Month	Consumption	OPEC	Non-OPEC	Brent
	m b/d	m b/d	m b/d	$/bbl
Jun-98	44.514	27.95	44.53	12.04
Jul-98	45.263	27.65	44.56	12.04
Aug-98	44.379	27.26	43.77	11.95
Sep-98	44.904	26.33	44.16	13.39
Oct-98	45.249	27.14	44.06	12.64
Nov-98	47.593	27.4	44.9	11.47
Dec-98	48.217	27.37	44.96	11.479
Jan-99	45.288	27.47	44.76	11.08
Feb-99	48.122	27.83	44.69	10.25
Mar-99	48.395	27.89	44.48	12.51
Apr-99	44.633	26.4	44.07	15.24
May-99	42.393	26	44.22	15.41
Jun-99	45.314	25.8	43.72	15.76
Jul-99	44.934	26.27	44.52	19.1
Aug-99	45.288	26.04	44.59	20.3
Sep-99	45.962	26.21	44.28	22.46
Oct-99	46.294	26.32	44.9	22.01
Nov-99	47.613	25.8	45.22	24.62
Dec-99	49.721	25.55	45.58	25
Jan-00	44.661	26.06	45.9	25.26
Feb-00	47.332	26.76	45.88	27.99
Mar-00	48.445	26.55	45.73	27.14
Apr-00	43.907	27.73	45.5	22.65
May-00	44.233	28.09	45.41	27.6
Jun-00	46.15	27.69	45.65	29.73
Jul-00	44.878	27.83	45.96	31.23
Aug-00	47.228	28.69	45.5	29.74
Sep-00	46.478	28.95	45.64	32.94
Oct-00	46.102	29.35	45.93	30.92
Nov-00	46.417	29.64	46.61	32.55
Dec-00	48.231	27.98	46.64	25.07
01-Jan	47.106	31.28	46.56	25.6
01-Feb	47.238	31.05	46.36	27.45
01-Mar	46.93	30.31	46.67	24.42
01-Apr	44.292	30.82	46.9	25.37
01-May	44.319	30.47	46.07	28.35
01-Jun	44.917	30	46.6	24.64
01-Jul	46	30	46.6	25.63

Table 1. OECD Oil Stocks during 1998 Crisis and Afterwards

Months	Japan		United States		Europe		Total OECD	OECD Lead Time
	Stocks (m bbl)	Lead Time	Stocks (m bbl)	Lead Time	Stocks (m bbl)	Lead Time		
Dec-97	734.6	100	1722.9	83	1237.2	86	3694.7	87
Jun-98	786.5	99	1860.2	79	1344.4	88	3991.1	85
Sep-98	801.3	91	1874.7	80	1353.6	85	4029.6	84
Dec-98	768.6	82	1856.6	79	1336.7	85	3961.9	81
Mar-99	746.5	95	1823.9	79	1319.6	92	3890	86
Jun-99	763.6	93	1846.5	78	1315.9	87	3926	83
Sep-99	779.4	85	1821.1	75	1317.4	84	3917.9	80
Dec-99	753.4	80	1691.6	71	1265.1	81	3710.1	76
Mar-00	734.9	90	1677.1	70	1268.8	87	3680.8	79
Jun-00	760.4	91	1733.6	71	1265.9	83	3759.9	78
Sep-00	765.4	87	1751.6	72	1285.6	84	3802.6	78
Dec-00	768	81	1688.1	62	1302	86	3758.1	77
Mar-01	761.4	96	1696	71	1291	88	3748.4	81
Jun-01	772.4	94	1766.1	72	1271.7	84	3810.2	84

Table 2. Monthly Prices of Different Benchmark Crude Oils (1996-2001)

Month	Consumption	OPEC	Non-OPEC	Brent
	m b/d	m b/d	m b/d	$/bbl
Dec-96	40.94	26.64	44.58	24
Jan-97	41.119	26.98	44.68	23.44
Feb-97	41.157	26.93	44.53	20.89
Mar-97	31.096	26.91	44.48	19.08
Apr-97	39.919	27.15	44.54	17.45
May-97	38.305	26.88	44.07	19.06
Jun-97	39.914	26.34	43.95	17.57
Jul-97	40.833	26.59	44.34	18.51
Aug-97	39.86	27.59	44.21	18.63
Sep-97	40.344	27.68	44.7	18.44
Oct-97	41.084	27.77	45.28	19.88
Nov-97	41.603	27.73	45.4	19.15
Dec-97	41.995	27.51	44.95	17.1
Jan-98	44.787	28.12	45.05	15.11
Feb-98	46.156	28.69	45.27	13.95
Mar-98	45.727	28.75	45.04	13.05
Apr-98	43.989	28.32	44.93	13.431
May-98	41.783	28.07	44.47	14.43

colder or warmer-than-expected weather are considered factors contributing to the price developments.

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B. European Union

Regarding the European Union, total SPRs of such countries as Germany and France are taken into the consideration since they hold some 90% of European Union oil stocks. In European Union, SPRs and CPRs have a positive correlation with oil prices but commercial oil products inventories have negative correlation with prices. Commercial oil products inventories' impact emerges with a time lag of two months. In this model, the production index of the world was not meaningful and OPEC's production index proved to be meaningful.

