

## **Long run Relationship among Oil, Gold and Stock Prices in Pakistan**

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### **Abstract**

Investors do not behave rationally and herding behavior is observed in their reactions to price changes. In imperfect markets, prices change in trends and these changes are termed as non random. Results of this study showed that in Pakistan Equity, Oil, and Gold Market have no long run relationship. Long run relationship was examined using Jhonson and Julius Co-integration Approach and data was used from year 2002 to 2010. Results clearly suggested that no long run relationship exists among these sectors of the economy.

**Key words:** Oil prices, Gold prices, Stock prices, Long run relationship, Pakistan.

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### **Introduction**

This paper aimed to explore the relationship among oil prices, gold prices and equity prices in Pakistan. Oil prices play an important role in determination of prices in different industries. Oil price is important factor to determine the industrial production which ultimately leads to equity market prices. Oil prices affect all the sectors of economy directly or indirectly. Oil prices will become the reason for changes in earning levels of the industries and companies in an economy. Increase in oil prices leads towards the decline of the earnings of company which ultimately leads towards the decline in stock price of that company. Strong evidence supports the rational of relationship between stock prices and oil prices innovations. Hassan and Nasir (2008).

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Similarly gold prices are supposed to become the attractive sector in the time of negative stock market returns. Gold prices reflect the relationship between inflation and interest rates which ultimately leads the pressure towards the equity market prices Kolluri (1981).

However, there are studies supporting the evidence of market imperfections in Pakistani equity market. Irshad and Sarwar, (2013), Nawaz et. al.(2013). There are many studies reporting existence of weak form efficiency in equity market of Pakistan. These studies support the opinion of technicians who claims to earn above average returns by predicting future patterns of prices. Omar et. al. (2013).

### ***Overview of Karachi Stock Market***

In Pakistan there are currently three stock exchanges: Karachi Stock, Lahore Stock Exchange and the Islamabad Stock Exchange. Among these three stock exchanges Karachi stock Exchange is the largest in terms of its market capitalization and number of listed companies. In Pakistan many steps has been taken by the government to attract the investors and to make the market most investors friendly. However, political instability has always been the disturbing factor for the Karachi Stock Market. In Karachi Stock market companies are listed in 35 different sectors. Karachi stock market has shown remarkable performance in previous years. However, KSE returns are found to have higher volatility as compared to other South Asian Countries Equity Markets. (Hussain et. Al. 2012). In Karachi Stock Market there are more than 651 listed companies, representing 35 different sectors and total members of 200 in first decade of 21st century (KSE, 2011). Karachi Stock Market is the oldest and largest equity market in Pakistan. In Karachi Stock Market, KSE 100 index is the most commonly used index to evaluate the overall market performance. As the figures reported by KSE officials in year 2010 total volume in KSE was 12 billion US\$ and total market Capitalization of 32.5 billion US\$ (KSE, 2011).

### ***Gold Prices in Pakistan***

In Pakistan Gold Prices has shown continuous increase from last many years. Gold Prices in Pakistan has crossed the limit of Rs. 40 thousand in 2010 and later on it went to above Rs. 55 thousand per Tola. This effect of increase in gold prices was also observed in international gold markets in these years. (Forex, 2011). Investors are attracted towards those sectors of the economy where increase in prices shows a continuous trend. Investors try to exploit the rise in price by putting their funds in those sectors of the economy. It was a similar trend which was observed in real estate during the period of 2000 to 2008. Increase in Gold Prices in Pakistan was the result

of rise in gold prices in international equity market. However, it is difficult to segregate the isolated effect of change in gold prices due to international rise in gold price and other factors.

### ***Oil Prices in Pakistan***

In Pakistan it is observed that cost of production is directly influenced by the changes in the oil prices. Energy is the major cost of production in manufacturing and agriculture sector of the Pakistan. In Pakistan the major revenue of the economy depends on textile and agriculture sector and cost of production in these sectors is greatly affected by the changes in oil and gas prices. Empirical evidence exists on the relationship between oil prices, and corporate profits in Pakistan. (Hassan and Nasir, 2008)

## **Literature Review**

### ***Relationship between Oil Prices and Stock Market***

Oil prices shocks in 1973 become the reason why many research studies focused the area of oil prices in recent past. These studies focused on relationship of oil prices with macroeconomic events in different periods focusing different economies of the world. Most of these studies reported negative relationship among oil prices and macroeconomic variables like Pierce and Enzler (1974), Rasche and Tatom (1977), and Draby (1982). Several other studies like Hickman et al. (1987), Jones and Leiby (1996), Hooker (1999), Hammes and Wills (2003) and Leigh et al. (2003) also reported inverse relationship among oil prices and macroeconomic variables.

