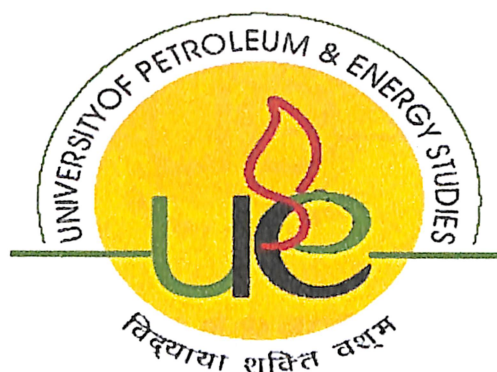


# PRICE AND TREND ANALYSIS OF CRUDE OIL AND GOLD



A  
DISSERTATION REPORT

*Submitted by*

**JAYDEEP DEB**

*in partial fulfillment for the award of the degree*

*Of*

**M.S (OIL TRADING)**

*Under the guidance*

*Of*

**Prof. Sharad Goel**

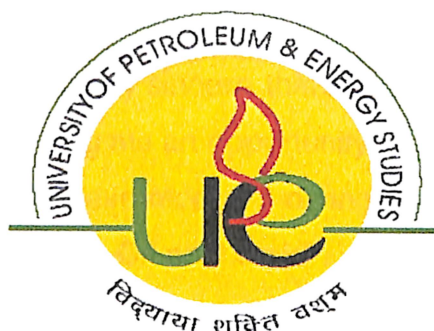
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**GURGAON**

# UNIVERSITY OF PETROLEUM AND ENERGY STUDIES



## DECLARATION

This is to certify that the dissertation report on "*PRICE AND TREND ANALYSIS OF CRUDE OIL AND GOLD*", submitted to University of Petroleum & Energy Studies, Gurgaon, by **Jaydeep Deb**, in partial fulfillment of the requirement for the award of degree of **M.S (OIL TRADING)** is a bonafide work carried out by him under my supervision and guidance. This work has not been submitted anywhere else for any other degree. The work was carried during December 2006 to April 2007.

**Prof. Sharad Goel**

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Finally I thank **God, the Almighty,** for protecting and giving me the courage to overcome the difficulties while at work.

  
**JAYDEEP DEB**  
**M.S (OIL TRADING)**

## *Abstract*

*Firstly what we did in our research is that is that we gave a small introduction of the topic and then we mentioned what is the need and objective of this study and then we elaborated our research methodology.*

*The next thing which we showed is the literature review where we showed some of the past work done on this topic.*

*Then we studied the prices of gold and crude oil for the 40 years period and tried to analysis and interpret it. We also studied about the oil, gold and inflation connection and also about gold-oil ratio.*

*Then we gave our findings and suggestion where we said that there is a very positive relationship between gold and crude oil and also gave some important findings about the gold-oil ratio.*

*Finally we gave the conclusion, where we said that the prices of both gold and crude oil are on the bullish side and sited the fundamentals of both gold and crude oil.*

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## Chapter 1

### 1.1 Introduction

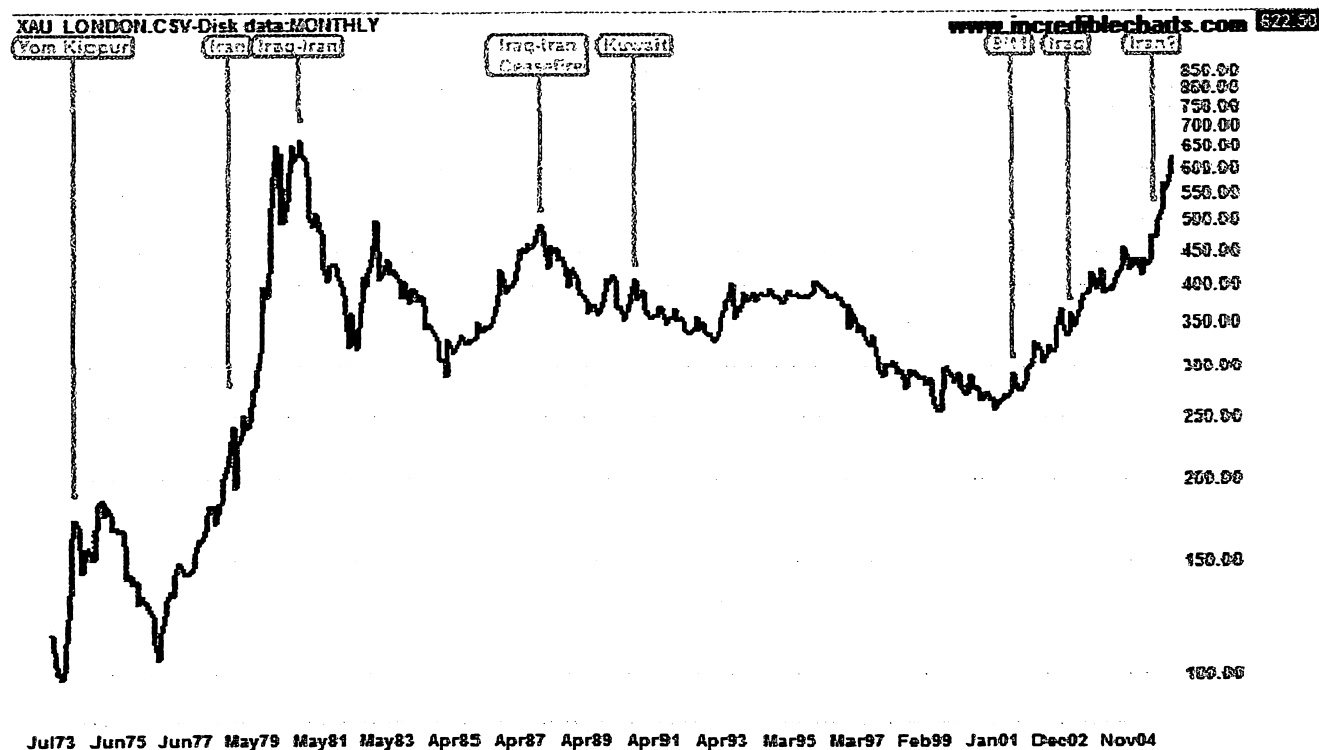
**Gold** is a chemical element with the symbol Au (from the Latin aurum) and atomic number 79. It is a highly sought-after precious metal which, for many centuries, has been used as money, a store of value and in jewelry. It is a dense, soft, shiny, yellow metal, and is the most malleable and ductile of the known metals.

**Crude oil** is a naturally occurring liquid found in formations in the Earth consisting of a complex mixture of hydrocarbons (mostly alkanes) of various lengths. The approximate length range is C<sub>5</sub>H<sub>12</sub> to C<sub>18</sub>H<sub>38</sub>. Any shorter hydrocarbons are considered natural gas or natural gas liquids, while longer hydrocarbon chains are more solid, and the longest chains are coal. In its naturally occurring form, it may contain other nonmetallic elements such as sulfur, oxygen, and nitrogen. It is usually black or dark brown (although it may be yellowish or even greenish) but varies greatly in appearance, depending on its composition.

**Gold and Crude Oil prices** tend to rise and fall in symmetry with one another. There are mainly two reasons for this:

- Historically, oil purchases were paid for in gold. Even today, a sizable percentage of oil revenue ends up invested in gold. As oil prices rise, much of the increased revenue is invested as it is surplus to current needs -- and much of this surplus is invested in gold or other hard assets.
- Rising oil prices place upward pressure on inflation. This enhances the appeal of gold because it acts as an inflation hedge.

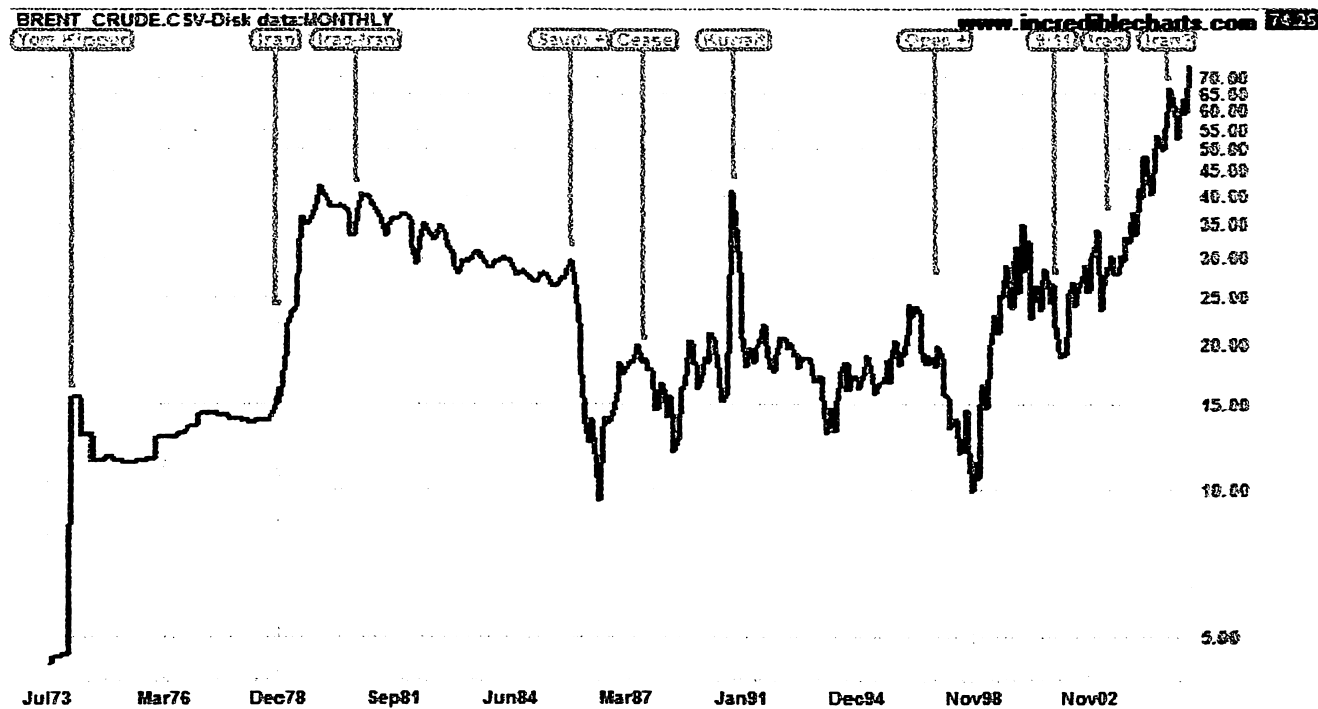
**Gold Price History:** The chart below starts with the Yom Kippur war between Israel and its neighbors in 1973 -- and the resulting Arab oil embargo when crude oil rocketed from \$3 to \$12/barrel. This was followed by the 1978 revolution in Iran and the Iran-Iraq war in 1980 which lasted until 1988. Iraq then invaded Kuwait in 1990, but the ensuing Gulf War had a limited effect on gold prices.



Data Source: Global Financial Data

Gold went into a decline until awakened from its slumber on September 11, 2001. The invasion of Iraq followed in 2003, initiating a strong up-trend, and prices have lately spurred even higher as tensions escalate over Iran's nuclear program.

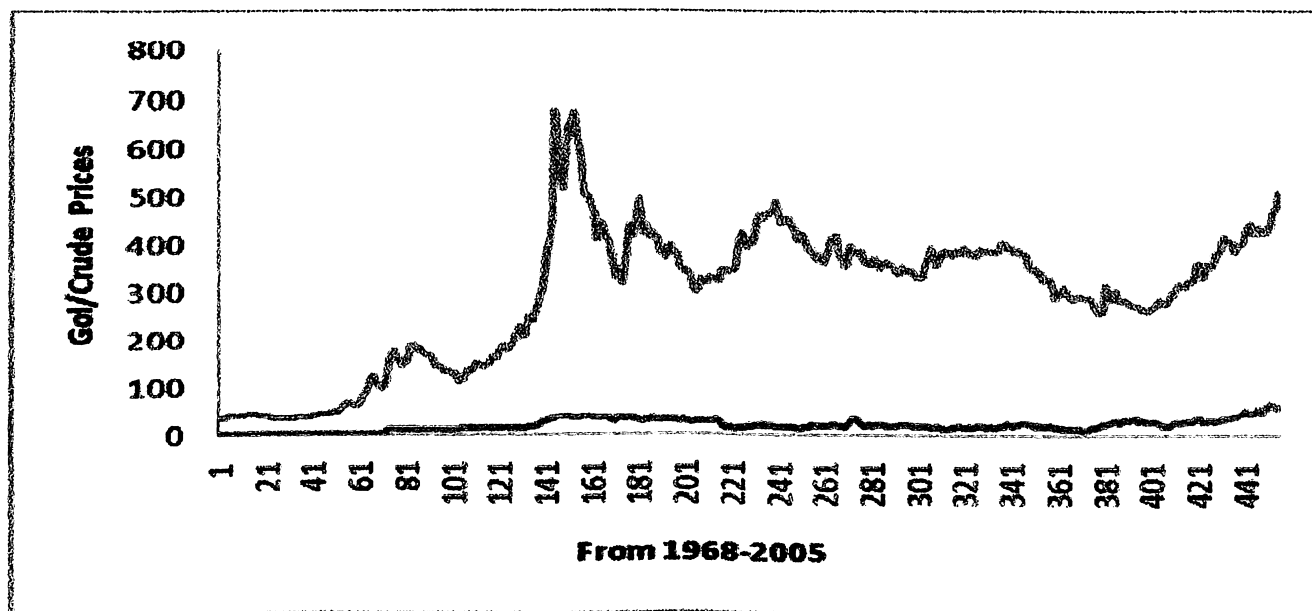
**Crude Oil Price History :** Yom Kippur started a huge spike in oil prices with the Arab oil embargo in 1973. This was followed by another spike in 1978 at the time of the Iranian revolution, culminating with the subsequent invasion by Iraq and the start of the Iraq-Iran war. The Saudis substantially increased production in 1985 and the Iraq-Iran ceasefire further eased shortages in 1988. The invasion of Kuwait and ensuing Gulf war caused a brief spike in 1990, but a relatively stable period then followed -- until 1998 when OPEC increased production while demand was falling due to the Asian financial crisis, causing a slump in prices. Subsequent production cuts saw price recover, before September 11 and the 2003 invasion of Iraq heightened fears of further shortages.



Data Source: Global Financial Data

We need to bear in mind that the above prices are not adjusted for inflation. In today's dollars, oil traded at close to \$100/barrel and gold above \$2000 during the 1980 crisis.

Shown below are the prices of both gold and crude oil put together in a graph:



So, for the above mentioned reasons we would like to analysis the price and trend of crude oil and gold. We think that there is a very positive relationship between the two. So we would like to study this topic to find out the above mentioned relationship and see whether it actually exists or not.

## 1.2 Need of the Study

There is a great need of this study. Understanding the price movements of both gold and crude oil will be of great help to the market players especially for traders, investors etc. Finding out, if there is any relationship between crude oil prices and gold prices will also be of great help as because if we can develop a relationship then we can predict, which way both the commodities will move. Application of this study will also help the financial analysts; business forecasters etc by making them take appropriate strategic trading decisions.

## 1.3 Objective of the Study

- To analysis the trends and correlation between gold and crude oil prices.
- To find out relationship between gold prices, crude oil prices and inflation.
- To study and analysis the Gold-Crude Oil Ratio.
- To design an optimal hedging strategy for minimizing the price risk.
- To provide a platform for Commodity Portfolio Management.

## 1.4 Research Methodology

Here mainly quantitative approach has been used rather than qualitative. We analyzed the crude oil and gold prices from the year 1968 to 2005 and tried to see how they moved. Analyzing 40 years of crude oil and gold prices at one go was not as easy as there are many fundamental factors which are present there. So what we did is that is that, we divided the 40 years period in the following years: (From 1968-1970), (From 1971-1980), (From 1981-1990), (From 1991-2000), (From 2001-2005) and tried to study these years separately.

The quantitative method that we used is that of the correlation analysis .As said earlier that, we divided the prices of crude and gold in those mentioned years, we will now try to find the correlations of the above mentioned years.

Also we will analysis the fundamentals of each of these above mentioned years.