C. Japan-Pacific

Regarding Japan-Pacific, commercial oil products inventories correlate positively with prices while SPRs and CPRs have negative correlation with prices. According to the model, commercial oil products inventories' impacts appear with time lag of three months (a season).

D. Comprehensive Model

Base on the comprehensive model, there is a positive correlation between CPRs and SPRs and oil prices where the impacts of commercial oil products inventories emerge one month after the emergence of SPR's impacts.

Conclusions

Although the relationship between oil stocks and prices in the market is a publicly accepted phenomenon, surveying these two variables in a specific period and in a cause and effect framework requires a careful attention to these variables and market features.

A review of CPRs and SPRs' impacts on the markets during the price crises in 1998 and afterwards demands a careful choice of influential variables. This paper have come to conclude that all types of oil stocks including SPRs and CPRs do impact on oil prices but the degree of impacts depends on the type of inventories (crude or oil products) and other parameters. The impacts also differ in different places and time. However, oil stocks are in turn affected by cyclic and periodic price developments. Among other factors affecting the levels of the inventories, futures markets, market priorities and possibility of stocks replacement are worth mentioning. Moreover, the volume of oil products (stocks and production) has its own specific impacts on the prices. Excess production capacity, futures prices and

were expected to draw down as usual due to the warmer-than-expected weather.

Assessment of Relations between Oil Inventories and Price Variables

Besides impacts on the markets, CPRs and SPRs have also some impacts on each other. A survey of decisions made by the countries holding the inventories shows that the government of these countries entrust private companies with holding minimum required levels of CPRs with the aim of avoiding heavy storage costs. But in emergencies, they get the control over these inventories and in this way they convert them into SPRs. One of the characteristics of the models devised for oil stocks is the correlation between different types of inventories.

On the other hand in studying the inventories, it should be considered that the current level of inventories is related to the previous levels. Therefore, the more the level of previous stocks, the smaller the size of current inventories. It is worth mentioning that there are several unrecognizable factors involved in the issue that are not taken into consideration when econometric models dealing with oil stocks are devised. Therefore in such cases, Arma model, which is able to explain the impact of unrecognizable factors on dependent variables, is used.

In order to estimate the optimum time lag between demand and price variables, it is possible to make use of Akaeek and Schweitzer methods.

To this end, the process of study is divided into two phases: segmental and comprehensive. In the first phase, the impact of oil stocks on different regions is surveyed and in a later phase, oil stocks worldwide are summed up and then the total impact of the summed up inventories is assessed. The interpretation of results will be discussed in the conclusion.

As mentioned earlier, from geographical point of view oil stocks are mainly found in three regions: The United States, European Union and Japan-Pacific.

A. The United States

In this model the correlation between SPRs and prices is positive while the correlation between oil products inventories or CPRs and prices is negative. According to the model, CPRs' impact on the prices emerges with a time lag of two months.

mentioned that the psychology of the market can have great impacts especially when a shortfall in supply is felt in the market. Oil observers studying recent price crisis have considered the production of oil products as a marginal factor however the results from recent studies show that this factor can play a crucial role in this regard. They have also proved that although such impacts are negligible in some other regions, they prove to be considerable in the United States. In Europe, the production of oil products can have different impacts. It should be mentioned that, this is oil products inventories that contributes to the most part of the impacts since it is the gauge of oil products production levels and the capability of the market to cope with probable crises.

Excess Production Capacity

Excess production capacity is regarded one of decisive factors which affects markets psychologically. But it is notable that excess production impacts are expected to emerge in the long run. In longitudinal studies (minimum 10 years), the impacts of excess capacity is considerable but they are not so dramatic in the short run since creation of spare production capacity is a time consuming task and average time for doing so is estimated at 3 to 4 years.

Futures Prices

There is a correlation between Contango/Backwardation markets and market's expectations of future prices. Market expectations are reflected as futures prices and regarding speculations. Futures prices and speculations can have impacts on the levels of inventories. Traders' transactions in late 1998 led oil prices to stand 1 $/bbl higher than the previous year. Throughout 1996 and 1997, oil prices were hovering above 18 $/bbl while the US futures market prices were between 19 $/bbl to 20$/bbl. The futures market transactions led oil prices to remain at 19 $/bbl until the end of December and the decline of futures prices caused physical prices to fall to 16.5 $/bbl in the middle of March 2001.

Colder or Warmer-than-Expected Seasons

Colder-than-expected weather is usually accompanied by a rise of demand for heating oil and heavy crude oils. This seasonal demand is accepted as a presumption. When such a demand is not materialized, supply will outstrip the demand in the market. Global markets' supply and demand statistics show that in winter 2001the global oil products inventories grew instead they

answer this question, such other questions should be answered as: What is the relationship between the inventories and oil prices? Is this relationship reciprocal or not? Are the inventories affected by oil prices or there are other factors affecting them?

One way to study the issue is to run an econometric model and estimate the relationship between the variables theoretically. Then the relationship is examined to determine the degree of impacts by each variable. Although there may be a large number of models made to this end, a few have been published. Most of the studies in this regard lack econometric models and they often studied the impacts of the inventories on the market rather than the crisis itself. Moreover, even such studies are very rare. The reason is somehow clear because the inventories act contrary to the market and they play important role in causing or aggravating the crises. Besides, most of the studies on oil market is done or sponsored by the consuming countries which in turn discourage others to carry out similar studies.

