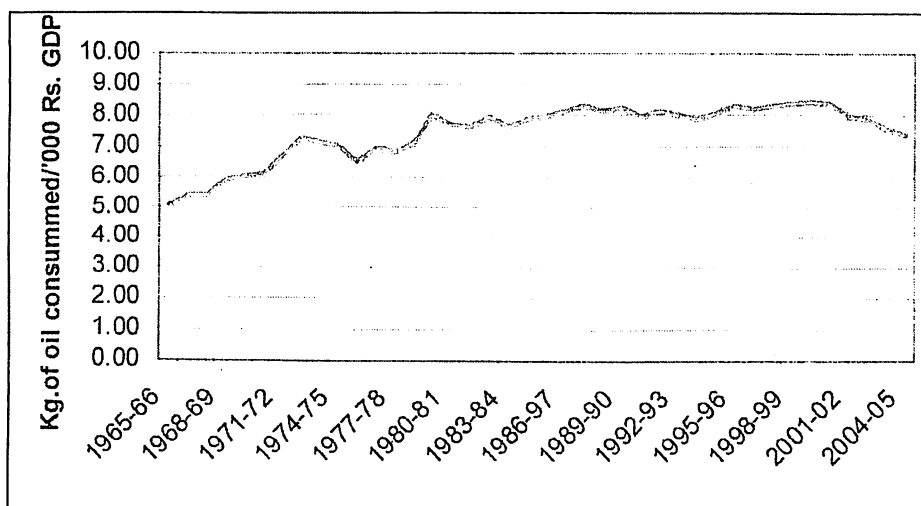


Figure 7.3

As the graph indicates above, there has not been any change in the oil intensity. As mentioned in Chapter 3, most of the countries particularly developed countries took immediate steps to improve energy efficiency due to oil price shock in 1973 and subsequent of 1980s. However, Government seems to be apathetic to oil price shock and there hardly seems to be any attempts towards reducing oil intensity. However, there seems to be some realization lately in this regard.

Hence, change in price of crude oil is expected to affect the economy of the country. Study carried out by FICCI recently suggested that the cumulative impact of a double digit oil price increase in 2005-2006, on top of a 14.9% rise in 2004-05 would be most felt by the manufacturing sector, especially chemicals, transport equipment, textile products, basic metal and non metallic minerals, while the macro impact of high oil prices of \$ 50 per barrel will be 0.4% on GDP growth and push up inflation rates by 1.5%. However, FICCI estimates also show that if oil prices go up to average price of \$ 80 per barrel for a full year it will pull down GDP by 4.9% and raise the wholesale prices index by 7.9% over the current levels. The study revealed that among the different sectors of the India economy only the manufacturing sector had a strong negative

relationship with oil prices. However, though the manufacturing sector is the most susceptible to oil prices increases, a lagged impact spread over three years, usually allows the manufacturing sector to escape the full brunt of most sharp oil price hikes.

7.2 Oil Price and GDP of India

The subject has already been covered in details in Chapter 5. When we plot real GDP of India as US \$ 2000 price and real oil price, the graph itself shows a relationship between GDP and oil price.