The next thing which we will consider is that we will look for the relationship between crude oil, gold and inflation. Although there is not much data available but still we will try to find some results with the help of the qualitative data present.

Another thing that we will look into is that of the Gold–Oil Ratio. We will first introduce the concept and then started doing some analysis on the Gold –Oil Ratio which can give us some excellent insight. We will also analyze the Gold –Oil Ratio from the year 1968 to 2005.Also we would like to develop a Gold-Crude Oil ratio contract.

Another thing which we think of doing is that, how to trade this Gold –Oil Ratio. Here we will like to show, how the investors can use different types of strategies to lock in the profits and losses. Here we made an assumption that the Gold-Crude Oil Ratio will be traded in futures and options in the exchanges in the near future.

So from the above we find that both qualitative and quantitative approach will be used in this research. We will mainly use the secondary data which will be easily available from the internet, books, articles, journals etc.So this is the methodology which we will follow for conducting this research.

## Chapter 2

### Literature Review

**Adam Hamilton**, in his article “**Gold/Oil Ratio Extremes 3**” published in 19<sup>th</sup> Aug, 2005 says that “One of the most powerful historical commodities interrelationships exists between oil and gold. This is fitting. Oil is the most important commodity on earth since almost everything tangible that we physically move burns oil in the process. And gold has been the ultimate form of money through six millennia of human history, utterly immune to the inevitable debasement and inflation that all paper currencies eventually suffer.

This key relationship is easiest to understand when expressed as a ratio, the Gold/Oil Ratio or GOR. It simply takes the market price of gold divided by the market price of oil and the result is charted across the seas of time. The really fascinating part is this ratio has traded within a well-defined range since just after World War 2, nearly 60 years. Any trend persisting for this long must be taken seriously by investors.

The GOR research presented today is the latest in a long thread of analysis that I started back in June 2000. Back then gold was running at \$292 and crude oil only cost \$32 per barrel. At that time the GOR was low but still well above historical extremes. But in just the past few months the GOR has dived to new all-time record lows that likely represent dazzling opportunities for investors who position themselves to ride the GOR back up into normal territory.”

**Dr. Jude Wanniski**, in his article “**Gold Vs Crude Oil**” published in 19<sup>th</sup> June, 2000 says that “The oil price should come back down as high prices pull capital towards higher relative returns, which implies more production -- but the process will take a while. The 1997/98 oil price plunge had a searing effect on producers, who obviously do not want to be burned again, should another deflation be right around the corner. Oil producers may not have identified price swings as monetary deflation, but they certainly grasped the concept that committing to new fixed capacity is more risky in an environment where the nominal price is highly volatile. As long as the dollar is not fixed in terms of gold, its volatility will continue to throw off misleading signals of capital shortages and surpluses, inevitably leading to booms and busts.

Gold and oil traditionally have had a 15-to-1 relationship, only slipping out of congruence for short periods of time. When the gold/dollar relationship is anchored, the oil/dollar relationship remains stable as well. When the dollar/gold relationship is malfunctioning, as it is now, capital is wasted as producers try to protect themselves from the damaging impact of inflations and deflations, which ultimately weaken the entire pricing system. The upshot is that prices will eventually come down. But in the meantime, we'll all be getting squeezed at the pumps."

**Adam Hamilton**, in his article "**Gold Boiling in Oil**" published in 1<sup>st</sup> July, 2000 says that "Global gold demand is rising rapidly, fueled by everyday people living in the east who have seen firsthand the effects of hyperinflation and despotic governments, and empirically realize gold is the ultimate refuge in financial and political storms. As Southeast Asia is recovering from the recent financial crisis, gold demand is booming. As history has taught over and over, the western equity credit bubbles WILL burst at some point, and the consequences will be catastrophic financially. When western investors began chasing gold to salvage some wealth as fiat paper and overvalued stocks burn, global gold demand may jump by an order of magnitude or more. All the gold mined in the history of the world would fit in a space a little larger than a 60 foot cube. When the bubble bursts, there simply isn't enough gold to go around.

The annual rate of increase in the global mined supply of gold has continued to dwindle. At recent prices of \$255 to \$290 per ounce, most mines in the world are unprofitable and many are being mothballed. When the inevitable gold rally of legend arrives, it will take many years to spin up capacity to meet demand, for the same reasons discussed above in the oil fundamentals. The bullish supply and demand fundamentals for the gold price in the next few years are phenomenal."

**Howard Simons**, in his article "**Oil-Gold and Other Uncorrelated Trades**" published in 20<sup>th</sup> Sep, 2006 says that "The long-term trend of this relationship, marked with a trendline, clearly is lower. This confirms the presence of an underlying economic process, in this case a long-term bull market in crude oil, a resource that is consumed and depleted. Indeed, the only interruptions in the long-term trend, such as those in 1986, 1993 and 1998, are produced by price declines in crude oil, not price increases in gold."

Prashant Srivastava, in his article **“'Gulf effect' makes gold dearer”** published in 8<sup>th</sup> May, 2006 says that “Since gulf countries are shying away from accepting dollar or euro currency in return for their liquid gold (crude oil) and are now adamant on accepting only pure gold in return, the price of the yellow metal in the local market skyrocketed to a historic high.”

## Chapter 3

### Data Analysis and Interpretation

#### 3.1 Prices of Crude Oil and Gold along with Gold-Oil Ratio (1968-2005)

Date	Gold(London)(\$ per ounce)	Crude(WTI)(\$ per Barrel)	Gold-Oil Ratio
1/1/1968	35.2	3.07	11.46579805
1/2/1968	35.2	3.07	11.46579805
1/3/1968	35.2	3.07	11.46579805
1/4/1968	37.9	3.07	12.34527687
1/5/1968	40.7	3.07	13.25732899
1/6/1968	41.1	3.07	13.38762215
1/7/1968	39.5	3.07	12.86644951
1/8/1968	39.2	3.07	12.76872964
1/9/1968	40.2	3.07	13.09446254
1/10/1968	39.2	3.07	12.76872964
1/11/1968	39.8	3.07	12.96416938
1/12/1968	41.1	3.07	13.38762215
1/1/1969	42.3	3.07	13.77850163
1/2/1969	42.6	3.07	13.8762215
1/3/1969	43.2	3.25	13.29230769
1/4/1969	43.3	3.35	12.92537313
1/5/1969	43.46	3.35	12.97313433
1/6/1969	41.44	3.35	12.37014925
1/7/1969	41.76	3.35	12.46567164
1/8/1969	41.09	3.35	12.26567164
1/9/1969	40.87	3.35	12.2
1/10/1969	40.44	3.35	12.07164179
1/11/1969	37.4	3.35	11.1641791
1/12/1969	35.17	3.35	10.49850746
1/1/1970	34.94	3.35	10.42985075
1/2/1970	34.99	3.35	10.44477612
1/3/1970	35.09	3.35	10.47462687
1/4/1970	35.62	3.35	10.63283582
1/5/1970	35.95	3.35	10.73134328
1/6/1970	35.44	3.35	10.57910448
1/7/1970	35.32	3.31	10.67069486
1/8/1970	35.38	3.31	10.68882175
1/9/1970	36.19	3.31	10.93353474
1/10/1970	37.52	3.31	11.33534743
1/11/1970	37.44	3.31	11.31117825
1/12/1970	37.44	3.56	10.51685393
1/1/1971	37.87	3.56	10.63764045

1/2/1971	38.74	3.56	10.88202247
1/3/1971	38.87	3.56	10.91853933
1/4/1971	39.01	3.56	10.95786517
1/5/1971	40.52	3.56	11.38202247
1/6/1971	40.1	3.56	11.26404494
1/7/1971	40.95	3.56	11.50280899
1/8/1971	42.73	3.56	12.00280899
1/9/1971	42.02	3.56	11.80337079
1/10/1971	42.5	3.56	11.93820225
1/11/1971	42.86	3.56	12.03932584
1/12/1971	43.48	3.56	12.21348315
1/1/1972	45.75	3.56	12.8511236
1/2/1972	48.26	3.56	13.55617978
1/3/1972	48.33	3.56	13.5758427
1/4/1972	49.03	3.56	13.77247191
1/5/1972	54.62	3.56	15.34269663
1/6/1972	62.09	3.56	17.44101124
1/7/1972	65.67	3.56	18.44662921
1/8/1972	67.03	3.56	18.82865169
1/9/1972	65.47	3.56	18.39044944
1/10/1972	64.86	3.56	18.21910112
1/11/1972	62.91	3.56	17.67134831
1/12/1972	63.91	3.56	17.95224719
1/1/1973	65.14	3.56	18.29775281
1/2/1973	74.2	3.56	20.84269663
1/3/1973	84.37	3.56	23.6994382
1/4/1973	90.5	3.56	25.42134831
1/5/1973	101.96	3.56	28.64044944
1/6/1973	120.12	3.56	33.74157303
1/7/1973	120.17	3.56	33.75561798
1/8/1973	106.76	4.31	24.77030162
1/9/1973	102.97	4.31	23.89095128
1/10/1973	100.08	4.31	23.22041763
1/11/1973	94.82	4.31	22
1/12/1973	106.72	4.31	24.76102088
1/1/1974	129.19	10.11	12.77843719
1/2/1974	150.23	10.11	14.859545
1/3/1974	168.42	10.11	16.65875371
1/4/1974	172.24	10.11	17.03659743
1/5/1974	163.27	10.11	16.14935707
1/6/1974	154.1	10.11	15.24233432
1/7/1974	142.98	10.11	14.14243323
1/8/1974	154.64	10.11	15.29574679
1/9/1974	151.77	10.11	15.01186944
1/10/1974	158.78	11.16	14.22759857
1/11/1974	181.66	11.16	16.27777778
1/12/1974	183.85	11.16	16.47401434
1/1/1975	176.27	11.16	15.79480287

1/2/1975	179.59	11.16	16.09229391
1/3/1975	178.16	11.16	15.96415771
1/4/1975	169.84	11.16	15.21863799
1/5/1975	167.39	11.16	14.99910394
1/6/1975	164.24	11.16	14.71684588
1/7/1975	165.17	11.16	14.80017921
1/8/1975	163	11.16	14.60573477
1/9/1975	144.09	11.16	12.91129032
1/10/1975	142.76	11.16	12.7921147
1/11/1975	142.42	11.16	12.76164875
1/12/1975	139.3	11.16	12.48207885
1/1/1976	131.49	11.16	11.78225806
1/2/1976	131.07	12.03	10.89526185
1/3/1976	132.58	12.1	10.95702479
1/4/1976	127.94	12.17	10.51273624
1/5/1976	126.94	12.17	10.43056697
1/6/1976	125.71	12.17	10.32949877
1/7/1976	117.76	12.17	9.676253081
1/8/1976	109.93	12.17	9.032867707
1/9/1976	114.15	13.9	8.212230216
1/10/1976	116.14	13.9	8.355395683
1/11/1976	130.48	13.9	9.38705036
1/12/1976	133.88	13.9	9.631654676
1/1/1977	132.26	13.9	9.515107914
1/2/1977	136.29	13.9	9.805035971
1/3/1977	148.22	13.9	10.66330935
1/4/1977	149.16	13.9	10.73093525
1/5/1977	146.6	13.9	10.54676259
1/6/1977	140.77	13.9	10.12733813
1/7/1977	143.39	13.9	10.31582734
1/8/1977	144.95	14.85	9.760942761
1/9/1977	149.52	14.85	10.06868687
1/10/1977	158.86	14.85	10.6976431
1/11/1977	162.1	14.85	10.91582492
1/12/1977	160.45	14.85	10.8047138
1/1/1978	173.17	14.85	11.66127946
1/2/1978	178.15	14.85	11.996633
1/3/1978	183.66	14.85	12.36767677
1/4/1978	175.27	14.85	11.8026936
1/5/1978	176.3	14.85	11.87205387
1/6/1978	183.75	14.85	12.37373737
1/7/1978	188.72	14.85	12.70841751
1/8/1978	206.3	14.85	13.89225589
1/9/1978	212.07	14.85	14.28080808
1/10/1978	227.39	14.85	15.31245791
1/11/1978	206.07	14.85	13.87676768
1/12/1978	207.83	14.85	13.9952862
1/1/1979	227.27	14.85	15.3043771

1/2/1979	245.67	15.85	15.49968454
1/3/1979	242.04	15.85	15.27066246
1/4/1979	239.16	15.85	15.08895899
1/5/1979	257.61	18.1	14.23259669
1/6/1979	279.06	19.1	14.6104712
1/7/1979	294.73	21.75	13.5508046
1/8/1979	300.81	26.5	11.35132075
1/9/1979	355.11	28.5	12.46
1/10/1979	391.65	29	13.50517241
1/11/1979	391.99	31	12.64483871
1/12/1979	455.08	32.5	14.00246154
1/1/1980	675.3	32.5	20.77846154
1/2/1980	665.32	37	17.98162162
1/3/1980	553.58	38	14.56789474
1/4/1980	517.41	39.5	13.09898734
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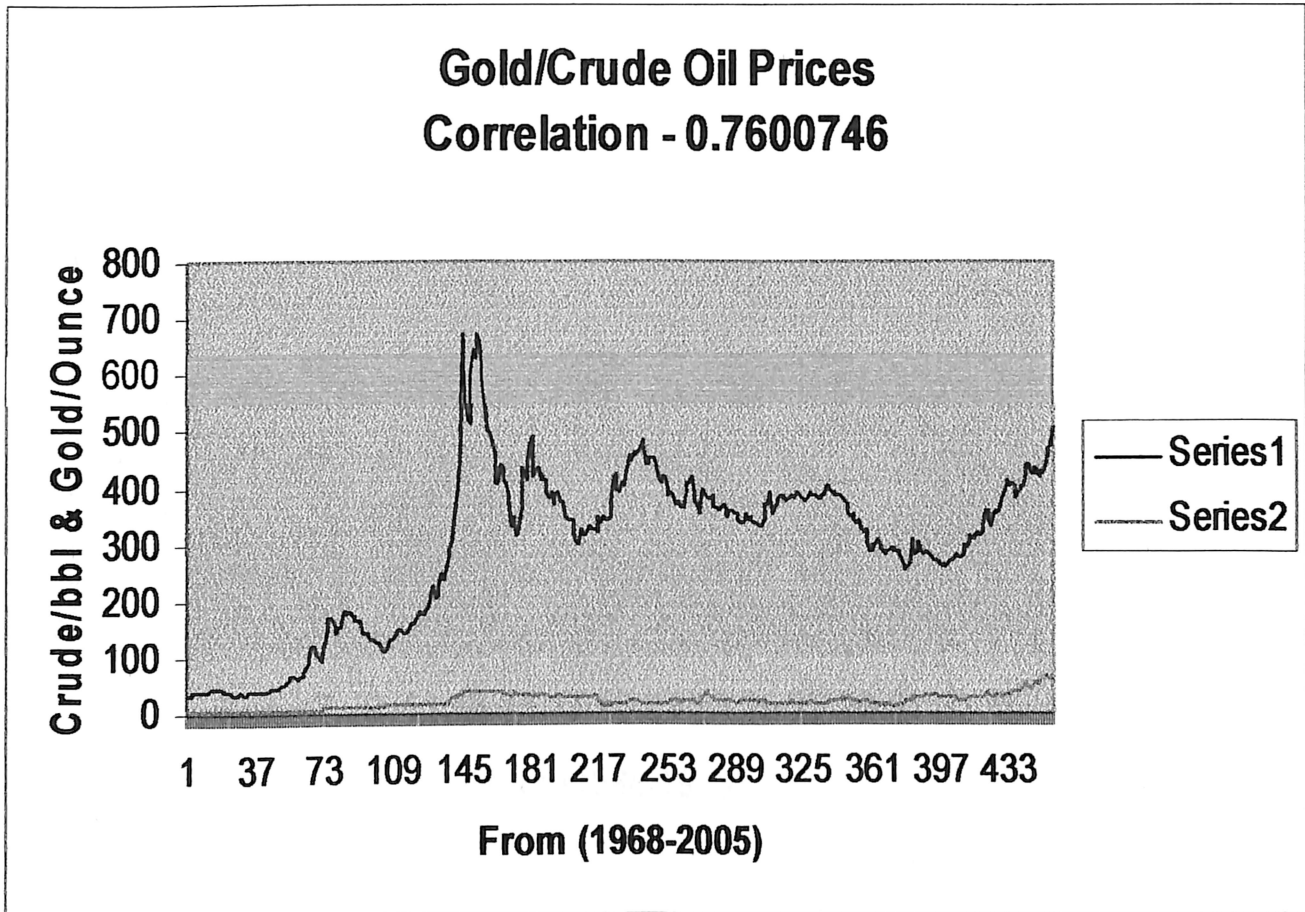
Sources: Dow Jones & Company