Impacts of Previous Price Developments on Current Prices

Previous prices can have impacts on the current oil prices since there is a cyclic and psychological correlation between their previous and current developments. In a normal market, or in better terms a backwardation market, the consumers are encouraged to release their inventories to minimize their storage costs. On the contrary, when the situations in the market are indicative of being contango, the consuming countries are willing to build up their stock where the oil prices are affected in this way. Let alone external phenomena like weather conditions and political developments, there are two main factors affecting oil prices:

1. supply/demand balance
2. developments of oil stock levels

It is clear that these two factors are interdependent and many oil observers believe that it is possible to stabilize oil prices in the market through running balance between supply and demand.

Oil Products (Production and stocks Levels)

Despite the emphasis put on crude oil inventories, oil products inventories play a decisive role in maintaining balance in oil market and prices. Oil products inventories and production are a palpable part of the market that can have considerable psychological impacts on the market. It should also be

inventories to optimize the benefits they can get from the falling oil prices or they would like to fill their stocks with cheaper oil. This is the case when the consuming countries believe that declining demand is transient and does not last for so long. In other words, the consuming countries prefer their long term interests (security of energy supply) to the short term benefits (cheap oil). Similar situation can occur when prices are rising when the consuming countries are worrying about skyrocketing prices.

Inventories and Consumption Priorities

Sometimes, market's priorities turn to a specific crude oil, for example light crude. This leads to a shortage of that specific crude in the market while other crude oils are supplied sufficiently. Therefore, it is possible that either other crude oils are stored in the inventories or oil prices increase and some times it is probable that the both happen simultaneously. The same thing happened to the United States when the country was in urgent need of light oil since new environment standards obliged the US refineries to do some mandatory alterations to gasoline formula. Such being the case, there was an assumption that there was a need to more oil production so OPEC started increasing its production mainly consisted of heavy or sour crude oils. This led to crude and oil products stocks build up then. Market priorities can have serious impacts on the markets where demand developments for oil products can have different impacts on the market. For example in the US market, gasoline should be available at terminals on 1 May so that the retailer can sell it as of 1 June. Small size of inventories has increased the pertinent risks in some areas.

Considering the US gasoline inventories, it is clear that the United States have played a considerable role in holding such inventories in the world. For example, In March 1998, the US gasoline stock was more than 328.53 out of total oil products inventories of 435 million barrels while in June 1999; it reached 223.95 million barrels out of total oil products stock of 400.21 million barrels. In the meantime, total OECD oil products inventories (including gasoline) was 1262 million barrels in the previous month. This indicates that the United States hold a loin's share of the global gasoline market so and shortfall in this country can affect the global markets severly.

Impacts of CPRs and SPRs on Oil Prices Crises

A question always arises in studying the last oil price crisis in the second millennium that to what extent SPRs have helped the crisis to last. To

national interests, the only remaining tool to control the market by the consuming countries is SPRs. This is important to recognize the relationship between the inventories and oil prices. Of course it is true that the inventories can replace the supply but whenever the inventories are released it is not concluded that supply is outstripped by demand. In 2001, a release of the US inventories led to a sharp fall of oil prices where players were convinced by the dominant interpretation that the draw down is a result of scarcity. But it was not true. The point here is that the negative demand for stock build up is by no means translated into supply shortfall. There are several factors playing influential and decisive role in such an interaction:

1. supply and demand
2. stock draw downs
3. stock build ups
4. inventories and consumption priorities
5. impacts of CPRs and SPRs on price crises
6. impacts of previous price developments on current prices
7. oil products (production and stocks levels)
8. excess production capacity
9. futures prices
10. colder or warmer-than-expected Weather

Supply and Demand

It is more reasonable to study inventories and their changes during the period of rising prices than during falling global demand. The performance of the inventories during crises is influential from different aspects. In other words, demand can decline even when the prices are falling as well and vice versa.

Stock Draw Downs

When demand declines and consequently oil prices start falling, oil consuming countries are willing to release the inventories to lower the prices further. On the other hand, it is possible that the decline in demand for oil has been overestimated and inventories have replaced the supply in meeting the demand. In other words, the inventories can act as a tool exclusively controlled by the consuming countries.

Stock Build Ups

When a decline in the global demand for oil is underestimated, oil consuming countries may be willing to divert a part of excess supply to their

Futures Markets and SPRs

Formation of futures markets was complementary to oil markets since there is no need to hold SPRs with the presence of such markets. However, since SPRs pursue their own goals which are far beyond the realm of futures markets, at least in theory their presence is still justifiable. In fact, in emergencies where SPRs are able to provide the consumers with cheap oil to prevent the negative impacts on their macro economies while futures markets are far from being useful. Energy consuming countries can only hedge themselves by transacting in futures markets. SPEs also can help countries control oil prices that is, consuming countries can strengthen the markets by purchasing oil while prices are falling and when the prices are strong enough they can sell it back to the market. But futures markets can not do so.

One of the most crucial and meanwhile reasonable roles played by futures market is their impacts on oil inventories. Regarding reciprocal relationship there are two dominant theories:

1. Stock draw downs give rise to Backwardation markets
2. Backwardation markets lead to stock draw downs

Although the abovementioned theories can support each other, they can not be true simultaneously. These theories describe the way each parameter impact on the other but the way the impacts work is as follows: According to the first theory, stock drawdown is a sign of oil scarcity in the market so it leads to rising spot prices and over time the correlation between stocks and prices becomes weaker.