Many of these studies reported inverse relationship; there are few studies reporting the interrelationship among oil prices shock and equity market returns. Many of the previous studies focused just on the relationship of oil prices and macroeconomic variables in developed countries of the world. There is still a need for the studies which particularly focus on this relationship in emerging economies of the world. Jones and Kaul (1992) reported their results regarding the relationship of stock returns with oil prices shock in US. Their study covers the relationship of oil prices and the lagged values of oil prices with stock market returns.

Haug et al. (1996) reported the reaction of US equity market as response to Oil price shocks. Evidence of oil prices shocks on equity prices was found, however, no evidence of equity prices on oil prices was observed. Their study reported

unidirectional relationship between these two variables. Gjerde and Sættem (1999) demonstrated that positive relationship exists between equity prices and oil prices. Their study reported that there exists positive relationship but it was also observed that equity market returns have a positive and delayed reaction to variations in industrial production and that the equity prices respond rationally to oil price shocks in the Norwegian market. Sadorsky (1999) reported that oil prices are an important factor in predicating equity market movements.

An important point to be noticed in all of these studies is that strong evidence of interrelationship among these variables is observed in many of the previous studies. Our contention here is that results of the studies reporting relationship in one country cannot be generalized in the economic settings of other countries. That is the first reason why such relationships are investigated in other economies of the world. Secondly, Economic conditions of any country are dynamic and there is always a time gap which needs to be addressed by the studies.

#### ***Relationship between Gold Prices and Stock Market***

Kolluri (1981) reported that gold prices are associated with inflation rate and these inflationary changes are ultimately reflected in interest rates. Changes in interest rates finally became the reason of volatility in equity market prices. The results of the Mahdavi and Zhou (1997), Blose and Shieh (1995), found that gold is now subject to inflation pressure.

Moore (1990) found the evidence of inverse relationship between gold prices and capital markets from 1970 to 1988. Büyüksalvarcı, A. (2010) reported the similar findings and reported that CPI, interest rates, gold prices, industrial production, oil prices, exchange rate and money supply are interrelated. His study suggested that in Turkey Gold investment is an attractive investment opportunity. In Turkey Gold prices were found to be the inversely related with stock market returns.

Sharma & Mahendru (2010) demonstrated that in Indian economy exchange rate and gold prices affect the stock prices. His study covered the period of January 2008 to January 2009 addressing macroeconomic events and equity market prices. Wang, Wang and Huang (2010) reported that in countries like USA, Germany, Japan, China, Canada and Taiwan oil prices, exchange rate and gold prices are related to equity market prices. Graham (2001) demonstrated that in short run, equity market prices are related with gold prices but in long run no such relationship was observed.

### ***Relationship between Oil and Gold Prices***

If we discuss the relationship between oil prices and gold prices there seems to exist no direct relationship. However, if we examine this relationship in an inflationary environment, the relationship becomes clear. In fact general price level is directly fluctuated with the changes in the oil prices. Any upward or downward pressure on oil prices is ultimately reflected in general level of prices in any country. Rise in oil prices means rise in general level of prices. (Hooker, (2002), Hunt (2006). The link between gold prices and oil prices is connected through the general level of prices in the economy. Any upward pressure in oil prices will increase the general level of prices and it finally raises the prices of gold in the economy. However, in some of the previous studies like Melvin and Sultan (1990) a different opinion is given regarding this relationship. The nature of relationship between oil and gold prices is same as other studies identified. However, they contend a different channel for the relationship between oil and gold prices. Their idea was to test this relationship with the use of export revenue. They argue that gold being an important and significant part of the international reserves of oil exporting countries; establish the relationship with oil prices. They further argue that any rise in prices of oil prices will ultimately raises the prices of gold.

### ***Hypotheses***

H1: There exists Long run relationship between oil prices and stock prices in Pakistan.