Average of Daily Prices (Monthly Data)

Gold-Oil Ratio = Price of Gold (per oz) / Price of Crude Oil (per barrel)

### 3.2 Analysis of the Correlation between Crude Oil and Gold

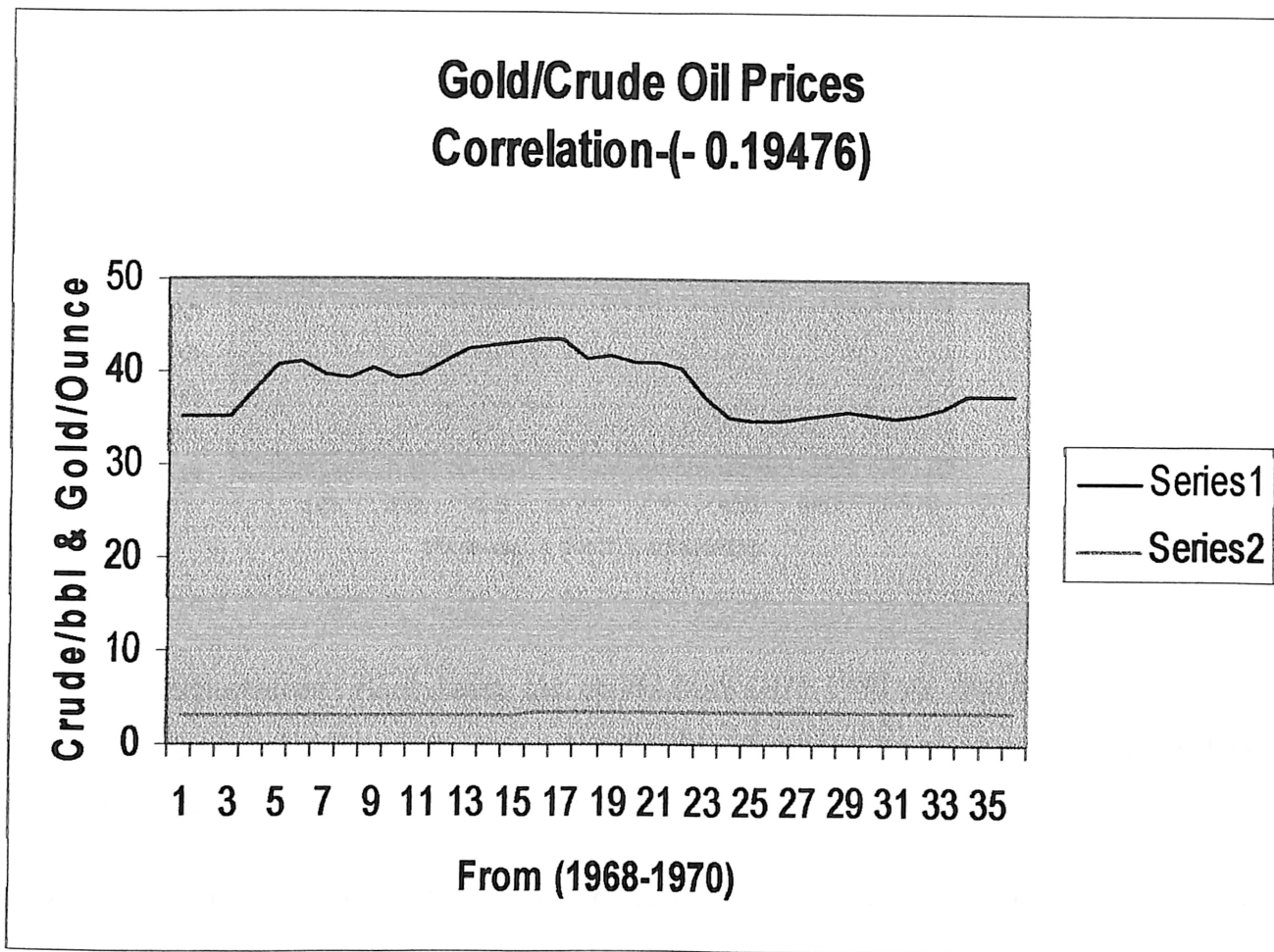
#### 3.2.a.i



3.2.a.ii Interpretation: Gold and crude oil prices tend to rise and fall in symmetry with one another. There are two reasons for this:

- Historically, oil purchases were paid for in gold. Even today, a sizable percentage of oil revenue ends up invested in gold. As oil prices rise, much of the increased revenue is invested as it is surplus to current needs -- and much of this surplus is invested in gold or other hard assets.
- Rising oil prices place upward pressure on inflation. This enhances the appeal of gold because it acts as an inflation hedge.

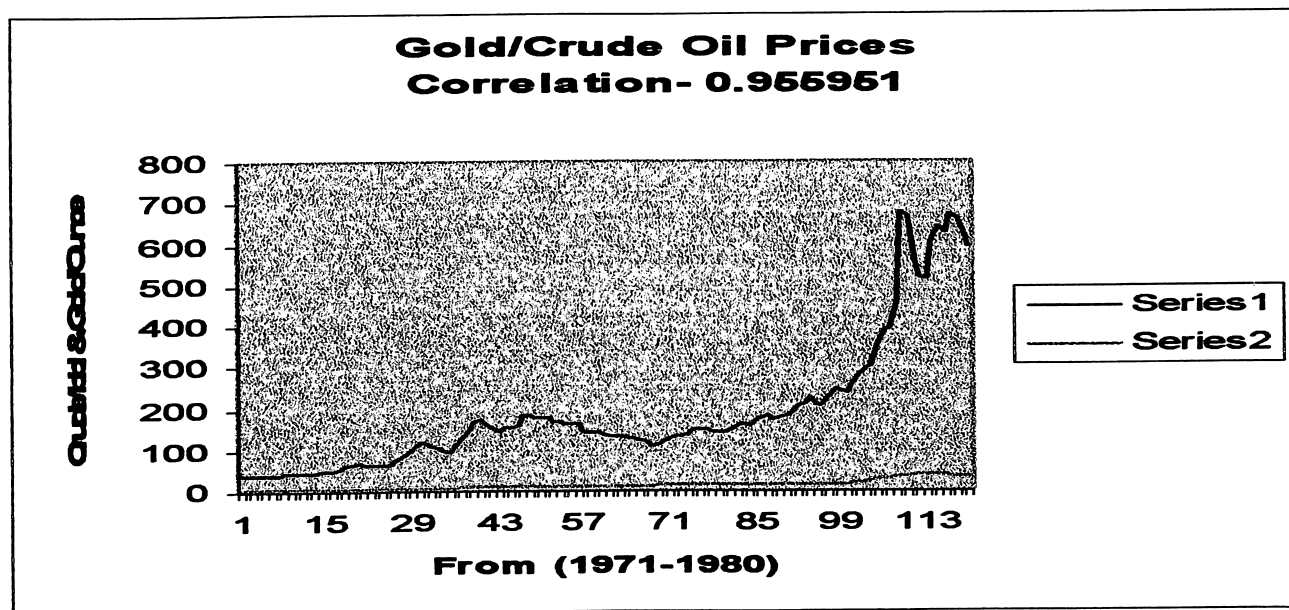
3.2.b.i



3.2.b.ii Interpretation: Here during the period from 1968-1970 we find that there is a negative correlation between crude oil and gold. There can be many reasons for that but some of the really important reasons are given below:

- OPEC was just new then to control over the prices.
- Not a huge demand for oil. So oil prices were quite smooth then.
- While demand for gold was always there.

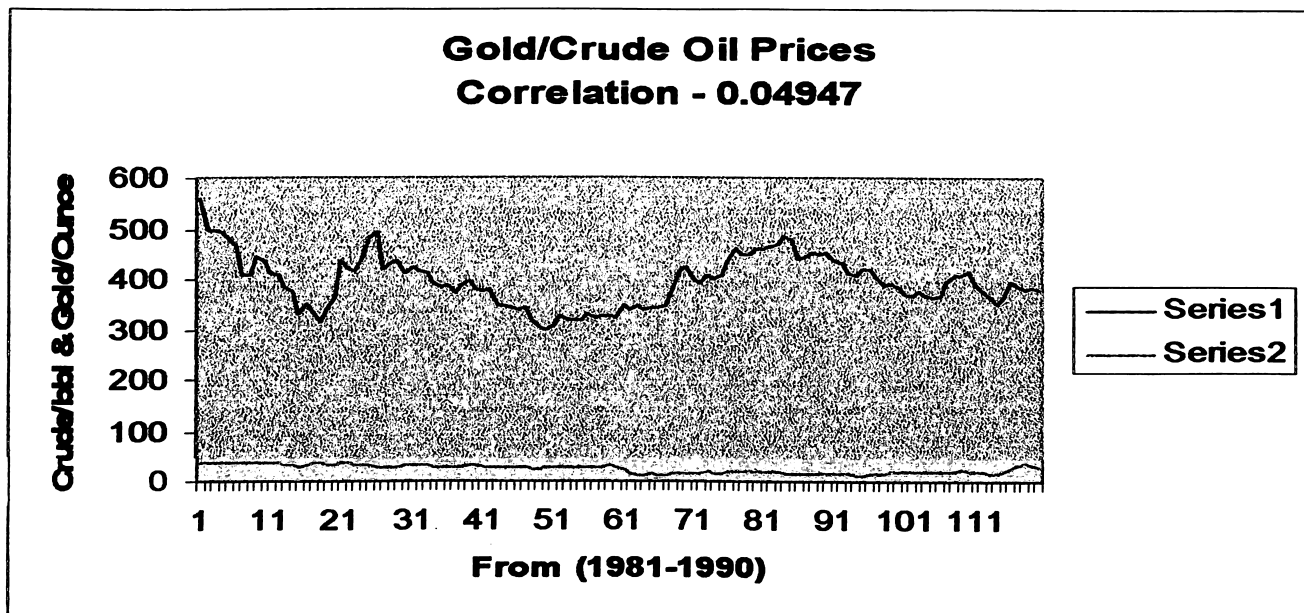
## 3.2.c.i



3.2.c.ii Interpretation: Here during the period from 1971-1980 we find that there is a very high positive correlation between crude oil and gold. There can be many reasons for that but some of the really important reasons are given below:

- 1971 : OPEC mandates "total embargo" against any company that rejects the 55 percent tax rate.
- 1972 : OPEC threatens "appropriate sanctions" against companies that "fail to comply with . . . [OPEC] decisions."
- 1975 : Iraq completes nationalization by taking over the BP and Shell shares of the Basrah Petroleum Company.
- 1978 : OPEC decides on a 14.5 percent price increase for 1979, to be implemented quarterly
- 1980 : Iraq breaks 1975 treaty with Iran and proclaims sovereignty over Shatt al-Arab waterway; Iraq invades Iran.
- And because of all this reasons gold was also demanded and this lead to the price rise in gold as well as crude oil.

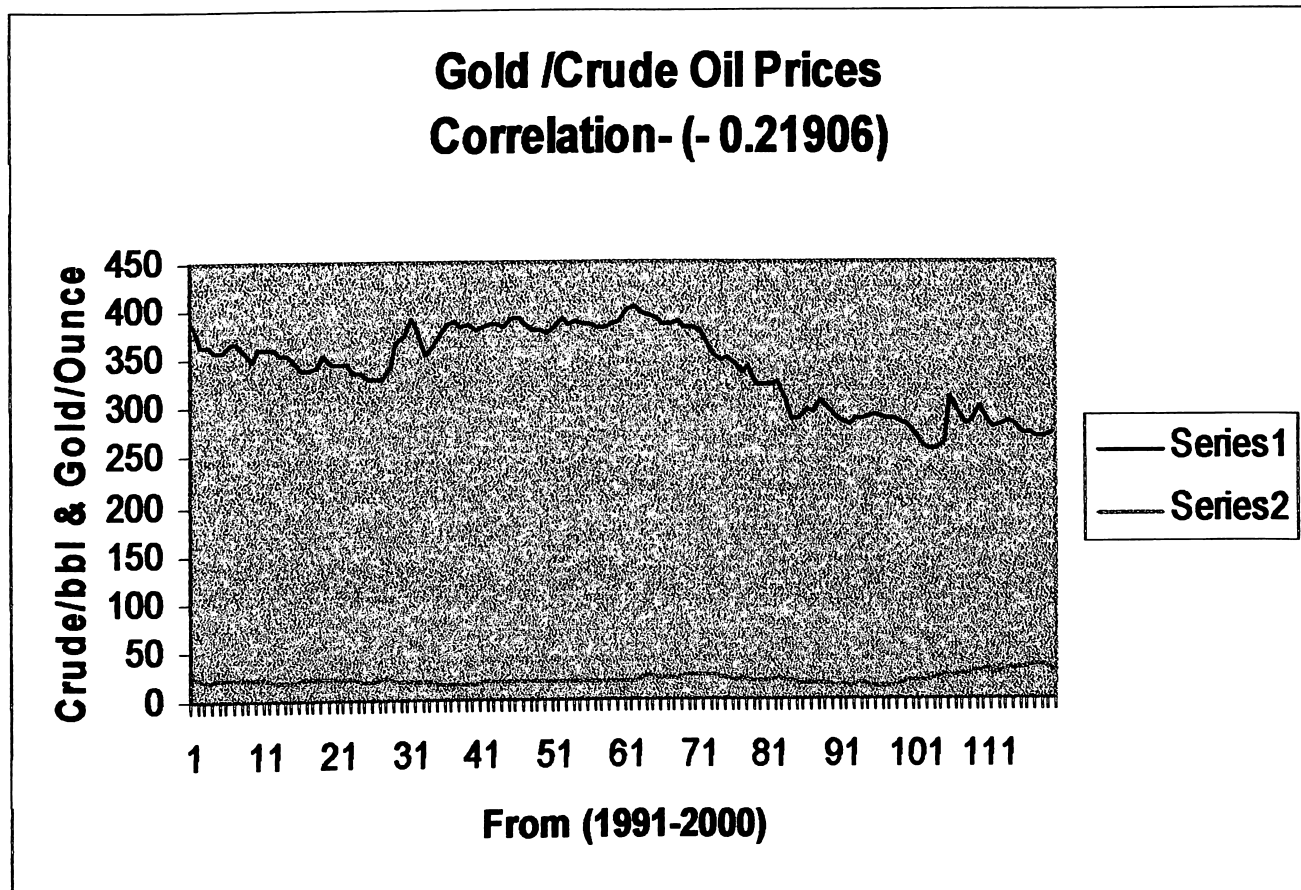
## 3.2.d.i



3.2.d.ii Interpretation: Here during the period from 1981-1990 we find that there is almost no correlation between crude oil and gold. There can be many reasons for that but some of the really important reasons are given below:

- 1982: Iraq declares unilateral cease-fire; Iran launches first attack into Iraq.
- 1984 : OPEC cuts production to 16 MMB/D.
- 1985 : Nine OPEC members adjust prices to cut gap between light and heavy crudes from \$4 to \$2.40 per barrel. Saudi light price cut one dollar to \$28 per barrel.
- 1987 : OPEC price accord begins to deteriorate.
- 1989 : Exxon tanker Valdez runs aground, spilling 11 million gallons of crude oil in the waters of Prince William Sound. Oil prices react upward to news of the spill and to potential shortages on the west coast caused by refinery fires there.
- 1990 : Iraq invades Kuwait.
- So because of these reasons mentioned above there were ups and downs in the prices of crude oil and therefore we find that there is no correlation between crude oil and gold.