The second theory does not refute the first one but it claims when futures prices are lower than spot prices, holding oil stocks fail to be economical since market situation is indicative of falling prices. Under such conditions, companies try to reduce their oil stocks. As a matter of fact, there is no reasonable justification for either theory.

Impacts of Inventories on Prices

In carrying out an analysis, inventories' impacts are considered a decisive factor along with two traditional factors namely supply and demand. Some believe that we should wait and let such factors as supply and demand as well as stock levels form an ultimate balance. Since supply is sometimes able to be replaced by the inventories, this substitution ability helps the inventories to act as a moderator in the markets. Suppose that all oil producing countries are independent nations trying to safeguard their

further cut to production while they had agreed to cut production in earlier meeting (106th OPEC Meeting) held on 26-26 November in Vienna.

In the 109th OPEC Meeting held in Vienna on 27-29 March 2000, 9 OPEC members decided to increase their production which was in sharp contrast to their previous decisions. Despite the fact that Iran objected to this decision and eventually refrained from signing it, other members agreed to increase OPEC production by 1.461 m b/d (2.9%) to 21.059 m b/d as of April 2000. On 21 June 2000, OPEC ministers agreed on a further rise in their production as of July. In the meantime, oil stocks were on the rise too. The US CPR built up by 2 million barrels to 285 million barrels. Although compared to 1998 and 1999, the US and European countries oil inventories drew by 80 million barrels, their oil stocks were only 20 million barrels less than the stocks in 1997. In September, oil stocks increased to the extent that the release of oil products inventories rose by 8% compared to the previous year. More importantly, the United States decided to release 30 million barrels of its SPRs within a month. The country delivered the oil to the applicant companies to pay back the delivered oil along with the interest in following 6 months.

In the106th OPEC Meeting, members agreed to increase their production by 807,000 b/d as of July. In the meeting, members also agreed to cut their production by 50,000 b/d if necessary. In the 109th OPEC Meeting, price band mechanism was introduced and a cut/rise of 500,000 b/d in members' production was envisioned. OPEC members decided to increase their production by 800,000 b/d as of 1 October 2000 in the 111th OPEC Meeting in Vienna on 9-11 September 2000.

The 113th OPEC Meeting is more important since the members had encountered an excess supply of 3.74 m b/d due to 4 consecutive phases of production increase by that time. In 2000, average oil stocks build up was 900,000 barrels. The 114th OPEC Meeting was held in March 2001 when oil prices were declining. In the meeting, the members agreed on a million barrels per day cut. Decreased oil demand was known the main reason contributing to the falling oil prices. In March, oil demand by Asian countries fell by 1 m b/d. In the 115th OPEC Meeting held 4-5 May 2001, members put emphasis on the previously held policies where OPEC 10 production was announced 24.758 m b/d in May. In 117th OPEC Meeting held on 27 September in Vienna, member states decided again to maintain their previous production level.

sole reason? Although it is not easy to separate the impacts of supply and demand on the markets, it is possible to analyze the developments of each sector without passing any judgment.

Declining oil prices since 1996 occurred in two phases. In the first phase, oil prices fell by 5 to 6 dollars per barrel. In the spring of 1997, oil prices were fluctuating between 17 $/bbl to 21 $/bbl. The fluctuation of demand for oil also played an important role in this regard. In 1996 and 1997, demand growth was 2.4% while in 1998; the demand grew only by 6%. OPEC experienced the price rise of 20% in 1996 and increase in production by 1.3 million b/d in 1997 so that in 1996, OPEC oil revenue increased to $150 billion from previous $125 billion. In 1998, the global demand for oil dropped suddenly. OPEC could not prevent a decline of 34% in oil prices even by production cuts in two consecutive phases and its oil revenues decreased to $50 billion.

Changes in Supply Side

Although OPEC's share in the global oil supply is less than 50%, the organization has entered the market pursuing clearly defined objectives. So, any change in OPEC's announced plans and probable support from non-OPEC producers are worth considering.

Changes in the supply side started from the 103rd Meeting of OPEC in Jakarta while in the 102nd Meeting observing the quotas by the member states was only addressed. In this meeting where the concerns were lingering on sharp plummeting oil prices, members decided to extend the production at 25.033 million b/d for two ending seasons of 1997.

OPEC ministers attend the 103rd OPEC Meeting from 26 November to 1 December 1997 in Jakarta. The meeting was held when there were worries lingering on Iraq's disrupted oil supply and colder than expected winter caused a rise in demand in the first half of 1997. Global oil demand in 1Q was 73.92 m b/d while the demand in 4Q grew to 75.11 m b/d. An OPEC extraordinary meeting was held on 30 March 1998 in Vienna to address the falling prices. Although it was widely believed that such factors as warmer than expected winter and a financial crisis in the South East Asia mainly contributed to falling prices, crude oil excess supply was actually the main reason. Eight days earlier that is, 22 March, Saudi Arabia, Venezuela and Mexico had reached an agreement on a production cut of 600,000 b/d in Riyadh. OPEC ministers in a meeting held in March 1999 agreed on a

products gives rise to considerable value added. And, oil history has been filled with conflicts and fights. Therefore, we can consider oil the most political commodity.