H2: There exists Long run relationship between Gold prices and stock prices in Pakistan.

H3: There exists Long run relationship between oil prices and Gold prices in Pakistan.

### **Data and Methodology**

This study covers the monthly data for gold prices, oil prices and stock prices. Data used in the study covers the period from year 2002 to 2010. Monthly stock price data of Karachi Stock market is used as proxy for stock prices from year 2002 to 2010.

### ***Stock Market Returns***

$$MI_t = \ln (MI_t / MI_{t-1})$$

Where:  $MI_t$  is Return for month 't'; and  $MI_t$  and  $MI_{t-1}$  are closing values of KSE- 100 Index for month 't' and 't-1' respectively.

***Oil Price Returns***

$$OP_t = \ln(OP_t/OP_{t-1})$$

Where:  $OP_t$  is Return for month 't'; and  $OP_t$  and  $OP_{t-1}$  are closing values of Oil Prices for month 't' and 't-1' respectively.

***Gold Price Returns***

$$GP_t = \ln(GP_t/GP_{t-1})$$

Where:  $GP_t$  is Return for month 't'; and  $GP_t$  and  $GP_{t-1}$  are closing values of gold prices for month 't' and 't-1' respectively.

Many techniques are used to explore the long run relationship between times series. In this study we used the following techniques to explore the relationship between stock prices, gold prices and equity market prices.

1. Correlation matrix
2. Co integration tests
3. Granger causality test
4. Impulse response analysis
5. Variance decomposition analysis

Co integration is used to explore the long run relationship among different time series. Co integration requires that all the series should be integrated at same level. For testing the stationarity of data unit root test is used. The null hypothesis for ADF test PP test estimates the existence of unit root in AR model. Augmented Dicky Fuller test requires that error terms should be independent statistically and their variance should be constant. Furthermore, Phillip Peron test is used where this strict assumption is relaxed. This can be represented mathematically by

$$Z_t = \alpha_0 + \alpha_1 Z_{t-1} + \alpha_2 \{t - T/2\} + u_t$$

Test statistics for the regression coefficients under the null hypothesis that the data are generated by  $Z_t = Z_{t-1} + u_t$ , where  $E(u_t) = 0$ .

If any variable is stationary initially at level it may become stationary after first differencing. If different series are integrated at I (1) then their existence of their linear combination will be termed as co integrated.

## Results

### *Correlation*

	<b>KSE 100</b>	<b>Oil Prices</b>	<b>Gold Prices</b>
KSE 100	1	0.207851	-0.03862
Oil Prices	0.207851	1	0.190822
Gold Prices	-0.03862	0.190822	1

Correlation identifies the degree of association between two variables and identifies the direction of the association between variables. Correlation simply gives the strength of relationship and identifies the direction of relationship. Correlation is found weak and positive between oil prices and stock returns in Pakistan from 2002 to period 2010. However, Gold prices are showing negative weak relationship. It shows that investors move their funds from Equity Market to Gold in the periods of stock market downfalls and re-invest in equity market if gold prices show negative returns. Relationship between Gold Prices and Oil Prices is also weak but positive. It shows that Oil Prices and Gold prices move in similar direction.

### *VAR Lag Order Selection*

Months	0	1	2	3	4	5	6	7	8	9	10	11	12
SC	2.28	-7.21	-6.98	-6.83	-6.60	-6.31	-6.07	-5.83	-5.58	-5.32	-5.07	-4.81	-4.5

(SC: Schwarz information criterion)

Before using Co-integration analysis proper lag length is necessary to be determined. For this purpose Schwarz Information Criteria is used. Lag Length is confirmed in the month where Value of SC is found minimum. According to results SC value is -7.21 at one month lag.

*Unit Root Test*

Series Name	ADF Level	ADF First Diff.	PP Level	PP First Diff.
KSE 100	-0.83346	-8.07754	-0.90689	-10.3106
Oil Prices	-1.38549	-6.0138	-1.27542	-8.86015
Gold Prices	1.066461	-8.84959	0.986297	-10.9822
Critical values				
1 %	-3.48122	-3.48162	-3.48082	-3.48122
5 %	-2.88375	-2.88393	-2.88358	-2.88375
10 %	-2.57869	-2.57879	-2.5786	-2.57869

Co-integration requires data to be stationary and secondly data should be stationary at same level. Data stationarity means that series should not effect from its previous lagged terms. Data should be random in order to accurately predict the long run relationship. For this purpose Unit root test is used. Augmented Dicky Fuller Test and Phillip Peron Tests are used. Results showed that data was non stationary at level but becomes stationary after first differencing.