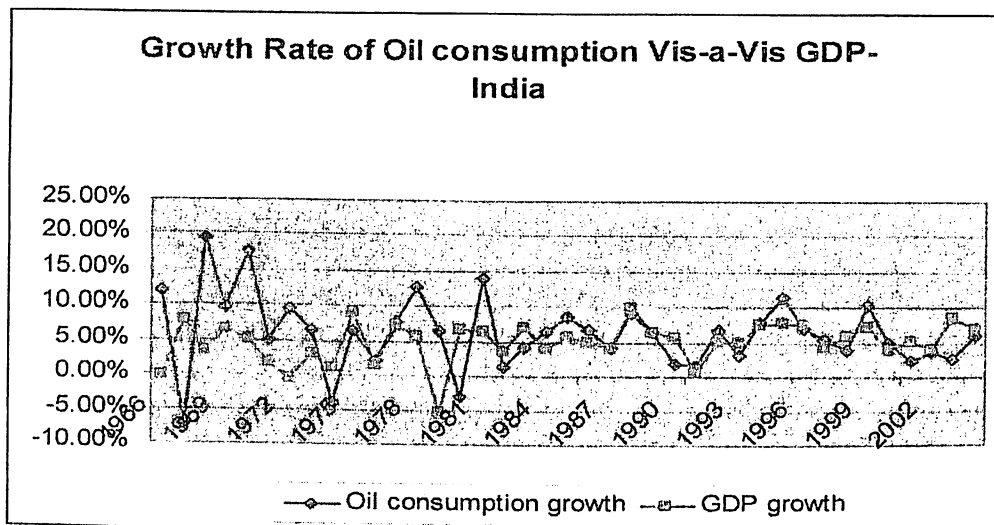
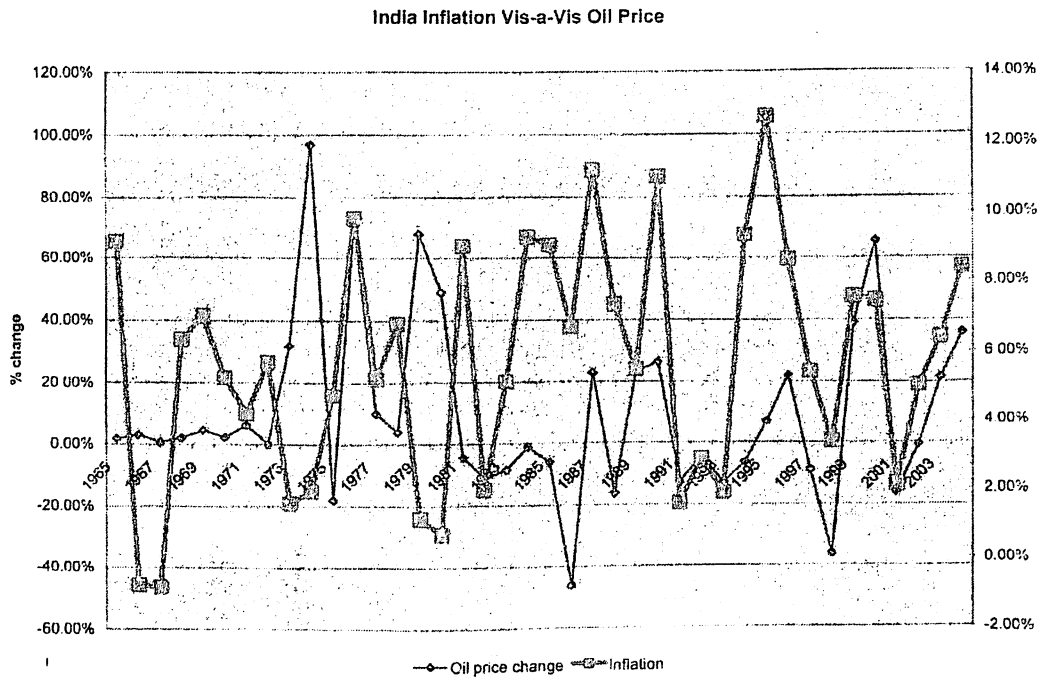


Figure 7.4

7.3 Relationship between oil price and inflation rate in India

There are two kinds of inflation : price inflation and wage inflation. Price inflation generally comes first, often from shortage of critical commodities. Those higher prices then squeeze workers' buying power, so they demand pay raises. To pay for those raises companies raise the price of their goods and services, which then send workers back for more raises, and the vicious cycle begins.

As mentioned in the theory, oil contributes to all the sector of the economy as an important input. The increase of oil price either caused by decreased supply or increased, will lead to increase in price of the commodity be it in any sector as the input cost is going up. This in turn raise the cost being charged to the customer and hence, should lead to price inflation. Further as mentioned above, worker will demand higher wages due to increase in prices which will lead to wage inflation leading to further increase in price. The plot below of oil price increase vis-à-vis shows the similar trend:-



The above graph indicates towards a linear relationship between oil price and inflation.

7.4 Oil Price and Investment in Exploration and Production Sector

The oil price and the capital expenditure in the exploration and production oil & gas sector does not show any relationship for the earlier years which can be seen from the figure 7.6 which shows that only lately (in the last two years) there seems to be some relationship between oil price and investment in exploration and production.