One crucial characteristic can be this: In oil market, a supplier can be a customer at the same time. Futures contracts, CPRs and SPRs have enabled the consuming countries to supply oil when disruptions arise. Therefore, they have gained the control over prices.

Oil prices used to be set in the Gulf of Mexico and New York until 1945. The price of a barrel of oil comprised the costs of shipment and the price of oil. In 1871, drilling operations started in Baku and in 1883 Baku-Batum railway was completed. As a result, pricing mechanism had to change. Arab-Israel war in 6 October 1973 intensified the change and OPEC, then, introduced the reference price and kept the rein on the market. Before the introduction of net back pricing mechanism by Saudi Arabia, oil market transactions were done based on the government sales prices. In January 1987, OPEC eventually adopted basket and reference prices. Mathematical combination of spot prices of crude oil of the countries such as Algeria, Indonesia, Nigeria, the UAE and Venezuela as OPEC members and a non-OPEC member namely, Mexico gave rise to OPEC's basket price which is considered a turning point in oil market.

Since 1986, oil prices have been determined by market mechanisms. This method known as market-related pricing formula was introduced by Mexico. In 1980's and after the oil shock of 1979, highly industrialized countries decided to establish a market parallel to oil market to alleviate the impacts of the oil shocks on their economies. This parallel market is known as oil paper markets.

Thirteen years after the time OPEC stopped oil pricing, once again the organization intervened in the pricing mechanism to cope with the recent oil price crisis. To this end, OPEC introduced a price band and officially declared that if the price exceeded the band it would bring it back to the band by controlling its production.

Supply and Demand Developments and OPEC Decisions to Adjust the Prices (1997- October 2001)

Recognition of the reasons contributing to the crisis is very important. The crisis, as mentioned earlier, forced OPEC to control oil pricing mechanism actively again. There is almost a consensus on the coincidence of the crisis and decreased economic growth in major consuming countries. But was it a

supply/demand balance, attempt to put pressure on the supply side. But the United States' unilateral measures during the Persian Gulf second war, which were discordant to the IEA Treaty, revealed that the organization's supervisory plan in emergencies is inefficient.

Geographical Distribution of Oil Stocks

One of the most crucial points regarding oil stocks is their geographical distribution. In other words, the location of the inventories contributes to a great extent to their impacts on the markets. The impacts of an oil stock in the United States is much more than that of similar stock in Europe or Japan since the distance between the markets and inventories and the degree of independence in the process of decision making matters here.

Despite the fact that oil stocks have decreased compared with total daily consumption, the sheer size of the inventories has increased 18.9 times ever since. It is believed that the inventories hold by these countries is equal to 27.23 days of their consumption. In fact the aforementioned lead time for inventories is calculated through dividing the amount of oil at stocks by the daily consumption of these countries ceteris paribus. At the present time, inventories are mainly found in three regions of the world that are known as oil stocks hubs:

1. The United States
2. European Union
3. Japan-Pacific

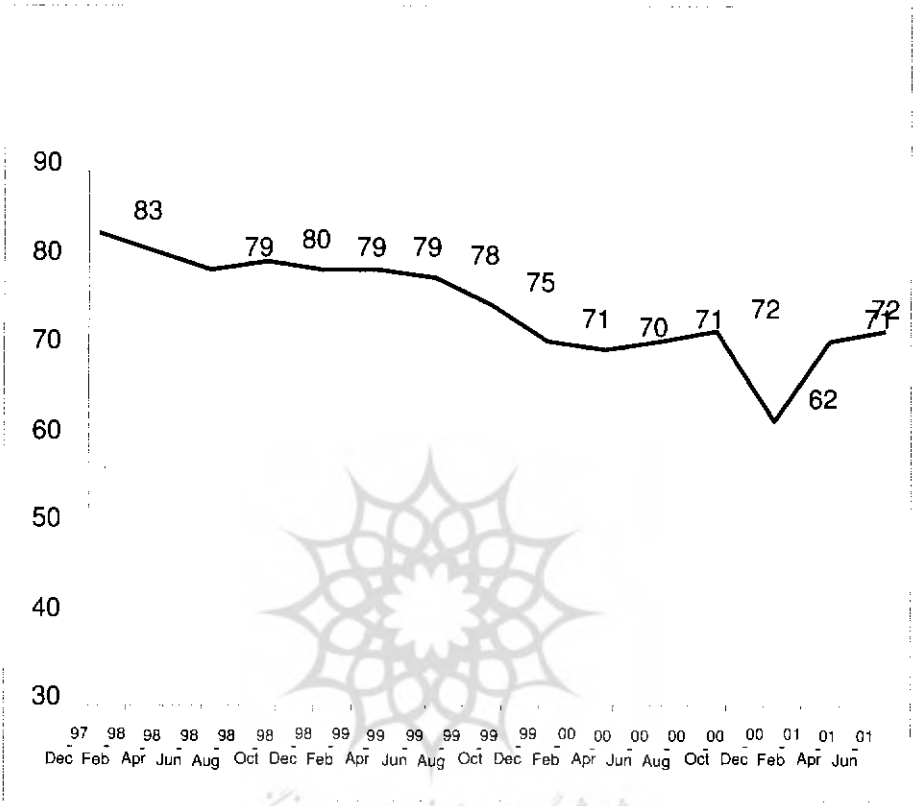
In fact, OECD inventories are the most influential stocks in the market and this organization controls all the impacts on oil market. In other parts of the world such as South America (mainly Brazil and Argentina) and Africa (mainly South Africa) oil inventories are of less size and importance.