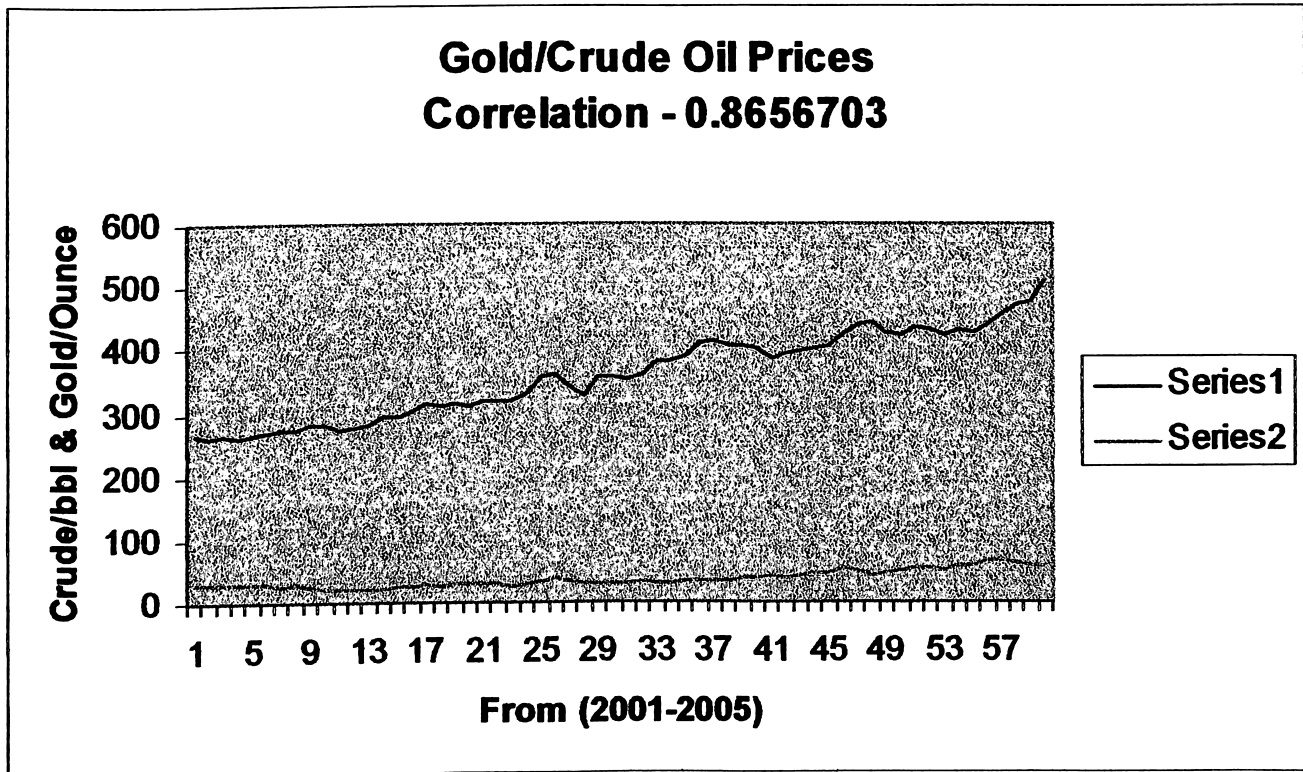
## 3.2.e.i



3.2.e.ii Interpretation: Here during the period from 1991-2000 we find that there is a negative correlation between crude oil and gold. There can be many reasons for that but some of the really important reasons are given below:

- 1991 : Reports Iraq will accept U.S. offer for talks in Geneva; Gulf war at its peak. U.S. draws Strategic Petroleum Reserve (SPR). Crude oil prices drop \$9-10 per barrel in one day after having risen \$3-5 per barrel during the first half of January .
- 1997-1998 : Asian Crisis which lead to recession stopped the flow of the Asian economy and that is why the crude oil demand was rising.
- Gold demand decreased rapidly due to Asian Crisis and so we can see a negative correlation.

3.2.f.i

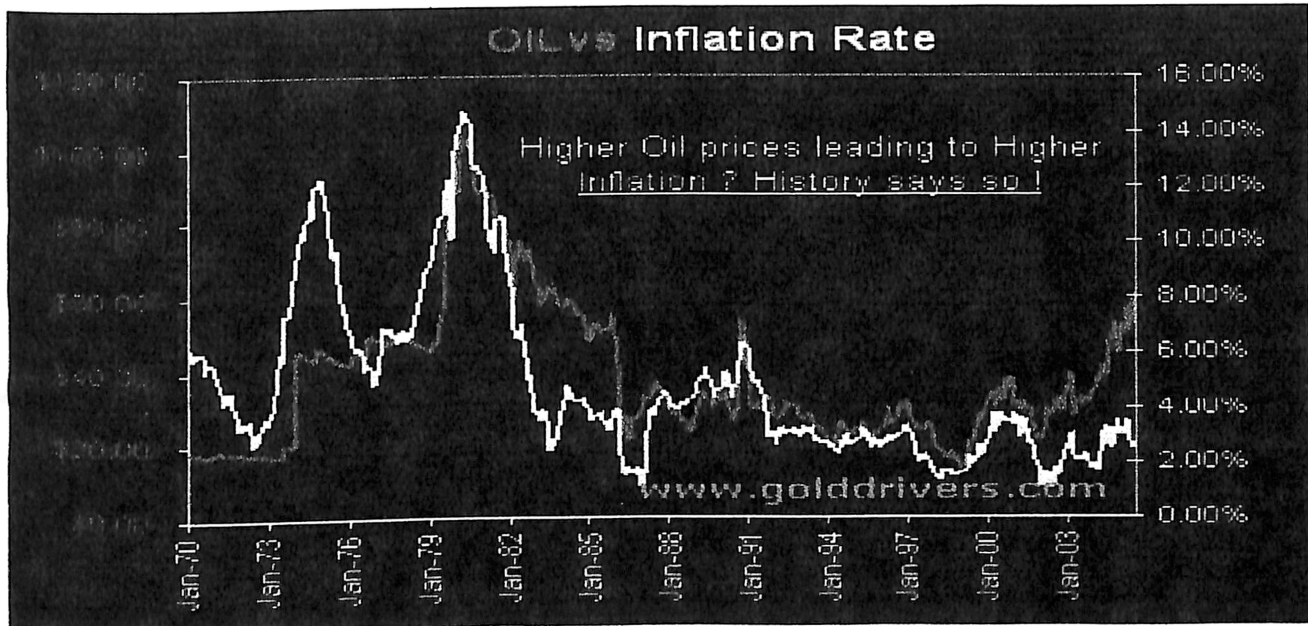


3.2.f.ii Interpretation: Here during the period from 2000-2005 we find that there is a very positive correlation between crude oil and gold. There can be many reasons for that but some of the really important reasons are given below:

- 2001 : OPEC agrees at a meeting of ministers in Vienna, to reduce members' production quotas by 1.5 million barrels per day. The move comes in response to OPEC members' concerns about declining prices.
- 2003 : US-Iraq Relations; Raise OPEC quota excluding Iraq
- 2004 : Political Stability in Iraq
- 2005 : Dispute, Strike in Nigeria; OPEC decides to leave its crude oil production quotas unchanged at 27 million bbl/d after a meeting in Vienna.
- These are the some reasons why the gold and the crude oil prices rose and therefore we find that there is a positive correlation between both gold and crude oil.

### 3.3 Oil-Inflation-Gold Relationship

Higher energy costs do cause inflation so we should expect a strong correlation between historic oil and inflation. We can see that in the chart given below:

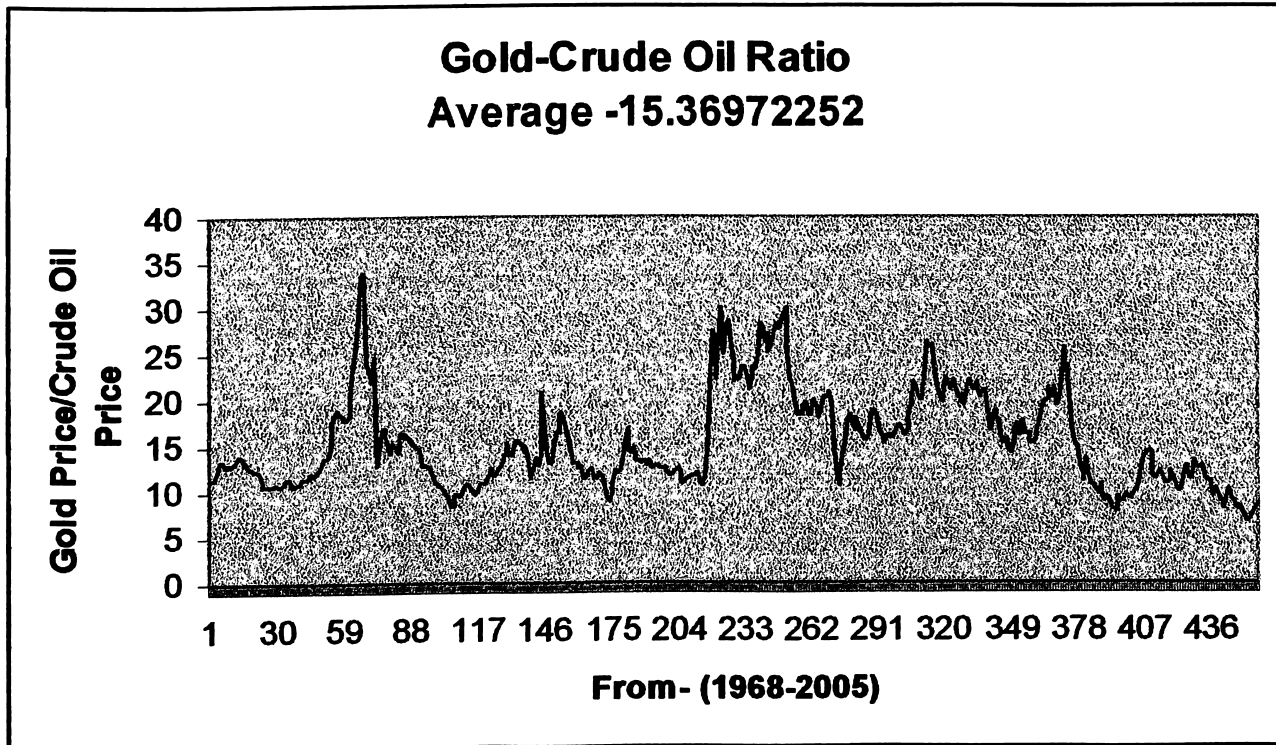


Now let us have a look at the correlation between inflation and gold in the chart given below. We find a very strong correlation between them.



### 3.4 Gold-Crude Oil Ratio

**Gold-Oil Ratio = Price of Gold (per oz.) / Price of Crude Oil (per barrel)**



The average gold to crude oil ratio (gold price divided by crude oil price) for several different periods of time is shown in the graph above. For the last 55 years, an ounce of gold has been worth about 15x as much as a barrel of crude oil. Over the last twenty years, for instance, the ratio has risen to over 23x. Currently, the ratio is at an unsustainable low of 7x. Each time levels below 10 are seen, they proceed a sharp and sustained rally of the ratio back above the historical average. There is no reason to believe the present low will last any longer than historical precedence indicates. There are only two events that can bring this ratio back into line. A sharp rally in gold prices, or a sharp drop in crude prices. Which event is more probable is to be seen in the near future.

### 3.5 Gold-Crude Oil Ratio Contract and the Exchange

This concept has not yet been tried anywhere. To trade the Gold-Crude Oil Ratio will be a interesting thing to do. It will quite similar to that of trading in the stock index. One more important feature, why this will be a very good trading instrument can be gauged from the fact that it has got a lot of volatility which is very essential for trading. Another important feature of this contract will be that, there will be no physical delivery as because the underlying asset in this case will be the Gold – Crude Oil Ratio and so it will be cash settled on the date of expiry of the contract. Given below is the contract specification of the assumed Gold-Crude Oil Contract which can be utilized in trading both futures and options in the exchange.

### 3.6 Contract Specifications of Gold-Crude Oil Ratio

**Name:** Gold – Crude Oil Ratio.

**Symbol:** GOR.

**Description:** GORMMYY.

**Contracts available for trading:** 1 Month / 2 Month / 3 Month.

#### **Trading**

**Trading period:** Mondays through Saturdays.

**Trading session:** Mon-Fri: 10.00 a.m. to 11.30 p.m, Sat: 10.00 a.m. to 2.00 p.m.

**Trading unit:** 1000 units.

**Quotation / Base value:** Rs. per unit.

**Maximum order size:** 5,00,000 units.

**Tick size (minimum price movement):** Re. 0.50.

**Daily price limits:** 4%

**Initial margin:** 5%

**Settlement:** Cash settled.

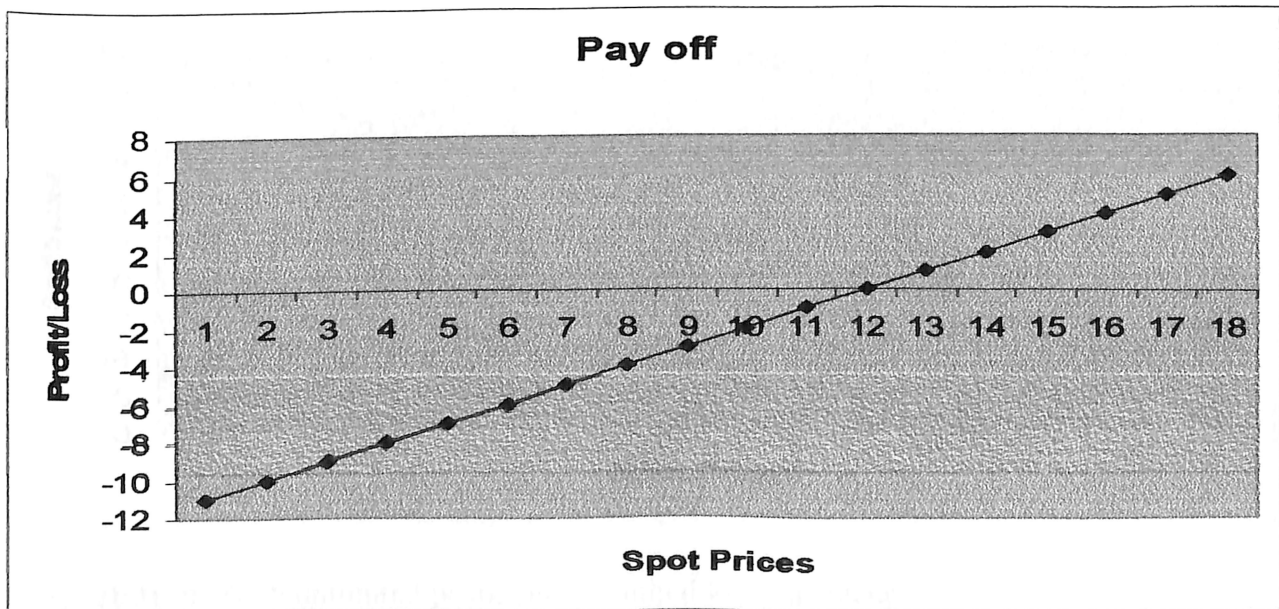
**Special margin:** In case of additional volatility, a special margin as deemed fit, will be imposed immediately on both buy and sale side in respect of all outstanding position, which will remain in force for next 2 days, after which the special margin will be relaxed.