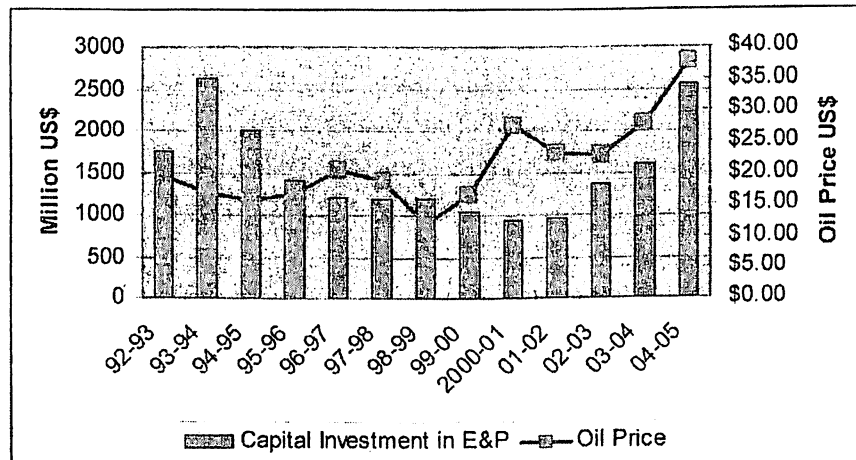


Figure 7.6

7.5 Chapter Summary

The chapter covers the impact of oil price change on the Indian economy. Oil has the share of 32% in the energy mix of India. The oil demand is growing every year in India whereas the production seems to be stagnant and hence, the gap between demand and supply is increasing. Today, India imports about 95 MMT of crude oil and the import bill of oil is of the order of 25.99 US\$ Million which is about 38% of India's total import and about 4.5% of its GDP. Hence, change in the oil price is expected to have impact on the Indian economy.

As regards inflation, it emerges from that the oil price changes have impact on inflation both for change during the current year and changes during the previous.

As regards other macro economic factor, it appears that the increase in oil price results in appreciation of Rupee value in the year of increase and depreciation in Rupee value if the increase is in the previous year.

Further, the capital investment for exploration and production in oil and gas sector does not show any statistically significant relationship between oil price and investment.

Chapter 8: Summary, Conclusions and Recommendations

Energy is one of the key factors for the growth of the economy along with labour and capital. Oil along with Coal and gas is the major source for energy. The share of oil in the energy mix is 38% in the world and 32% in India. Hence, any fluctuation in oil price is expected to have the impact on the macro economy of a country. However, whether all oil prices are having similar impact or different and whether price decrease has same impact as increase are subject of discussion. It is also interesting to know the impact of change in oil price in the importing countries and the exporting countries. The exporting countries are expected to be benefited by increase and the importing countries are expected to suffer. Further, the upstream hydrocarbon business is a high risk and high to medium reward business. A successful discovery from exploration can change the fortune whereas the failure in cost intensive exploration may change the profitability of the organization completely. It is this background which motivated me to take up the project subject as “**Factors affecting Oil Price and its impact on indian Economy**”.

8.1 Methodology

The report assesses the impact of oil price on the macro economy and the strategies of the upstream companies through theory. The history of oil prices and its pricing methodology as well as link between oil consumption and GDP have been analysed to fully understand the impact of oil price. Accordingly, the report has been divided into six sections before coming to findings, conclusions and recommendations. These are:-

- Understanding the events affecting the oil price over the years
- Relationship between output and oil consumption
- Theory which links the oil price with GDP
- Relationship between oil price and GDP
- Oil price vis-à-vis strategy of oil and gas companies
- Study link of oil price with Indian Economy

8.2 Findings and Conclusions

8.2.1 Crude Oil Pricing

Five major events namely Suez Crisis Nov., 1956, Arab-Israel was in Nov., 1973, Iranian Revolution in Nov. 1978, Iran-Iraq war in Oct., 1980 and Persian Gulf War in Aug., 1990 had major impact on the crude oil prices. Crude oil price increase in the recent years has been caused both by reduction in supply in 2003 (Venezuela and Iraq factor) as well as increased demand mainly from the growing Asian economy particularly China and India. Spare capacity of the oil producers is also one of the major determinants of crude oil price and low spare capacity is also one of the reason for present hike in crude oil price alongwith increased demand of oil particularly from China and India. If we see the history crude oil prices, it may be said that the real oil prices reached its peak in 1980 and present high price level, however, in second only to the price level in early 1980s. The lowest price level was reached in 1998 was due to combination of recession in earlier growing Asian market as well as increased production from the OPEC countries.

Currently more than 150 crude grades are described in *The International Crude Oil Market Handbook (2004)*. The oil industry classifies "crude" by the location of its origin (e.g., "West Texas Intermediate, WTI" or "Brent") and often by its relative weight (API gravity) or viscosity ("light", "intermediate" or "heavy"). The refiners also refer to it as "sweet", which means it contains relatively little sulfur, or as "sour" which means it contains substantial amounts of sulfur and requires more refining in order to meet current product specifications. Although the pricing of the crude is done through the use of marker crudes such as West Texas Intermediate (WTI), Brent, Dubai, Tapis, Minas etc. but the prices of these different crude oils move broadly together. **Hence, any analysis carried out on the basis of one type of crude oil is expected to hold good for others also.**

8.2.2 Crude Oil Consumption and GDP

In order to understand the impact of oil price on GDP, it is imperative to understand the relationship between GDP and oil consumption. Based on the past trend it has been observed that increase in GDP leads to increase in oil consumption. For example, the GDP of the world increased by an average rate of 3% during the period 1995-2005 and during the same period, the increase in consumption of oil has been of 1.7%.