Pricing Impact on the Market

When it comes to oil and oil prices, understanding the general set up, existing limitations, needs and capabilities is of much importance. To do so, the impacts of each variable on oil prices and the reaction of each parameter should be well analyzed so that the model can be clearly defined and the relationship between the variables is recognized. For example, is a time lag of one to three months reasonable for a variable?

Oil is a commodity with the following characteristics: Oil production requires considerable investments. Consumption occurs long after the production. Players are playing for high stakes. Converting crude to oil

Figure 4. Oil Stocks Lead Time in European Union



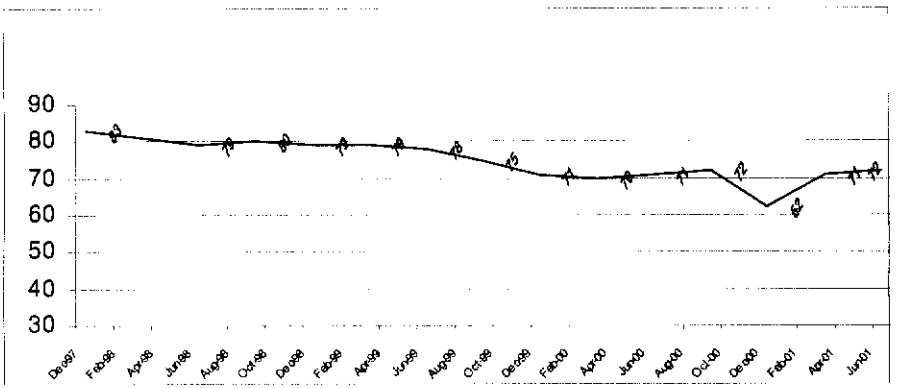
Source: IEA: Oil Market Report

Oil Stocks Management

There are two ways of managing oil stocks based on the type of the stocks. When the stocks are made to pursue strategic goals, the management is done in as a part of policies adopted. But if the stocks are not strategic, such factors as cost-effectiveness and market management should be taken into consideration.

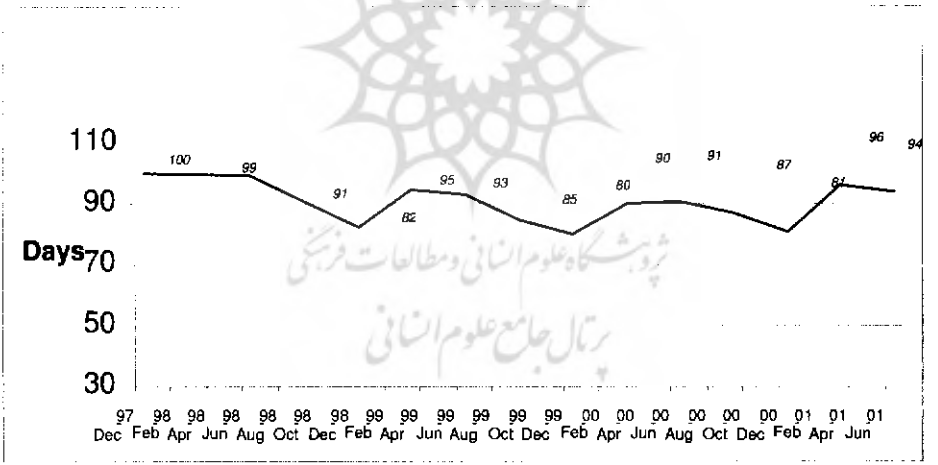
By 1993, non-strategic oil stocks were managed base on opportunity costs. That is, companies held oil stocks considering the consumption rate in the market and costs of holding such stocks and criteria like profitability was considered through decision makings. The period since 1973 can be divided into two consecutive eras: Before and after 1993. The 1993 crisis indicated that oil consumers, as a dominant factor in the market contributing to the

Figure 2. Oil Stocks Lead Time in the United States



Source: IEA: Oil Market Report

Figure 3. Oil Stocks Lead Time in Japan



Source: IEA: Oil Market Report

impacts of disruptions to oil supply due to political, economic and/or technical reasons.

Member states create SPRs in three ways:

1. Creating emergency stocks owned and managed by governments

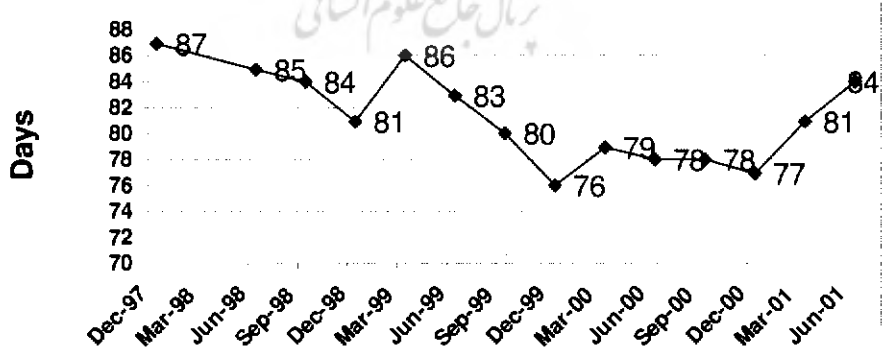
2. Assigning a mandatory minimum levels of oil inventories for oil companies and private sector

3. Establishing public institutes to maintain and manage the inventories.

IEA is responsible for the management of inventories and member states have agreed that IEA should decide on the when and how of the release of such reserves. According to IEA treaty, member states had to initially hold oil stocks equivalent to 60 days of their prior year's net imports. A supervisory committee was established in this regard and in 1980, the lead time increase to 90 days.