### 3.7 Strategies that can be used by an Investor in a Gold-Oil Ratio Contract

Futures

(Holder of a Long Position)

Spot Prices(Rs)(Assumed)	Delivery Price(Rs) (Assumed)	Pay Off(Rs)
1	12	-11
2	12	-10
3	12	-9
4	12	-8
5	12	-7
6	12	-6
7	12	-5
8	12	-4
9	12	-3
10	12	-2
11	12	-1
12	12	0
13	12	1
14	12	2
15	12	3
16	12	4
17	12	5
18	12	6

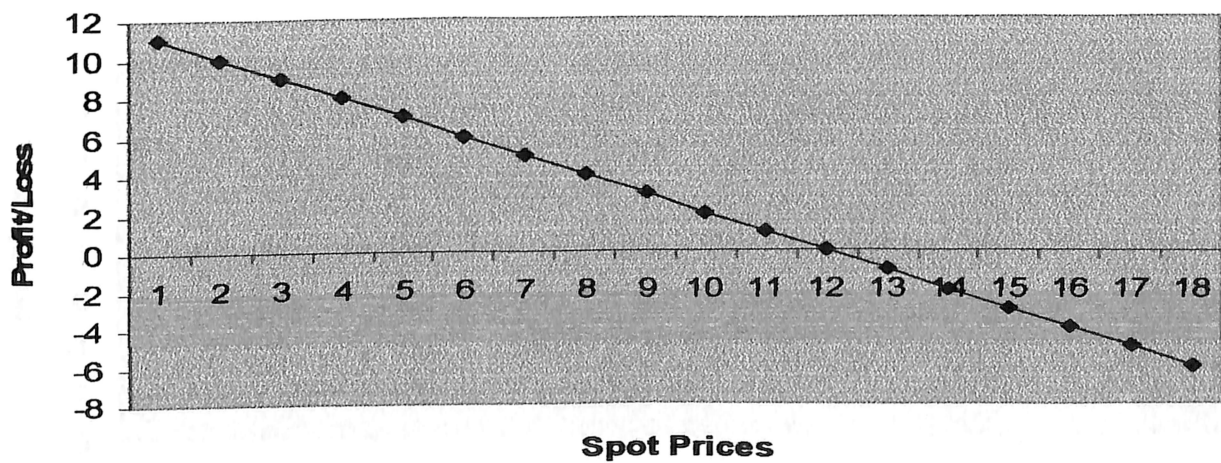


Interpretation: Both unlimited profit and unlimited loss can occur.

Futures  
(Holder of a Short Position)

Spot Prices(Rs)(Assumed)	Delivery Price(Rs) (Assumed)	Pay Off(Rs)
1	12	11
2	12	10
3	12	9
4	12	8
5	12	7
6	12	6
7	12	5
8	12	4
9	12	3
10	12	2
11	12	1
12	12	0
13	12	-1
14	12	-2
15	12	-3
16	12	-4
17	12	-5
18	12	-6

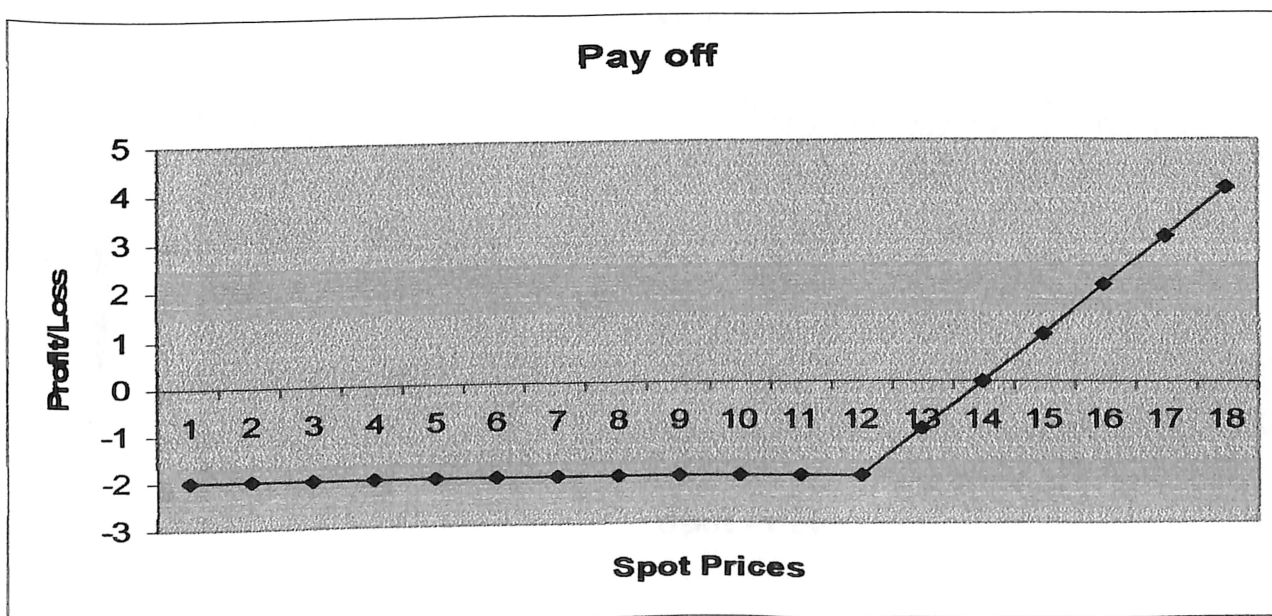
**Pay off**



Interpretation: Both unlimited profit and unlimited loss can occur.

Options  
(Buy a Call)

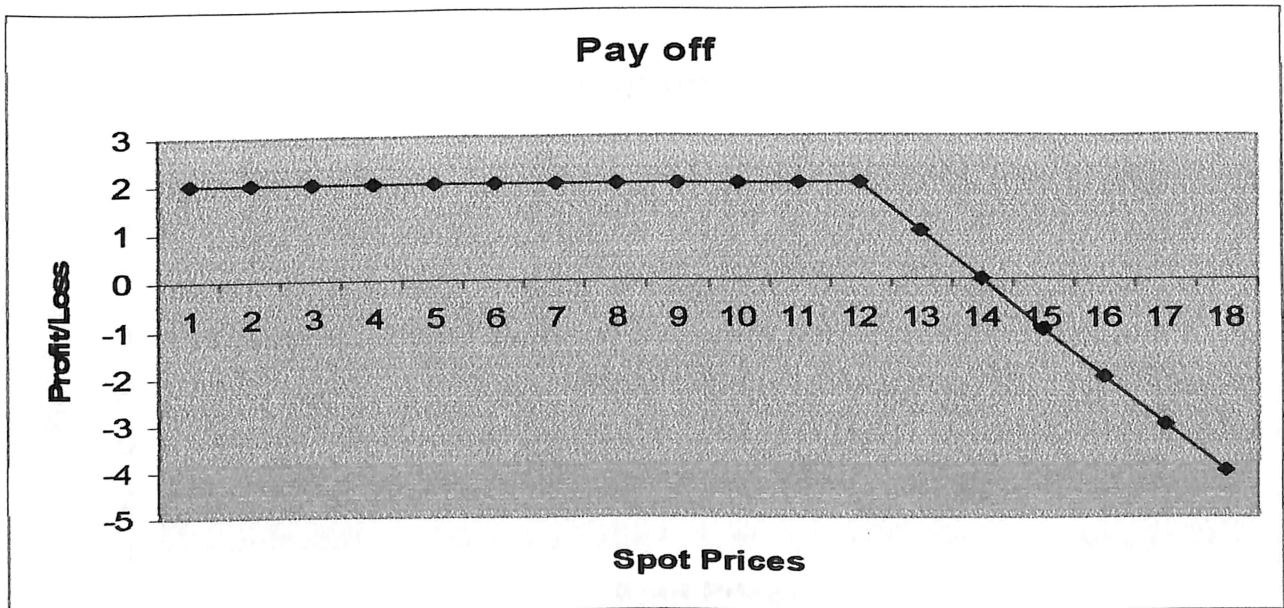
Spot(Rs)(Assumed)	Strike Price(Rs)(Assumed)	Premium(Rs)(Assumed)	Payoff(Rs)
1	12	2	-2
2	12	2	-2
3	12	2	-2
4	12	2	-2
5	12	2	-2
6	12	2	-2
7	12	2	-2
8	12	2	-2
9	12	2	-2
10	12	2	-2
11	12	2	-2
12	12	2	-2
13	12	2	-1
14	12	2	0
15	12	2	1
16	12	2	2
17	12	2	3
18	12	2	4



Interpretation: Here the profits are unlimited but the losses are limited.

Options  
(Sell a Call)

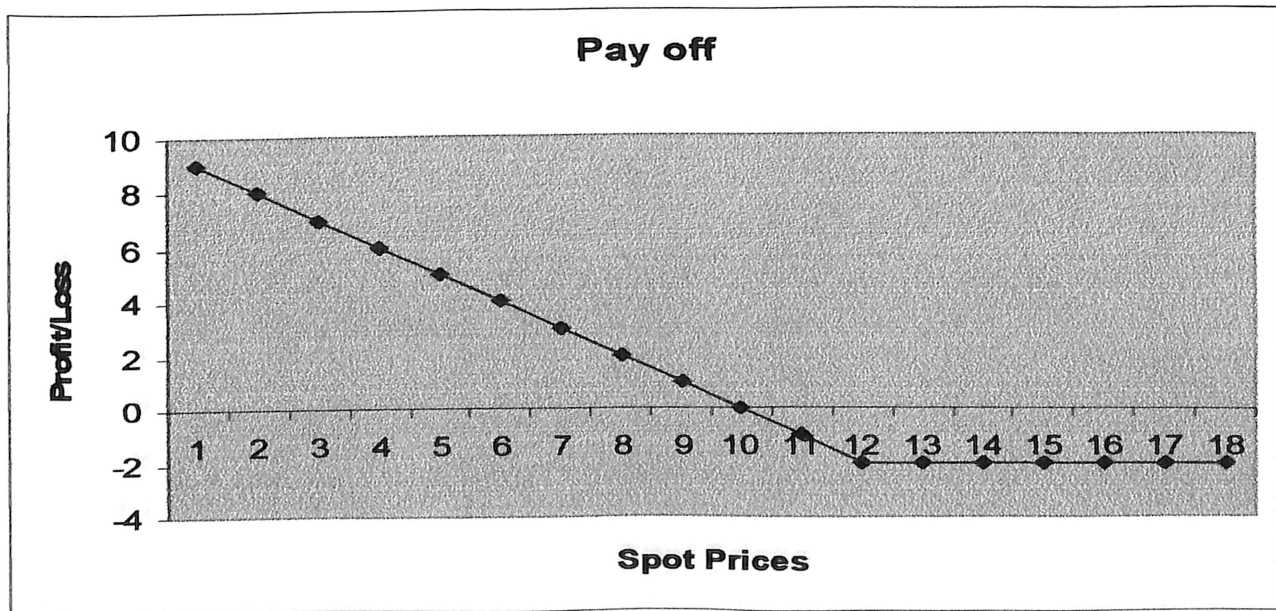
Spot(Rs)(Assumed)	Strike Price(Rs)(Assumed)	Premium(Rs)(Assumed)	Payoff(Rs)
1	12	2	2
2	12	2	2
3	12	2	2
4	12	2	2
5	12	2	2
6	12	2	2
7	12	2	2
8	12	2	2
9	12	2	2
10	12	2	2
11	12	2	2
12	12	2	2
13	12	2	1
14	12	2	0
15	12	2	-1
16	12	2	-2
17	12	2	-3
18	12	2	-4



Interpretation: Here the profits are limited but the losses are unlimited.

Options  
(Buy a Put)

Spot(Rs)(Assumed)	Strike Price(Rs)(Assumed)	Premium(Rs)(Assumed)	Payoff(Rs)
1	12	2	9
2	12	2	8
3	12	2	7
4	12	2	6
5	12	2	5
6	12	2	4
7	12	2	3
8	12	2	2
9	12	2	1
10	12	2	0
11	12	2	-1
12	12	2	-2
13	12	2	-2
14	12	2	-2
15	12	2	-2
16	12	2	-2
17	12	2	-2
18	12	2	-2

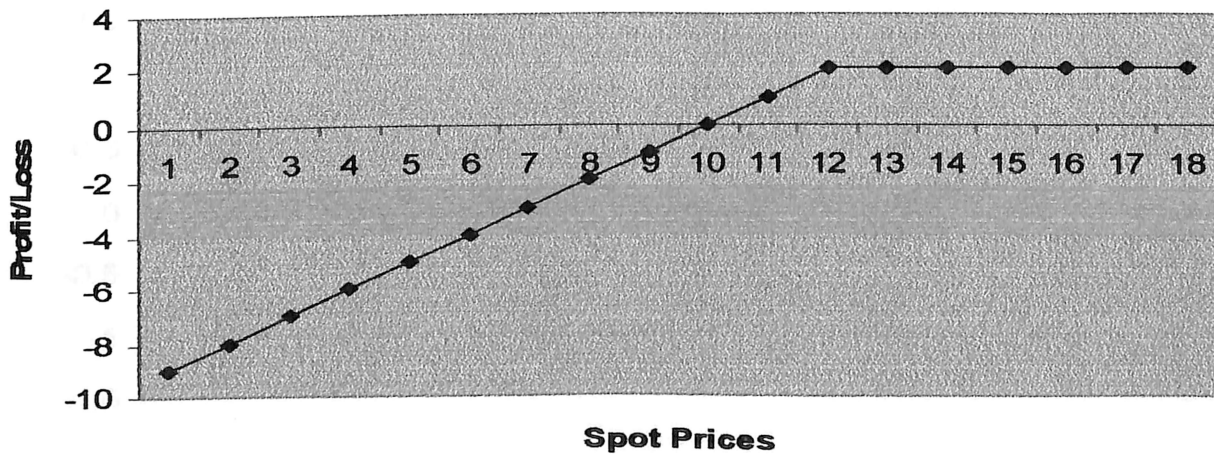


Interpretation: Here the profits are unlimited but the losses are limited.

Options  
(Sell a Put)

Spot(Rs)(Assumed)	Strike Price(Rs)(Assumed)	Premium(Rs)(Assumed)	Payoff(Rs)
1	12	2	-9
2	12	2	-8
3	12	2	-7
4	12	2	-6
5	12	2	-5
6	12	2	-4
7	12	2	-3
8	12	2	-2
9	12	2	-1
10	12	2	0
11	12	2	1
12	12	2	2
13	12	2	2
14	12	2	2
15	12	2	2
16	12	2	2
17	12	2	2
18	12	2	2

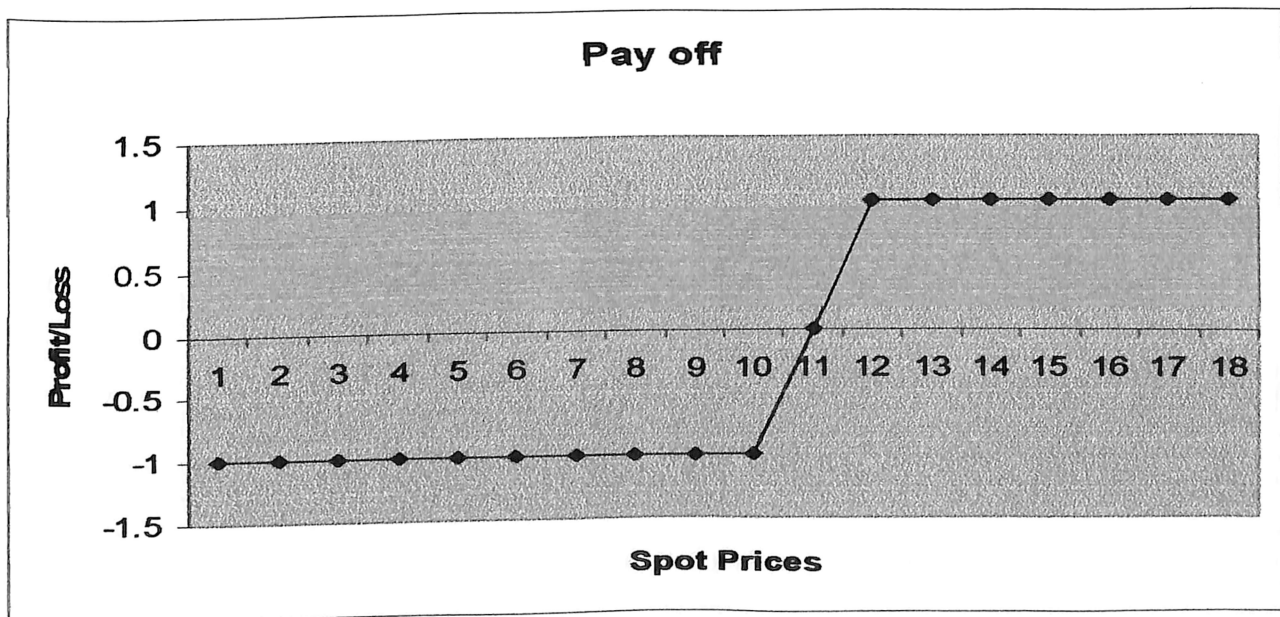
**Pay off**



Interpretation: Here the profits are limited but the losses are unlimited.