*Co-integration***Unrestricted Cointegration Rank Test (Trace)**

No. of CE(s)	Hypothesized	Trace	0.05	Prob.**
	Eigenvalue	Statistic	Critical Value	
None	0.164894	27.18099	29.79707	0.0973
At most 1	0.028071	3.755464	15.49471	0.9223
At most 2	0.000415	0.053977	3.841466	0.8163

*Unrestricted Co integration Maximum Eigen Value Test*

No. of CE(s)	Hypothesized	Max-Eigen	0.05	Prob.**
	Eigenvalue	Statistic	Critical Value	
None *	0.164894	23.42552	21.13162	0.0234
At most 1	0.028071	3.701487	14.2646	0.8894
At most 2	0.000415	0.053977	3.841466	0.8163

Co-integration is used to identify the long run relationship among different variables. Co-integration will exist among different series when series have lead lag relationships. Co-integration assumes that a series should be stationary and all the series must be integrated at same level. Results of co-integration test found no



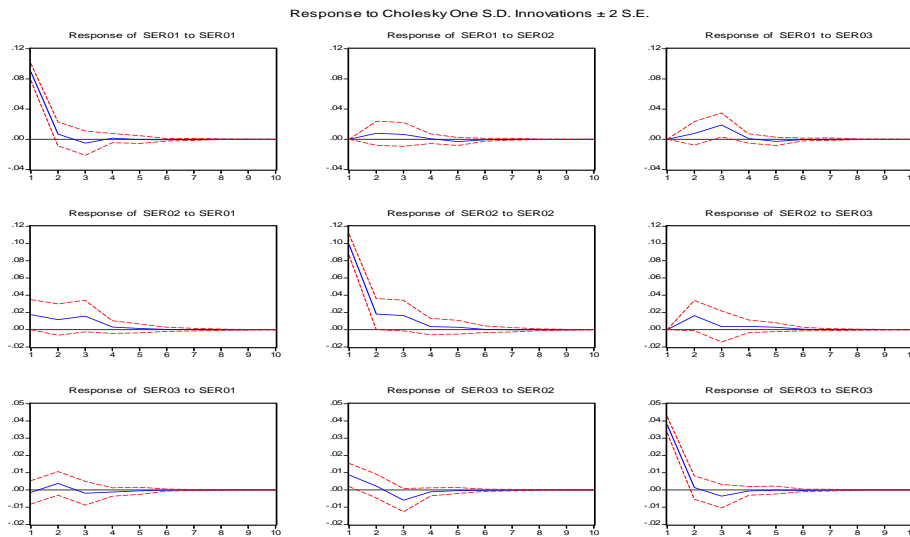
evidence of long run relationship among Gold, Oil and Stock Prices. Results of Co integration Rank Test shows that gold prices, oil prices and equity market prices are not integrated in the long run. However, results of Maximum Eigen Value Test showed one co-integrating equation. To further explore this relationship granger causality is used.

**Granger Causality**

Null Hypothesis:	Obs	F-Statistic	Probability
$\Delta$ Oil Prices does not Granger Cause $\Delta$ KSE 100	131	1.68383	0.19675
$\Delta$ KSE 100 does not Granger Cause $\Delta$ Oil Price		1.23475	0.26857
$\Delta$ Gold Price does not Granger Cause $\Delta$ KSE 100	131	1.40129	0.2387
$\Delta$ KSE 100 does not Granger Cause $\Delta$ Gold Price		0.55513	0.4576
$\Delta$ Gold Price does not Granger Cause $\Delta$ Oil Price	131	3.08045	0.08163
$\Delta$ Oil Price does not Granger Cause $\Delta$ Gold Price		0.00613	0.93769

Co-integration provides us the evidence of existence or non-existence of long run relationship among different time series. It provides us the evidence just about the relationship existence but it does not identify that which market leads the other series. Results of co-integration test reported the absence of any long run relationship and granger causality also reported absence of causality from any series to the other series.