As the economy of the member states grew and the consumption was on the rise, the costs of maintaining the lead time were to mount. Figures 1, 2, 3 and 4 show that over years, the lead time differs in different regions. For example, in 1975 it was possible to meet the demand for oil for 90 days by storing 700 thousand barrels of oil but in 1995, an oil stock of 3,733.5 million barrels to cover only 79.1 days. In 1998, the size of oil stocks reached 3,963.4 million barrels enough for 81.8 days.

Figure 1. IEA Treaty Lead Time (days)



Source: IEA: Oil Market Report

stocks to keep its operations on stream in the time of unexpected happenings. Primary inventories mainly contain crude oil and they are usually found in refineries and crude oil loading terminals.

Secondary inventories are mainly used by markets and they contain oil products. They are often found in the neighborhood of the markets and divided into two mandatory and seasonal groups, each of which has its own specific usage.

2. Commercial Petroleum Reserves (CPRs)

Any oil market observer investigating supply and demand in oil market encounters two basic questions: First, Where does the excess supply go? And, second, how is the excess demand satisfied? Asking these two questions indicates that a supply and demand mechanism in oil market is inefficient when there is no moderator. This moderator is called Commercial Petroleum Reserves or CPRs. In fact, when decreased demand leads the process to fall, some excess oil supply is purchased and when demand outstrips the supply leading to higher prices the stored oil is released.

It is worth mentioning that CPRs are not simply seeking profit making but they are devised to relieve the heated oil market. Stock build up is done when the costs of purchasing and storing are lower than the current crude oil prices.

3. Strategic Petroleum Reserves (SPRs)

SPRs are the most modern inventories in oil market and they were innovated long after the introduction of CPRs and mandatory inventories. Contrary to other inventories, SPRs' goal is to help the consumers control the market. Eversince, the goal of SPRs has changed slightly but they have never lost their impacts on the markets. As a matter of fact, highly industrialized countries have created them to materialize an acceptable security margin for themselves.

In 1912, the US navy started to build four oil storage tanks to meet its need during the war. In 1916, Germany, similarly, attempted to store some oil in its underground storages. However, OECD members took more serious measures to this end by establishing the International Energy Agency (IEA) in 1974. There was a general consensus on creating a strategic petroleum reserve as a preemptive tool to cope with any disruptions to oil supply. SPRs were actually founded in 1975 with the aim of diminishing the negative

are efficient or not. The inventories' impact on the markets is determined by such factors as their category, location of inventories, and the time of launching strategic or commercial stocks to the market.

Inventories, based on their contents (crude or product) and the specific shortage in the market are released. The commercial or strategic inventories can be released at initial, middle and final stages.

Types of Inventories

Based on the objective they pursue, inventories are of different size, that is to say, the goal of stock build up determines their impact on the market. For example, when a thousand barrels of crude oil or oil product is built up for strategic purposes it can have specific impacts completely different from those of the commercial stock of the same size. Every country may create inventories due do some specific reasons and these reasons determine the when and how of the impacts on the market.

Besides the type of inventories, it is very important who has created the inventories. Inventories are normally created by both producing and consuming countries.

A specific type of inventory which usually lies in obscurity is a transient inventory created by producing countries in the vicinity of oil markets. Transient inventories do have little impacts on the market due to their limited size and number and they only help the producing countries react rapidly to the demand fluctuations. Saudi Arabia as the biggest producing country stores a sizeable amount of transient inventories.
Another type of inventory is created by the consumers that have remarkable impacts of the markets.

Inventories are classified based on three criteria as follows:

Firstly, their ownership (government, private or public)

Secondly, their content (crude, mid-distillates, product, etc)

Thirdly, their goals (operational, strategic and commercial)

It is not possible to determine the impacts of the inventories on oil market using the firs and second criteria. Thus the third criterion seems to be convenient to this end.

1. Operational Inventories

Operational inventories put into practice since the birth of oil industry in the world are considered the oldest ways of storing crude oil and oil products. Each refining or distribution unit in the downstream sector needs operational

• How is the management of inventories carried out? And what is their geographical distribution?

• How do the inventories interact with futures market?

• What is the real impact of different types of inventories on prices in different regions?

The Impacts of SPRs and CPRs on oil market

A fall of crude oil prices in 1998 and afterwards was considered a serious price crisis by oil producing countries. Although such factors as the crisis in the South Asia, decreased global economic growth and increased OPEC oil production are believed to contribute to this crisis, a few people raised a question why the crisis took a long time of three years and the market failed to experience stable prices in this period. It is notable that at the beginning stage of the crisis, a decrease in oil production by OPEC and non-OPEC producers failed to buoy up the prices. In later stages, when it was broadly believed that any change in production levels can change the trend, increased oil production could not pin up falling prices either.

When OPEC, in order to stop falling oil prices, reduced its production in two phases, oil prices did not increase, rather they fall more rapidly to 10 $/bbl. In contrast, oil prices kept on falling when OPEC increased its production through four phases.