Options  
(Bullish Call Spread)

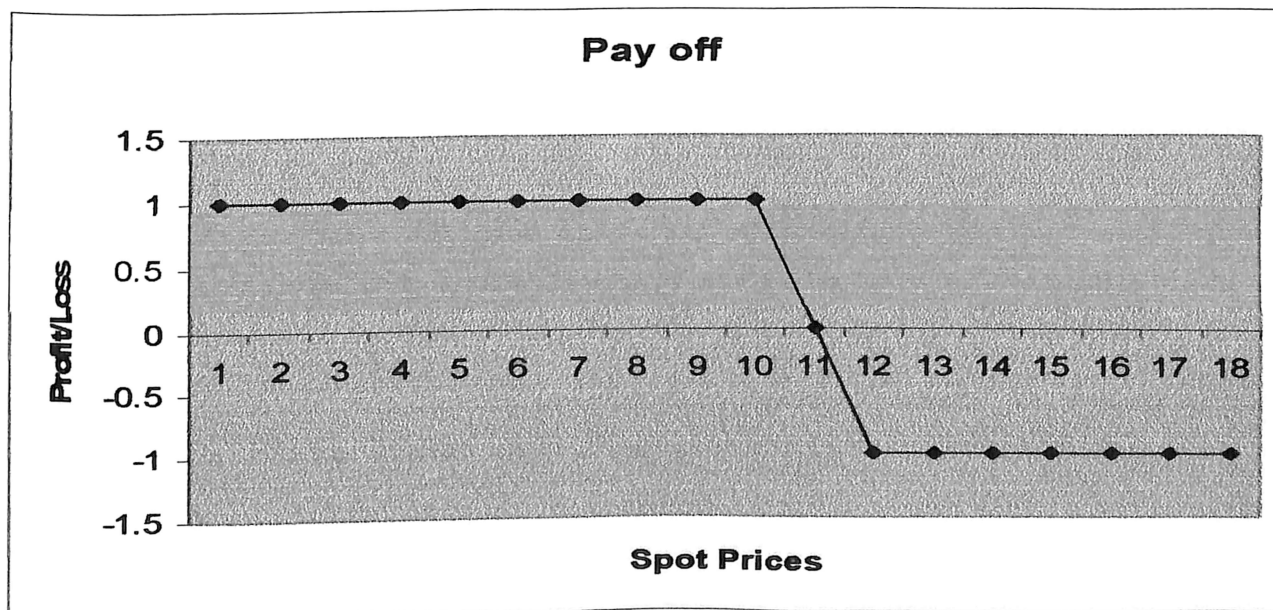
Spot(Rs)(Assumed)	Buy Call Rs10@Rs 2 (Pay off)	Sell Call Rs12@Rs 1 (Pay off)	Net Premium	Net Payoff
1	0	0	-1	-1
2	0	0	-1	-1
3	0	0	-1	-1
4	0	0	-1	-1
5	0	0	-1	-1
6	0	0	-1	-1
7	0	0	-1	-1
8	0	0	-1	-1
9	0	0	-1	-1
10	0	0	-1	-1
11	1	0	-1	0
12	2	0	-1	1
13	3	-1	-1	1
14	4	-2	-1	1
15	5	-3	-1	1
16	6	-4	-1	1
17	7	-5	-1	1
18	8	-6	-1	1



Interpretation: Here the profits and losses are limited.

Options  
(Bearish Call Spread)

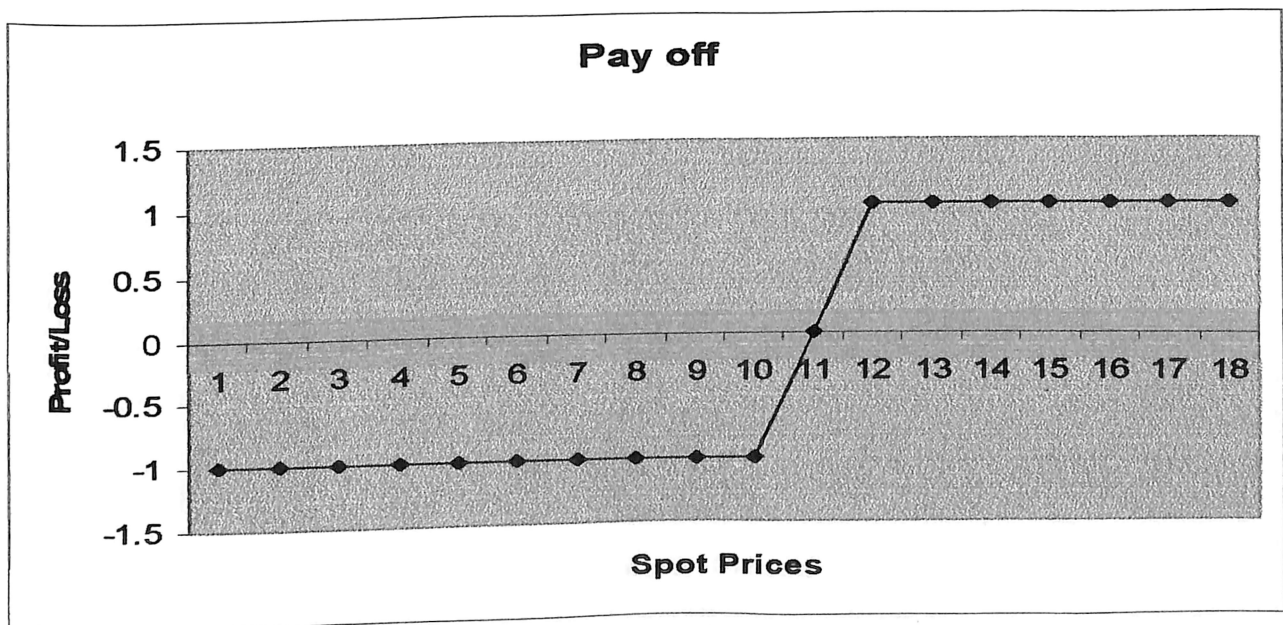
Spot(Rs)(Assumed)	Buy Call Rs12@Rs 1 (Pay off)	Sell Call Rs10@Rs 2 (Pay off)	Net Premium	Net Payoff
1	0	0	1	1
2	0	0	1	1
3	0	0	1	1
4	0	0	1	1
5	0	0	1	1
6	0	0	1	1
7	0	0	1	1
8	0	0	1	1
9	0	0	1	1
10	0	0	1	1
11	0	-1	1	0
12	0	-2	1	-1
13	1	-3	1	-1
14	2	-4	1	-1
15	3	-5	1	-1
16	4	-6	1	-1
17	5	-7	1	-1
18	6	-8	1	-1



Interpretation: Here the profits and losses are limited.

Options  
(Bullish Put Spread)

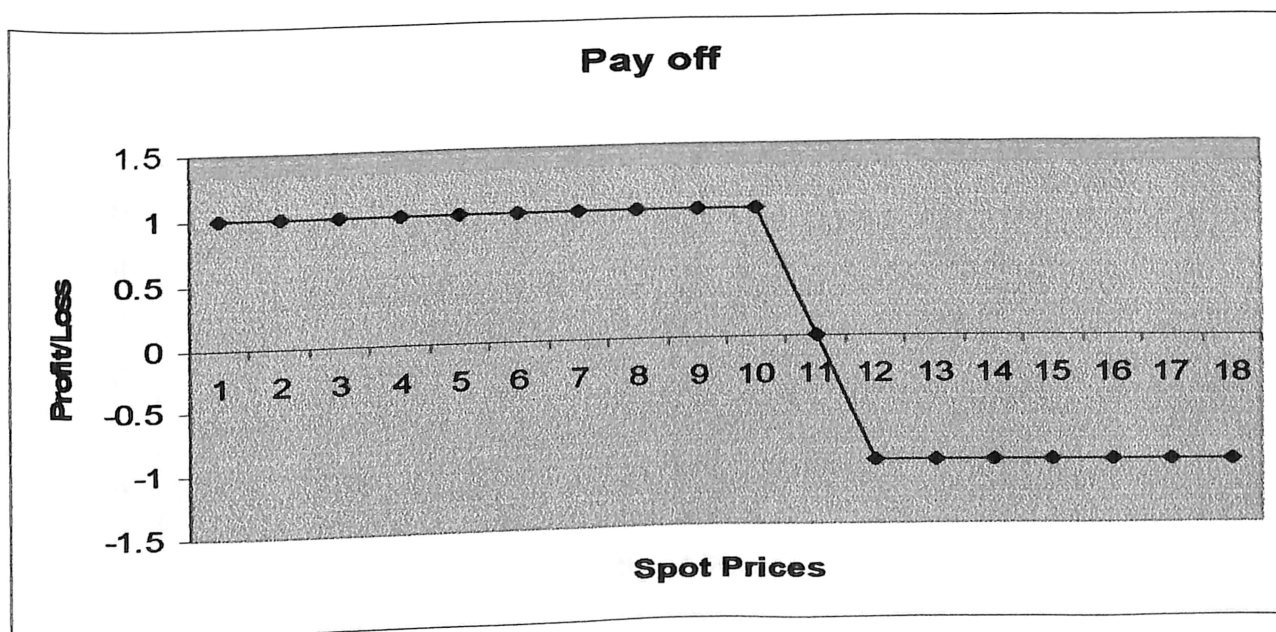
Spot(Rs)(Assumed)	Buy Put Rs10 @Rs1 (Pay off)	Sell Put Rs12 @Rs 2 (Pay off)	Net Premium	Net Payoff
1	9	-11	1	-1
2	8	-10	1	-1
3	7	-9	1	-1
4	6	-8	1	-1
5	5	-7	1	-1
6	4	-6	1	-1
7	3	-5	1	-1
8	2	-4	1	-1
9	1	-3	1	-1
10	0	-2	1	-1
11	0	-1	1	0
12	0	0	1	1
13	0	0	1	1
14	0	0	1	1
15	0	0	1	1
16	0	0	1	1
17	0	0	1	1
18	0	0	1	1



Interpretation: Here the profits and losses are limited.

Options  
(Bearish Put Spread)

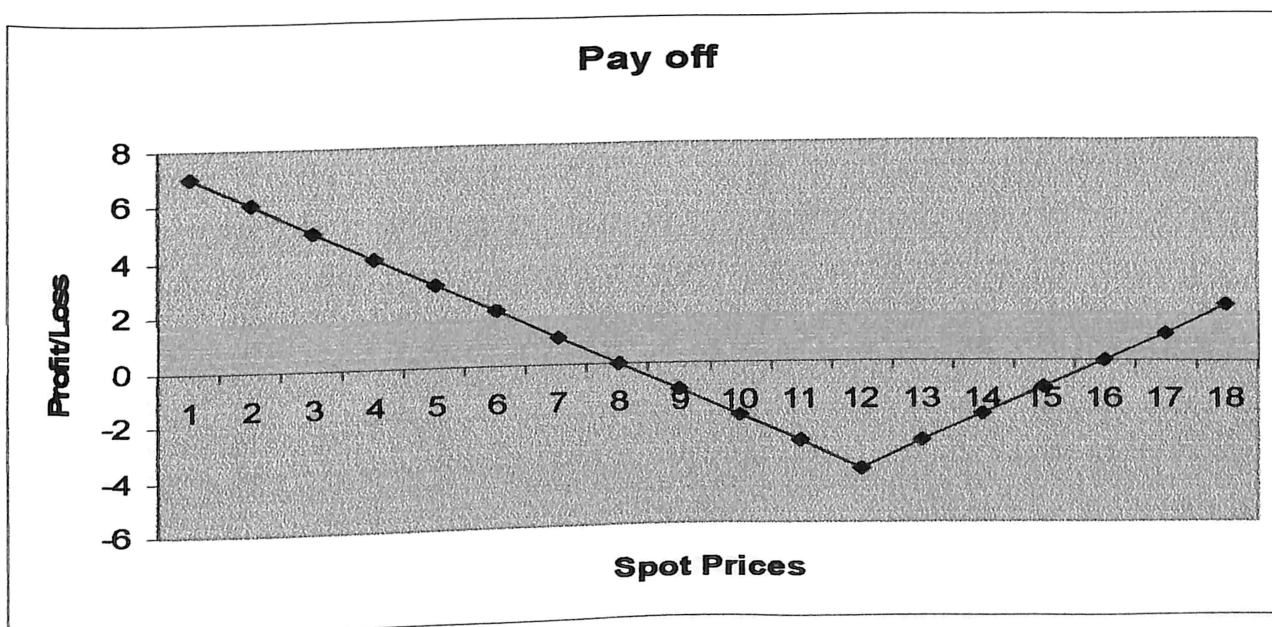
Spot(Rs)(Assumed)	Buy Put Rs12 @Rs 2 (Pay off)	Sell Put Rs10 @Rs 1 (Pay off)	Net Premium	Net Payoff
1	11	-9	-1	1
2	10	-8	-1	1
3	9	-7	-1	1
4	8	-6	-1	1
5	7	-5	-1	1
6	6	-4	-1	1
7	5	-3	-1	1
8	4	-2	-1	1
9	3	-1	-1	1
10	2	0	-1	1
11	1	0	-1	0
12	0	0	-1	-1
13	0	0	-1	-1
14	0	0	-1	-1
15	0	0	-1	-1
16	0	0	-1	-1
17	0	0	-1	-1
18	0	0	-1	-1



Interpretation: Here the profits and losses are limited.

Options  
(Straddle Purchase)

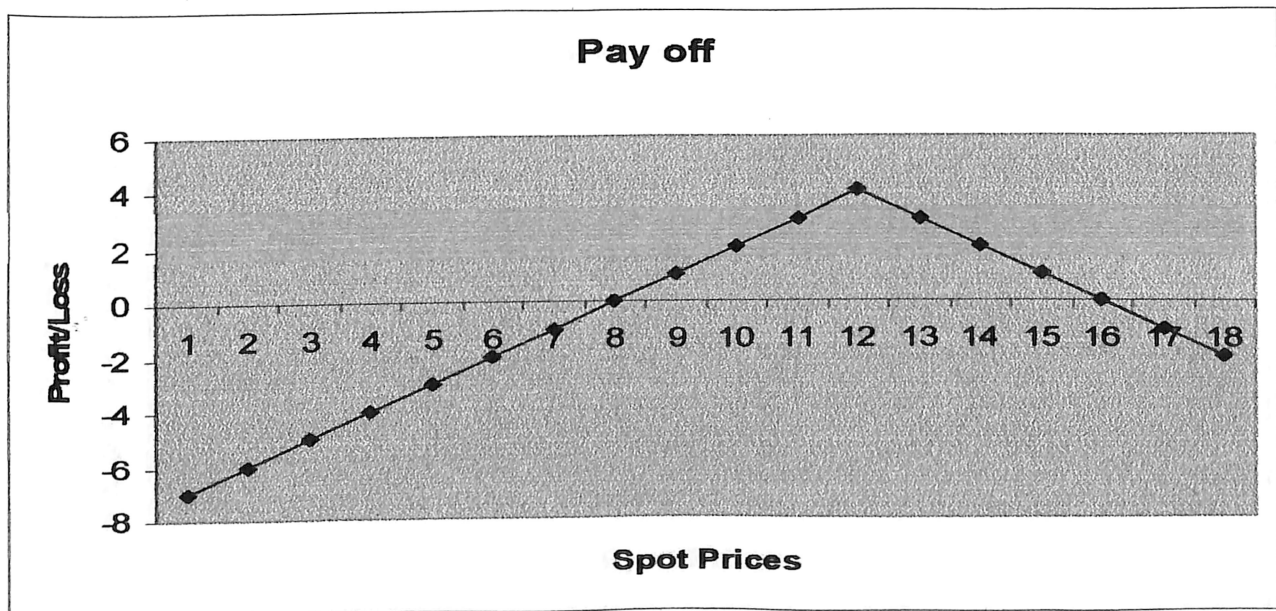
Spot(Rs)(Assumed)	Buy Call Rs12 @ Rs 2 (Pay off)	Buy Put Rs12 @ Rs 2 (Pay off)	Net Premium	Net Payoff
1	0	11	-4	7
2	0	10	-4	6
3	0	9	-4	5
4	0	8	-4	4
5	0	7	-4	3
6	0	6	-4	2
7	0	5	-4	1
8	0	4	-4	0
9	0	3	-4	-1
10	0	2	-4	-2
11	0	1	-4	-3
12	0	0	-4	-4
13	1	0	-4	-3
14	2	0	-4	-2
15	3	0	-4	-1
16	4	0	-4	0
17	5	0	-4	1
18	6	0	-4	2



Interpretation: Here the profits are unlimited but the losses are limited.