8.2.3 Literature survey and various theories

From the Supply and Demand theory, it appears that the price of crude oil is affected by both supply and the demand. In case of oversupply, the exporters of oil will soon have excess inventory, so they will lower prices to reduce this. Inventory will be reduced and the oversupply will be eliminated. In the case of too low a price and undersupply, importers will likely to compete at the low price, but since more importing countries would like to buy at the price that is too low, the exporters would raise the price to the highest they can, which is the equilibrium point. In each case, these actions of importers and exporters cause the quantity and price to move towards the equilibrium point.

Similarly, when economy is in a growth path, the quantity of oil demanded at all prices will tend to increase. This will lead to an increase in demand. This raises the equilibrium price of crude oil price. Conversely, if the demand decreases particularly during recession as well as due to increased energy efficiency, the opposite happens. If the demand decreases the price decreases as well as the quantity supplied.

The transmission mechanisms through which oil prices have an impact on real economic activity include both supply and demand channels. The supply side effects are related to the fact that crude oil is a basic input to production, and consequently an increase in oil price leads to a rise in production costs that induces firms to lower output. Oil price changes also entail demand side effects on consumption and investment. Consumption is

affected indirectly through its positive relation with disposable income. The magnitude of this effect is in turn stronger the more the shock is perceived to be long lasting. Moreover, oil prices have an adverse impact on investment by increasing firms' costs. Various researchers suggest that oil price fluctuations have considerable consequences on economic activity. These consequences are expected to be different in oil importing and in oil exporting countries. The transmission mechanisms through which oil prices have an impact on real economic activity include both supply and demand channels. The supply side effects are related to the fact that crude oil is a basic input to production, and consequently an increase in oil price leads to a rise in production costs that induces firms to lower output. Oil prices changes also entail demand side effects on consumption and investment. Consumption is affected indirectly through its positive relation with disposable income. The magnitude of this effect is in turn stronger the more the shock is perceived to be long-lasting. Moreover, oil prices have an adverse impact on investment by increasing firms' costs.

Several experts have concluded that the linear specification might well mis-represent the relationship between GDP growth and oil prices. This mis-representation of the linear specification has led to different attempts to redefine the measure of the oil price change. These attempts are based on non-linear transformations of the oil prices, in an effort to reestablish the correlation between GDP growth and oil prices. On the one hand, few researchers find asymmetry between the responses of the GDP to oil price increases and decreases, concluding that the decreases are not statistically significant. Few researchers however report that the response of the GDP to an oil price shock depends greatly on the environment of oil price stability. An oil shock in a price stable environment is more likely to have greater effects on GDP than one in a price volatile environment. These authors thus propose a measure that takes the volatility of oil prices into account. They find asymmetry in the effects of positive and negative oil price shocks, but they also manage to re-establish the above-mentioned negative correlation.

As far as exporting countries are concerned, the maximum impact is on the Saudi Arab where increase of 10% oil price shows increase in GDP by 3% in the year of increase. However, one year of lag of oil price increase has negative impact in current years GDP. Norway shows a marginal increase of 0.3%, Malaysia of 0.1% and Venezuela negligible for 10% increase in oil price in the same year within overall significance level of 10%. Negligible impact shown by Venezuela of oil price may be due to the fact that despite higher oil price at the end of 2002 and into 2003, domestic political instability, culminating in a disastrous two month national oil strike from December 2002 to February 2003, temporarily halted economic activity. The economy remained in depression in 2003. Decrease in oil price does not show any significant impact on Norway, Malaysia and Venezuela. However, the GDP of Saudi Arab decreased by 1.3% for every 10% decrease in oil price.

8.2.4 Oil Price and Strategy of the Upstream Companies

Study of the impact of oil price on the strategies of upstream leads to following findings/conclusions:-

- a) The major mergers have taken place during the period of low oil price. These mergers took place for consolidations with aim of achieving better synergy. All find mega mergers in the oil and gas industry namely BP and Amoco, Exxon and Mobil, Chevron and Texaco, Total, Fina and Elf were during the same period.
- b) The capital expenditure on exploration goes up with increase in oil price.
- c) Acquisition of oil reserves through farm in or M&A found to be more when oil prices are lower. However, same could not be said conclusively as result obtained was not statistically within 10% level. However, the lin log model showed that lagged oil price has negative relationship with the share of acquisition.