When there is no moderator in the market, it is not possible to analyze the situation but when a moderator is recognizable in the market then the correlation between price and production is to some extent able to be analyzed.

The performance of the inventories can give rise to inefficient mechanism of supply and demand and its negative impacts on the market. On the other hand, under normal conditions, the rise of prices as one the most influential factor in determining the size of the inventories can lead to the release of the inventories (as much as permitted). This normalcy is subject to the market conditions and there is no a general rule in this regard. In fact, the reciprocal impacts of the prices and strategic and commercial stocks should be examined. Although the issue seems to be easy in theory, understanding the nature and depth of impacts are a difficult task in reality.

Performance of Inventories in the Market

The performance of the inventories in the market determines their category. In other words, the inventories' scope of impacts determines whether they

producing countries is by no means enough and in the time of crises, an additional security margin is needed. The security margin can be materialized through oil stock build ups, investment of oil producing countries in oil industries of consuming nations, ability to shift from oil to other fuels, energy saving and alternative forms of energy. During the" International Energy Security" conference held in 1988 on the US and its allies' security of energy supply, Herington, Secretary of the US Department of Energy promulgated: "the US reliance on OPEC crude has fallen since we have diversified our energy resources and despite the US economy has grown by one third, our energy consumption is still equal to our previous consumption in a decade".

One of the mechanisms to materialize the security margin was establishing crude and oil products inventories because building crude and oil products storage facilities was relatively inexpensive and it was more reliable than other ways.

Inventories can fill the gap between supply and demand on one hand and on the other hand, they can intensify oil price developments in the global markets under different conditions.

Inventories were initially established with the aim of providing security of supply for highly industrialized countries and they proved to be efficient and reliable but over the years, the mission of these inventories transformed from a stabilizing factor into a determining factor.

In fact, not only such market fundamentals as supply and demand have impacts on the size of inventories but also contango and backwardation situations in the market send signals to change the size of inventories. The inventories as a sign of the presence of stability or instability in the market can in turn, determine the future prices.

Considering just-in-time management methods, it is clear that the inventories performance is to the advantage of their owners rather than to the security of the market. In other words, the inventories have created a rival for OPEC and other non-OPEC oil producing countries in the market that can hamstring their production potency.

A survey of CPRs and SPRs impacts during 1998 crisis and afterwards requires answering some questions as follows:

- What are the impacts on the prices and markets?
- What are the different types of inventories and their specific impacts?

(SPRs) on the global oil prices in three regions namely the United States, the European Union and Japan-Pacific. In surveying the markets and understanding the fundamentals, OPEC's decisions were considered a determining factor. A historical trend of Market developments in terms of inventories was surveyed from the eve of OPEC meeting in Jakarta to the organization's later meeting in November 2001. And the results were evaluated by means of econometric models. In these IS-Arma models, the impacts of each variable on oil prices are dealt with in the period of December 1996 to November 2001 using time lag theoretical principles. Moreover, the paper tries to answer the question how and to what extent these variables affect the prices.

Keywords: *Reserves, operational inventories, Commercial Petroleum Reserves (CPR), seasonal inventories, Strategic Petroleum Reserves (SPR).*

Introduction

Oil, the most important source of providing energy for the world's industry, is considered the most political and strategic commodity. Needless to say that oil matters for the global economy. For example, oil price crisis in 1978 contributed to a dramatic fall of Japan's economic growth. Historically, oil market is vulnerable to price crises. By definition, any instability in oil market is regarded as a price crisis manifested in the form of a sudden and unexpected fall or jump of oil prices in the market.

Oil consuming countries, especially highly industrialized ones, attempt to hedge their economy against price fluctuations in oil market. As long as they had a hand in oil supply, they could easily hedge themselves but as soon as host countries started to go-it- alone they could not avoid the fluctuations any longer. So the security of energy supply turned out to be a meaningful term for them. Generally speaking security of energy supply for the global industry is defined as: ensured accessibility to the needed energy at relatively low prices where the ways of obtaining it do not put the national interests at jeopardy.

During such oil crises as 1973 Arabs oil embargo and Islamic revolution in 1979, the global markets were damaged to a great extent due to a lack of excess oil production capacity in the world,. Therefore, oil consuming countries realized that excess production capacity provided by

Commercial and Strategic Petroleum Reserves Impacts On Price Crises in 1998-2001

Abstract

Oil inventories held by major consuming countries and OECD members in particular during the price crises (not price fluctuations) in 1998 and afterwards, are one of the main issues that have drawn the attention of policy makers and market observers. The 1998 crisis was the last oil price crisis in the 20th century that was offset to some extent in ending months of 2001. In this paper, oil inventories fall into three categories as operational (seasonal and mandatory), commercial and strategic reserves. Operational inventories including crude oil and oil products are subject to the industry's conditions rather than market conditions and are used to control the prices. However, strategic and commercial crude oil and oil products reserves (SPR & CPR) are actively sensitive to the market conditions and any change in their volume can have dramatic impacts on the prices. This paper shows that the impacts of the inventories on oil prices differ in different parts of the world considering the consumption rate, distance and type of the inventories (crude or oil products). Moreover, the prices are sensitive to such factors as security of energy supply. To this end, the author at first examined the impact of Commercial Petroleum Reserves (CPRs) and Strategic Petroleum Reserves

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