Options  
(Straddle Sale)

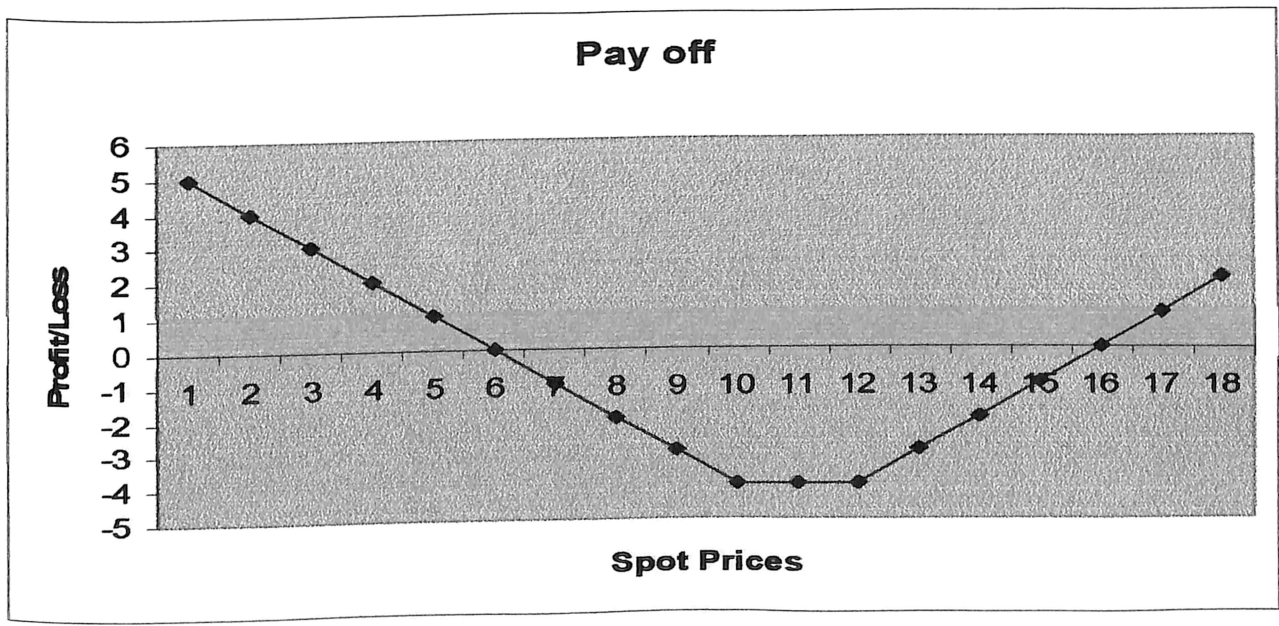
Spot(Rs)(Assumed)	Sell Call Rs12 @ Rs 2 (Pay off)	Sell Put Rs12 @ Rs 2 (Pay off)	Net Premium	Net Payoff
1	0	-11	4	-7
2	0	-10	4	-6
3	0	-9	4	-5
4	0	-8	4	-4
5	0	-7	4	-3
6	0	-6	4	-2
7	0	-5	4	-1
8	0	-4	4	0
9	0	-3	4	1
10	0	-2	4	2
11	0	-1	4	3
12	0	0	4	4
13	-1	0	4	3
14	-2	0	4	2
15	-3	0	4	1
16	-4	0	4	0
17	-5	0	4	-1
18	-6	0	4	-2



Interpretation: Here the profits are limited but the losses are unlimited.

Options  
(Long Strangle)

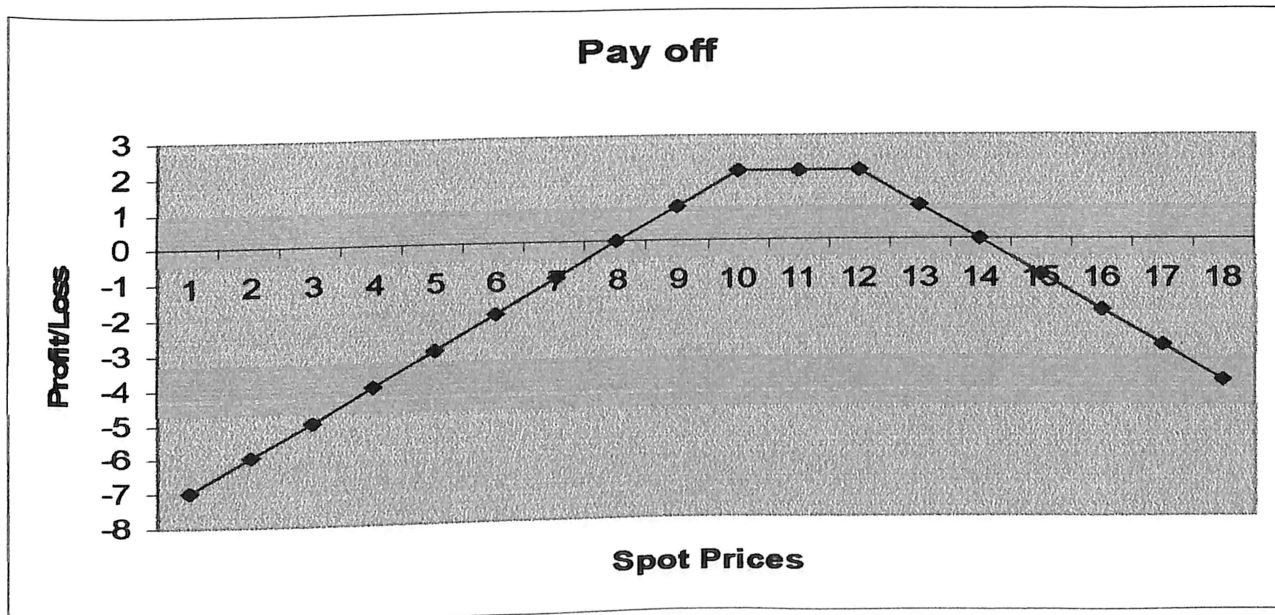
Spot(Rs)(Assumed)	Buy Call Rs12 @ Rs 2 (Pay off)	Buy Put Rs10 @ Rs 2 (Pay off)	Net Premium	Net Payoff
1	0	9	-4	5
2	0	8	-4	4
3	0	7	-4	3
4	0	6	-4	2
5	0	5	-4	1
6	0	4	-4	0
7	0	3	-4	-1
8	0	2	-4	-2
9	0	1	-4	-3
10	0	0	-4	-4
11	0	0	-4	-4
12	0	0	-4	-4
13	1	0	-4	-3
14	2	0	-4	-2
15	3	0	-4	-1
16	4	0	-4	0
17	5	0	-4	1
18	6	0	-4	2



Interpretation: Here the profits are unlimited but the losses are limited.

Options  
(Short Strangle)

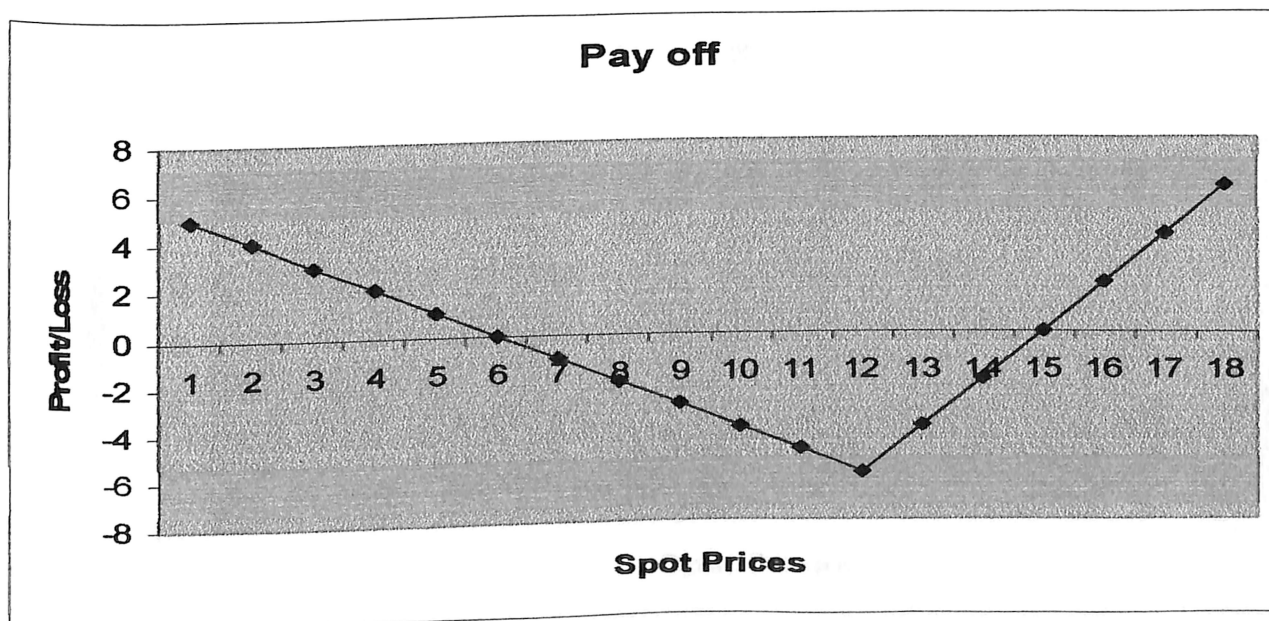
Spot(Rs)(Assumed)	Sell Call Rs10 @ Rs 2 (Pay off)	Sell Put Rs12 @ Rs 2 (Pay off)	Net Premium	Net Payoff
1	0	-11	4	-7
2	0	-10	4	-6
3	0	-9	4	-5
4	0	-8	4	-4
5	0	-7	4	-3
6	0	-6	4	-2
7	0	-5	4	-1
8	0	-4	4	0
9	0	-3	4	1
10	0	-2	4	2
11	-1	-1	4	2
12	-2	0	4	2
13	-3	0	4	1
14	-4	0	4	0
15	-5	0	4	-1
16	-6	0	4	-2
17	-7	0	4	-3
18	-8	0	4	-4



Interpretation: Here the profits are limited but the losses are unlimited.

Options  
(Strap)

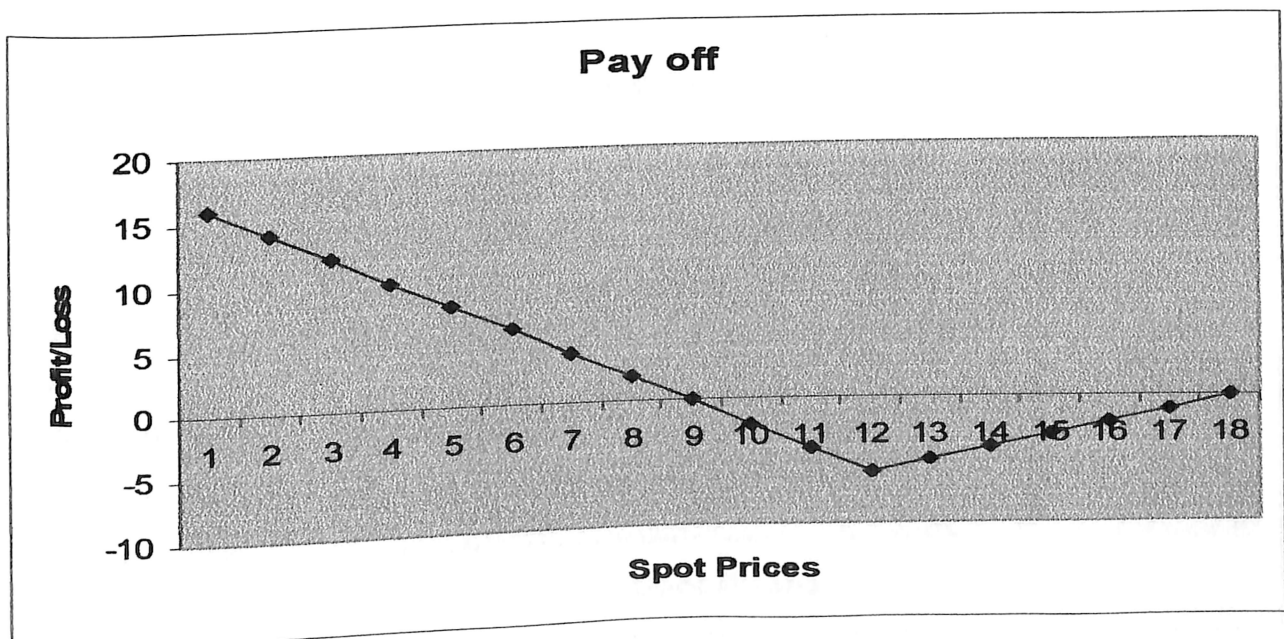
Spot(Rs) (Assumed)	Buy Call Rs 12 @ Rs 2(pay off)	Buy Call Rs 12 @ Rs 2(pay off)	Buy Put Rs 12 @ Rs 2(pay off)	Net Premium	Net Payoff
1	0	0	11	-6	5
2	0	0	10	-6	4
3	0	0	9	-6	3
4	0	0	8	-6	2
5	0	0	7	-6	1
6	0	0	6	-6	0
7	0	0	5	-6	-1
8	0	0	4	-6	-2
9	0	0	3	-6	-3
10	0	0	2	-6	-4
11	0	0	1	-6	-5
12	0	0	0	-6	-6
13	1	1	0	-6	-4
14	2	2	0	-6	-2
15	3	3	0	-6	0
16	4	4	0	-6	2
17	5	5	0	-6	4
18	6	6	0	-6	6



Interpretation: Here the profits are unlimited but the losses are limited.

Options  
(Strip)

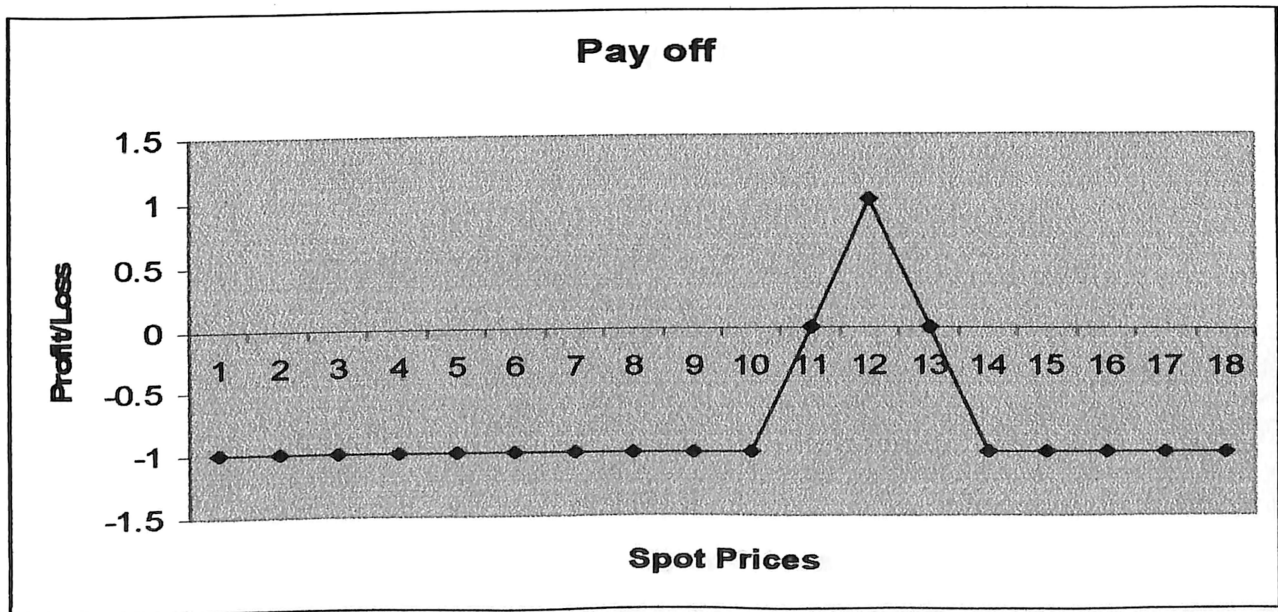
Spot(Rs) (Assumed)	Buy Call Rs 12 @ Rs 2(pay off)	Buy Put Rs 12 @ Rs 2(pay off)	Buy Put Rs 12 @ Rs 2(pay off)	Net Premium	Net Payoff
1	0	11	11	-6	16
2	0	10	10	-6	14
3	0	9	9	-6	12
4	0	8	8	-6	10
5	0	7	7	-6	8
6	0	6	6	-6	6
7	0	5	5	-6	4
8	0	4	4	-6	2
9	0	3	3	-6	0
10	0	2	2	-6	-2
11	0	1	1	-6	-4
12	0	0	0	-6	-6
13	1	0	0	-6	-5
14	2	0	0	-6	-4
15	3	0	0	-6	-3
16	4	0	0	-6	-2
17	5	0	0	-6	-1
18	6	0	0	-6	0



Interpretation: Here also the profits are unlimited but the losses are limited.