**Impulse Response Function**



(Ser01, Ser02 and Ser03 represent KSE 100, Oil Prices and Gold Prices)

Impulse Response Function measures the standard deviation in a series due to one standard deviation change in other series. Results of impulse response function reported that stock prices in Karachi stock market are not affected by the oil and gold prices. Results indicate that stock prices changes in KSE are mainly due to change in its own lagged values. These results are same as reported by co integration. In case of Oil Prices and gold prices results are showing similar trend. Results indicated that changes in these three series are due to changes in their own lagged values and deviation due to other series in not considerable.

### *Variance Decomposition*

Variance Decomposition of KSE 100:

<b>Period</b>	<b>S.E.</b>	<b>KSE 100</b>	<b>Oil Prices</b>	<b>Gold Prices</b>
1	0.089177	100	0	0
2	0.090141	98.4716	0.769825	0.758576
3	0.092488	93.8425	1.222257	4.935242
4	0.092508	93.82876	1.228213	4.943023
5	0.092602	93.63972	1.334825	5.025452
6	0.092607	93.63429	1.339503	5.026202
7	0.092608	93.63409	1.339498	5.026412
8	0.092608	93.63397	1.339527	5.026507
9	0.092608	93.63389	1.339555	5.026559
10	0.092608	93.63389	1.339555	5.026559

Variance Decomposition of Oil Prices:

<b>Period</b>	<b>S.E.</b>	<b>KSE 100</b>	<b>Oil Prices</b>	<b>Gold Prices</b>
1	0.099932	3.063799	96.9362	0
2	0.103519	4.131074	93.37713	2.491799
3	0.106069	6.162797	91.3428	2.4944
4	0.106245	6.225827	91.15355	2.620621
5	0.106334	6.234768	91.07327	2.691961
6	0.106338	6.236354	91.06807	2.695574
7	0.106338	6.236437	91.06799	2.695571
8	0.106338	6.236451	91.06798	2.695571
9	0.106338	6.236456	91.06797	2.695572
10	0.106338	6.236457	91.06797	2.695573

## Variance Decomposition of Gold Prices:

Period	S.E.	KSE 100	Oil Prices	Gold Prices
1	0.038773	0.130709	5.004459	94.86483
2	0.039048	1.081414	5.262337	93.65625
3	0.039707	1.283386	7.329151	91.38746
4	0.039745	1.373155	7.391055	91.23579
5	0.03975	1.390387	7.396864	91.21275
6	0.039751	1.390678	7.39839	91.21093
7	0.039751	1.390755	7.398798	91.21045
8	0.039751	1.390769	7.398797	91.21043
9	0.039751	1.390769	7.398803	91.21043
10	0.039751	1.39077	7.398803	91.21043

Variance Decomposition decomposes the variance and identifies the percentage variance in a series due to its own variance and percentage variance due to the other series. Variance decomposition is analyzed separately for KSE 100 index, Oil Prices and Gold Prices. Results reported that most of the variance in KSE 100 index, Oil Prices and Gold Prices is mainly because of their own innovations and changes. However, it is observed that minimum 93 percent variance in KSE 100 is due to its own innovations and maximum of 5 percent of variance in KSE is observed due to Gold Prices at any particular time period. Results of variance decomposition of Oil Prices and Gold Prices are showing similar behavior. It is observed that most of changes in Oil Prices and Gold Prices and mainly because of their own price changes and innovations. However, it is noticed that KSE brings approximately 6 percent variance in Oil prices and Oil prices brings approximately 7 percent variance in gold prices at any particular time period during the period from 2002-2010 in Pakistan.

### Conclusion

Investors do not behave rationally and they herding behavior is observed in their reactions to price changes. In imperfect markets prices changes in a trend and these changes are termed as non random. Results of this study clearly showed that in Pakistani Equity Market, Oil Market and Gold Market, there is no existence of long run relationship. Equity Market, Oil Market and Gold Market are the major sectors where investors can escape from maturity risk and reinvestment risk. Liquidity and Marketability in these sectors is high as compared to real estate. No long run relationship in these sectors encourages investors to allocate their funds in these

sectors in order to control their risk. Results of this study suggest that changes in KSE, Oil Prices and Gold Prices do not co vary and investors can allocate their funds across these sectors.

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