8.2.6 Oil Price and Indian Economy

8.2.6.1 Oil Price and Capital Investment for exploration and production

The capital investment for exploration and production (E&P) does not show any relation with oil price which in contrast to the world scenario. This may be due to the fact that the price for oil which Upstream Companies was getting was controlled through Administrative Price Mechanism.

8.2.6.2 Findings/Conclusions

The change in oil price also affects the inflation rate and exchange rate in India. Increase in oil price increases the inflation. The increase in CPI is expected to be 1.8% with 10% oil price increase in the current year and to increase by 2% if oil price increase of 10% is in the previous year. However, the effect of oil price increase on inflation in USA and other developed countries was statistically insignificant.

The change in oil price is having a positive impact in the year of change with value of Rupee appreciating with respect to US\$. However, the impact of oil price change on interest rate of India was not found to be significant. Further, the change in oil price had no statistically significant relationship with investment in the exploration and production for oil and gas.

Summing up, energy plays a major part in the economy. The consumption of oil, which is being one of the major sources of energy, is strong relationship with the GDP elasticity of which varies from country to country depending on oil intensity. Hence, the oil price also becomes important determinant of the macroeconomic activity. The increase in oil price has a positive affect on most of the exporting countries and negative affect on importing countries. However, these impacts are statistically significant only when increase in oil prices is high. India seems to have largest impact of the oil price compared to other importing countries studied. Saudi Arabia seems to be benefited the most by increase in oil price. The impact of decrease in oil price is not found to be statistically significant except the Saudi Arab. The increase in oil price increases inflation and results in appreciation in Rupee values vis-à-vis US\$ in India but impact on interest rate is statistically not significant. Upstream oil companies increases their capital investments when the oil prices are high and at low prices cost of acquisition of hydrocarbon reserves

becomes more economical. Hence, Change in Oil Price affects the macro economy as well as the strategies of the upstream Oil and Gas Companies, level of impact varies from negligible to significant depending on the level of change and direction of change.

8.3 Recommendations

The findings and conclusions are definitely indicative if not the exact picture. The various action points which emerges out of the findings and conclusions are:-

- There is a strong need to improve the oil intensity of India by improving energy efficiency. Figures suggest that no concrete steps have been taken to improve energy efficiency in India over the years whereas most of the countries seems to have taken steps after the oil shock in 1979-1980. This may be due to the fact that the prices of few petroleum products are highly subsidized resulting in general apathy towards the energy efficiency. There is a need to price the product at a level which is close to international level which will force users to resort to better energy efficiency method to minimize unit input cost.
- The importing countries should minimize budgetary costs by passing through the hike in oil prices onto administered energy prices, especially if there is a reduction in access to international capital markets, constraining the ability to use foreign by swing to finance the deterioration in the external accounts.
- Any adjustment of taxes on petroleum products need to be considered in terms of what is appropriate from the overall fiscal and macroeconomic situation. If the oil price increase appears to be of short duration, there is little merit in adjusting taxes. However, if prices remain, or are expected to remain, there has to be some rethinking of the best use of the revenue decline. The appropriate strategy will depend upon the tax structure of the country concerned. Particularly for countries that have regulated prices, a full pass through of the oil price increase would generally be appropriate, if consistent with the overall macroeconomic and fiscal situation of the country. I will

strongly recommend the same for India as only then energy consciousness can be brought among the users.

- Exploration of hydrocarbon being the risky business, the companies need to invest more when the return are good. Hence, the upstream companies should invest more on exploration when the oil prices are high. The significant amount of excess additional earning due to high oil prices should be utilized for exploration as only this will result in bridging the gap between demand and supply particularly for the importing countries. With regard to India, there is a need for review of policy in order to intensify the exploratory efforts as well as go for induction of state of the art technology which will result in bridging the gap between demand and supply. A directive in terms of certain high % of excess earning to be utilized for exploration may be given which may be more beneficial in the overall context. It is also the right time for encouraging the Foreign Direct Investment (FDI) in the exploration sector in the present context when the prices are high and likely to remain high in the coming years. This will required good marketing of the hydrocarbon prospects in the country as well as good and stable fiscal terms. In this regard, the recent initiative of attracting FDI through New Exploration Licensing Policy (NELP) by Government of India is praiseworthy.
- Exceptionally low oil price may also produce undesirable results. A period of very low prices may lead to reduced investment in such areas as oil exploration, refining capacity, and distribution systems, as well as energy saving technology potentially increasing subsequent price volatility and uncertainty if supplies of oil and refined products do not keep pace with rising demand. Hence, Government should provide some kind of fiscal incentive to the upstream oil companies in order to maintain the pace of exploration and other activities in the hydrocarbon sector.

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