Options  
(Butterfly with Calls)

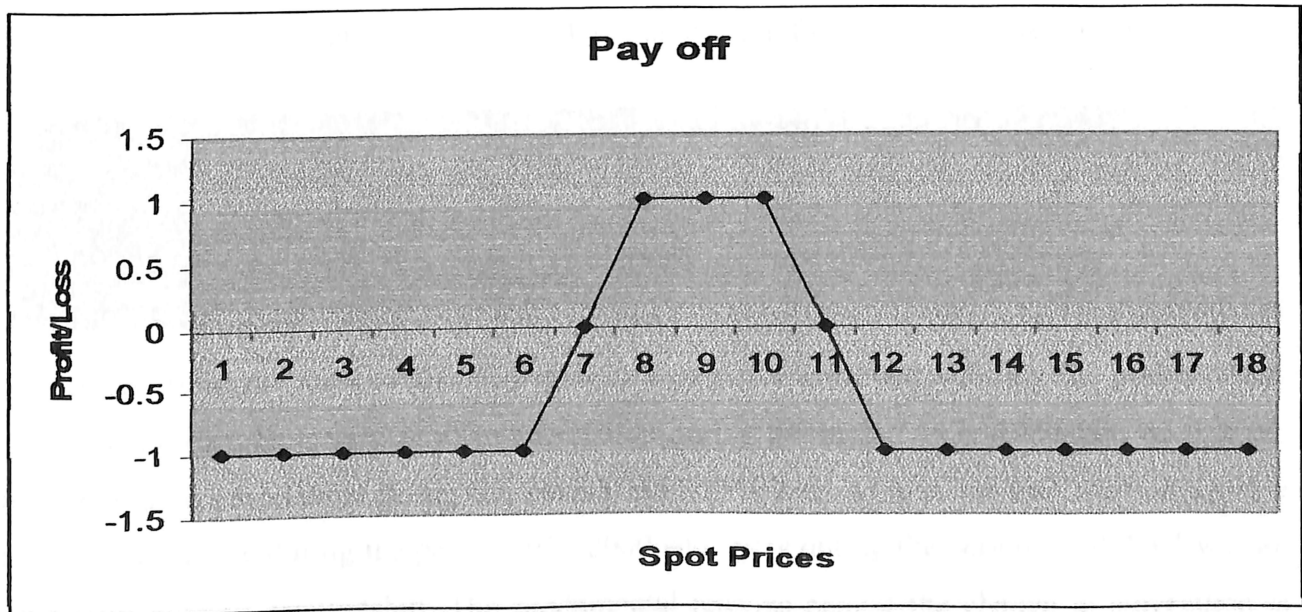
Spot(Rs) (Assumed)	Buy Call Rs 10 @ Rs 3(pay off)	Buy Call Rs 14 @ Rs 4(pay off)	Sell Two Call Rs 12 each @ Rs 3 each (pay off)	Net Premium	Net Payoff
1	0	0	0	-1	-1
2	0	0	0	-1	-1
3	0	0	0	-1	-1
4	0	0	0	-1	-1
5	0	0	0	-1	-1
6	0	0	0	-1	-1
7	0	0	0	-1	-1
8	0	0	0	-1	-1
9	0	0	0	-1	-1
10	0	0	0	-1	-1
11	1	0	0	-1	0
12	2	0	0	-1	1
13	3	0	-2	-1	0
14	4	0	-4	-1	-1
15	5	1	-6	-1	-1
16	6	2	-8	-1	-1
17	7	3	-10	-1	-1
18	8	4	-12	-1	-1



Interpretation: Here the profits and losses are limited.

Options  
(Condor with Calls)

Spot(Rs) (Assumed)	Buy Call Rs 6 @ Rs 3 (pay off)	Buy Call Rs12 @ Rs 4 (pay off)	Sell Call Rs 8 @ Rs 2 (pay off)	Sell Call Rs10 @ Rs 4 (pay off)	Net Premium	Net Payoff
1	0	0	0	0	-1	-1
2	0	0	0	0	-1	-1
3	0	0	0	0	-1	-1
4	0	0	0	0	-1	-1
5	0	0	0	0	-1	-1
6	0	0	0	0	-1	-1
7	1	0	0	0	-1	0
8	2	0	0	0	-1	1
9	3	0	-1	0	-1	1
10	4	0	-2	0	-1	1
11	5	0	-3	-1	-1	0
12	6	0	-4	-2	-1	-1
13	7	1	-5	-3	-1	-1
14	8	2	-6	-4	-1	-1
15	9	3	-7	-5	-1	-1
16	10	4	-8	-6	-1	-1
17	11	5	-9	-7	-1	-1
18	12	6	-10	-8	-1	-1



Interpretation: Here also the profits and losses are limited.

## Chapter 4

### Findings, Suggestions and Limitations

#### 4.1 Findings

Here we analyzed the 40 years (1968-2005) of crude oil and gold prices. For that what we did is that, we divided the 40 years period in the following years: (From 1968-1970), (From 1971-1980), (From 1981-1990), (From 1991-2000), (From 2001-2005) and tried to study these years separately. And this strategy paid off as because we could collect a lot of information from the price trends present in those following years.

Oil prices do have a strong correlation with gold since oil prices do have a tremendous impact on the world economy and so on financial markets. Since gold is money and trades like money it will react to inflationary pressures caused by rising oil prices since gold is the ultimate safe haven in times of economic weakness.

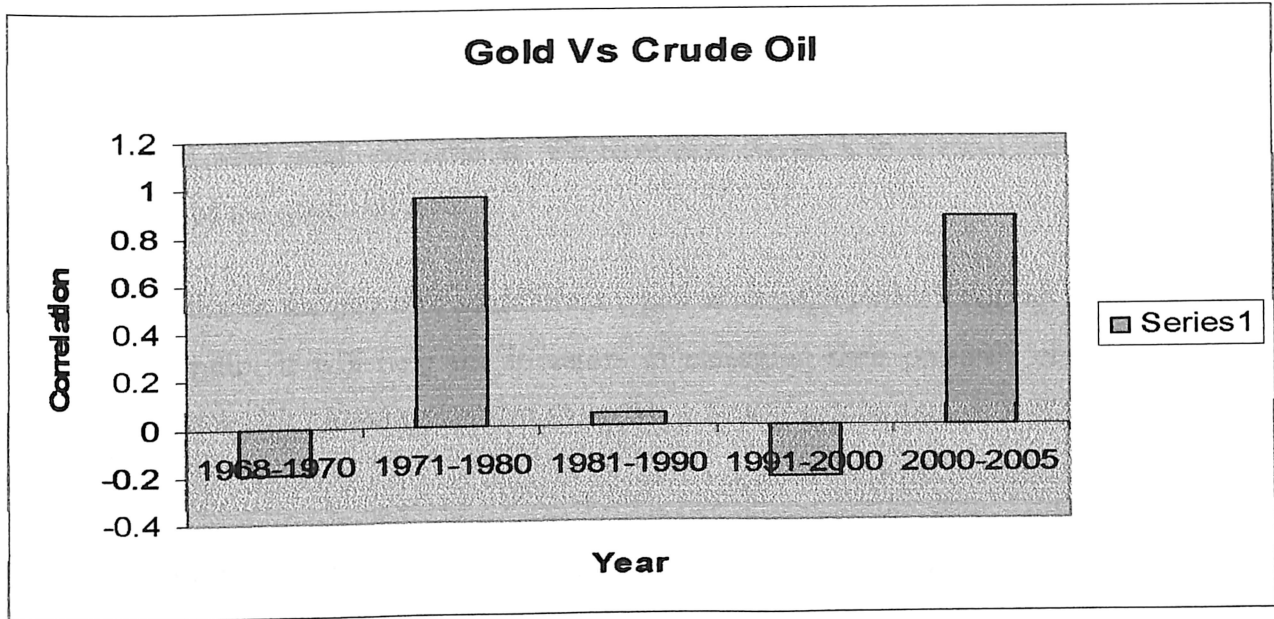
The overall correlation of crude oil and gold is quite positive but there are also periods with no correlation as well as negative correlation .This can be seen from the chart given below:

Year	Correlation (Crude Oil Vs Gold)
1968-1970	-0.19476
1971-1980	0.955951
1981-1990	0.04947
1991-2000	-0.21906
2000-2005	0.8656703

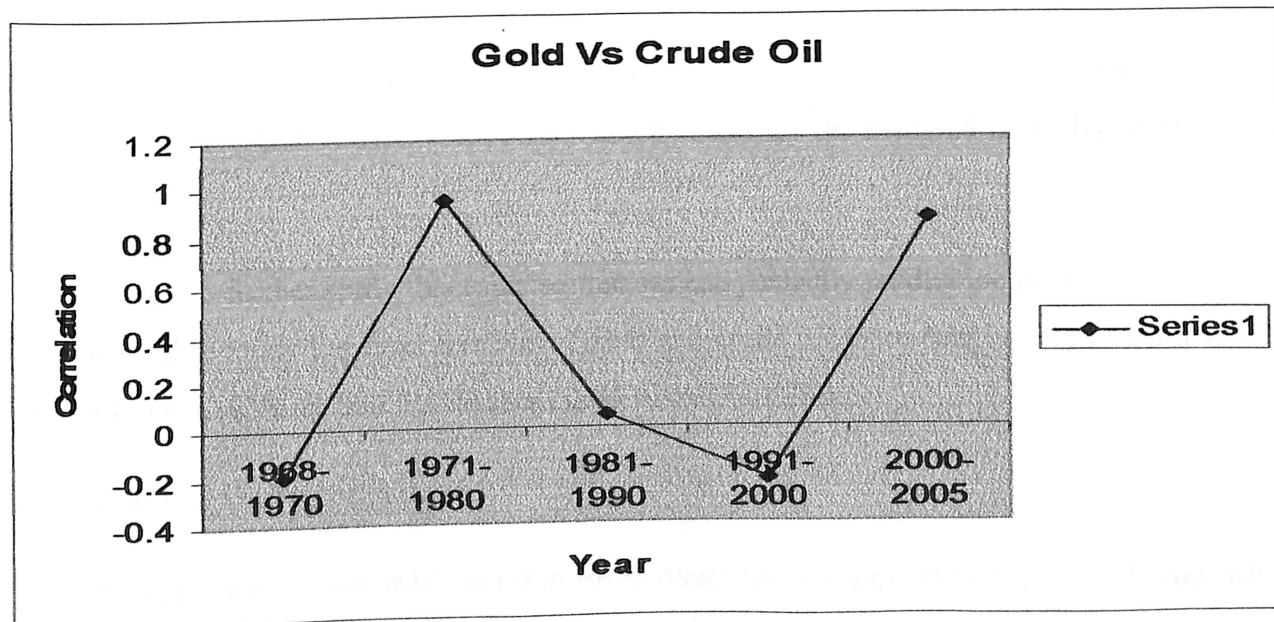
We can see from the above chart that there is a negative correlation during the period 1968-1970,then we can see a very positive correlation during the period 1971-1980,then we can see that there is no correlation during the period 1981-1990,then we can see that there is again a negative correlation during the period 1991-2000 and lastly during the period 2000-2005 we can see a very positive relationship .The fundamental reasons behind the change in correlation is being described in the earlier chapter i.e. "Analysis and Interpretation"

The different correlations mentioned above can be shown with the help of a graph as well:

**Bar chart**



**Line chart**



We also found out that there is a very strong correlation between oil and inflation. Actually higher oil prices leads to inflation and when the inflation rises we find that there is an increase in gold prices because purchasing gold minimizes the inflation risk .And therefore we find a very strong correlation between inflation and gold. Thus we can say that oil prices, inflation and gold prices are related to each other.

We also found what gold –oil ratio is. We have also shown it in a excel sheet and also have drawn a graph of the gold –oil ratio.

We have also drawn the pay offs of different types of strategies which will be using for trading the gold –oil ratio. It will help the investors in managing their portfolio as well as help in reducing the price risk (Assumption that the gold –oil ratio will be traded in the exchange in the near future).

So these are all the findings that we got from this research. The findings that we got will be very much useful for the researchers, students, scholars, traders, investors etc

## 4.2 Suggestions

There are many suggestions to be given but to point out a few, we should firstly develop a gold-oil ratio contract which if done can be very much useful for the mankind specially investors and traders.

Also we need to further study this topic so that we can perfectly predict the gold-oil relationship. We also need to study the fundamentals of gold and crude oil more deeply. Even then it will be practically impossible to find out an exact gold-oil relationship.

## 4.3 Limitations of the Study

- It is practically impossible to establish an exact relationship between gold and crude oil.
- Analysing the prices and trends may not be as easy as said as because there are ‘n’ number of factors governing oil and gold.
- Time constraint.

## Chapter 5

### Conclusion

5.1 From a fundamental and technical standpoint, the bullish case for gold and oil is extremely compelling.

5.1. a First, let's take a brief look at bullish oil fundamentals:

- Global oil demand is growing rapidly, and projected to keep growing dramatically for the next decade. China and India alone, representing over a third of the population of the planet, are industrializing rapidly and will need vast amounts of oil to fuel each of their billion people plus population economies.
- OPEC is operating at levels over 95% of maximum production. Only Saudi Arabia is thought to have significant capacity left, and even the Saudis have not upgraded oil infrastructure sufficiently due to the increasing cost of their domestic social problems.
- God forbid, if another war breaks out in the Middle East, oil is going stratospheric. The region, as always, is rife with tensions. Iraq hates Iran. Kuwait and Saudi Arabia fear both Iran and Iraq. Everyone in the region except Turkey would like to drive Israel into the sea and retake Jerusalem and the Dome of the Rock (the third most holy site in Islam).

5.1. b Now let's take a brief look at bullish gold fundamentals:

- Global gold demand is rising rapidly, fueled by everyday people living in the east who have seen firsthand the effects of hyperinflation and empirically realize gold is the ultimate refuge in financial and political storms.
- The annual rate of increase in the global mined supply of gold has continued to dwindle. At recent prices, most mines in the world are unprofitable and many are being mothballed.

So prices of both gold and crude oil seem to be bullish and are likely to continue to move up in the near future and also that there is a very positive relationship between gold and crude oil.

## References

### Books:

- **Gold: History and Genesis of Deposits by Robert W. Boyle**
- **How You Can Profit from Gold by James E. Sinclair, Harry D. Schultz**
- **Crude: The Story of Oil by Sonia Shah**

### Articles:

- **Adam Hamilton's article "Gold/Oil Ratio Extremes 3"**
- **Dr. Jude Wanniski's article "Gold Vs Crude Oil"**
- **Adam Hamilton's article "Gold Boiling in Oil"**
- **Howard Simons's article "Oil-Gold and Other Uncorrelated Trades"**
- **Prashant Srivastava's article "'Gulf effect' makes gold dearer"**

### Internet Sites:

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- **[www.nymex.com](http://www.nymex.com)**
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