

Investigating the Relationship between price Fluctuations of gold with Stock Exchange Indices Empirical case: Tehran Stock Exchange

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Abstract: Efficient financial markets are a feature of developing countries. One of the most important economic sectors is capital market; therefore development of the capital markets can play an important role in the growth of national income and welfare. Many various factors influence on information formation and market parties views as well as stock price of the companies. Meanwhile, gold price is regarded as an important and influential variable in stock indices. In this paper, the relationship between gold price fluctuations and Tehran stock exchange indices is investigated using seasonal data within 2002-2010. Calculations were done using Eviews software. Correlation coefficient test, Granger causality test, Dicky Fuller test, and Phillips–Perron test are used in this paper in order to answer research questions. Results indicate that there is negative correlation between gold price fluctuations and Tehran stock exchange indices.

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1. Introduction

Gold has been always regarded as a valuable and expensive metal. It's been for thousands of years that this metal has outstanding role in economical and social progression of societies. Prominent value of gold according to its weigh and bulk, its non-oxidation against weather, its divisionary without value losing and its standard are among dominant features of gold. In 19th century the gold was used as money but alongside with paper and credit money currency, usage of gold as current money decreased down. Nevertheless, the gold has maintained its status in economical and political struggles as a rival for current monies and their alternative. (Sarfaraz & Afsar, 2005).

Gold global price index is among the most important indices in political and social factors around the world. (Abbasian, 2008).

In time of war, revolution and severe inflation, current money of a country cannot play its role as value treasure, since states edit unfunded monies for providing war expenses. Money increasing and product decreasing and state resources digression from welfare products to war products lead to inflation and decreasing of money value. In this time, people buy gold for maintaining their wealthy value which its value goes up with inflation. Gold has been accepted as money or money similar due to its high liquidity power in global level. (Sarfaraz & Afsar , 2005).

In economical improvement stream, importance of capital as a significant factor of production is increases up. This leads to policies for attracting capital. Among most important policies of developed countries is extending capital markets and encouraging foreign investors. Capital market is so important due to unit inflation effects comparing to money market.

In fact, awareness of effective factors on stock market can help to investor's investment direction in capital market. Global price of gold is an important variable in international monetary changes and has been effective on main economical variables such as stock indices. This research analyses the relation between gold price and Tehran stock market indices.

2. Previous Research

Basile and Joyce (2001) used causality test in order to study dynamic relationship between stock price index and land price index as well as some macroeconomic variables such as industrial products, money stock, commercial and construction lending in a vector self correlation (VAR) for Japan economy. They found there is bubble between stock asset market and land market. Existence of bubble can be attributed to variables of money, bank loaning and real estate sector.

Ibrahim and Aziz (2003) have analyzed the relation between four main economical variables and the prices of Malaysian stock market .Experiential

documents, show existence of long-term relation between these variables and stock prices and considerable counter influence in short-term. Particularly it reflects positive long-term and short-term relation between stock prices and two main economical variables. However, the rate of exchange has reverse relation with stock prices. The results in money providing show positive influence on pecuniary increasing in short-term and it's negative influence on stock prices in long-term.

Lawrence (2003) by using seasonal data of London gold price from January 1975 until December 2001 had realized that there is affirmative Correlation between gold price returns and changes of some main economical variables such as inflation, Gross Domestic Product (GDP) and profiting rate.

Maghyereh and Al-kandari (2007) have examined the relation between oil prices and stock market in member states of Gulf Cooperation Council (GCC). Former researches showed that there is no relation between oil prices and efficiency of Gulf Cooperation Council (GCC) stock market. The result of this could have been that former research only had applied liner relation, while this research has applied non-liner co integration analysis. The research results showed that oil price has great influence on stock price indices in GCC states in non liner model. Therefore, statistical analysis in this research definitely supports the non liner model of relation between oil and economy.

Liu and Shrestha (2008) have examined the relation between Chinese stock market variables and a complex of main economical variables such as money providing, industrial production, inflation, exchange and profiting rate. The results show that cointegrating relation between stock prices and main economical factors are existed in Chinese stock market. More specific analyze shows that stock market action in long-term has positive relation with macro economy.

Shabri Abd et al (2009) have examined what the main effective economical factors on Islamic stock market In Malaysia on deterioration period were. The results showed that real effective exchange rate, M3 money providing, Treasury Bill Rate (TBR), and Federal Fund Rate (FFR) are suitable goals for government to concentrate in order to balancing Islamic stock market and capital flowing encouraging. According to the relation between profiting rate and stock efficiency, this research concludes when the profiting rate increases up, disregarding of domestic or external, Muslim investors demand more Shari'ah stocks which lead to stock prices increasing.

Adjasi (2009) has an examination on influence of non-confidence in main economical factors on stock price fluctuations on Ghana. Findings show that more fluctuations in Cacao prices and interest rate,

increases fluctuations of stock price, as while as high fluctuations on gold prices, decrease oil prices and money providing and price fluctuations.

3. Research Questions

- I. What is the relationship between gold fluctuations and TEPIX?
- II. What is the relationship between gold fluctuations and industrial index?
- III. What is the relationship between gold fluctuations and TSE-50-AVE Index?
- IV. What is the relationship between gold fluctuations and TEDPIX?

4. Variables

4.1. Dependent Variable:

4.1.1. Index

Index literally in Persian means a tool for discriminating two phenomena. Statistically it denotes a quantity used for comparison of magnitude of one or more variables. If we want to compare different socioeconomic phenomena and investigate the respective changes, Indices are used.

In summary, capital market indices are used for following purposes (Brown & Reilly, 2002):

As criteria for evaluating performance of investment professional managers

Prediction of market future moves (by technical analyzers)

Measuring assets systematic risk

Stock price indices are usually classified according to two characteristics:

Weighting method

Averaging method

In weighting method, indices can be categorized into three categories:

Weightless price index

Price indices with equal weight

Price indices with weight equal to stock market value

Stock Indices in International Field

As it was mentioned, there are three methods of weighting in calculating market index. Dow Jones Industrial Average index which is the oldest and one the most common indices in New York stock, is a weightless price index (Bailey, Alexander & sharp, 1999).

Nikkei 225 which is the most common stock market index in Japan is also calculated in a similar way to Dow Jones index.

Standard & Poor's 500 (S&P500) index is one of the indices commonly used by institutional investors which is calculated in weighted value average method in 500 top stocks. S&P also calculates value of weighted indices for industrial, transportation, welfare industries and public and

financial service stocks (Bailey, Alexander & sharp, 1999)

Many indices are developed in USA for measuring stock price performance. New York Stock Exchange Index (NYSE), Amex Index and Wilshire 5000 Stock Index are among these indices (Elton & Gruber, 1995).

In most countries, indices are measured based on total stock value and values of industries stocks or different economic sectors. Such indices can be used for identification of the domestic market moves and more importantly, for comparison of markets performance. Financial Times-Stock Exchange 100 Index (Foot Sie) in London Stock market, Nikkei 225 in Tokyo stock market and TSE 300 in Toronto stock market are among those indices.

Calculation of Tehran Stock Exchange Indices

4.1.2. TEPIX

This index indicates total market price changes and is calculated as weight average using following formula:

$$TEPIX_t = \frac{\sum_{i=1}^n P_{it} q_{it}}{D_t} \times 100$$

Where,

P_{it} : ith firm price in time t

q_{it} : The number of stocks by ith firm price in time t

D_t : Basic value in time t which is equal to $\sum p_{i0} q_{i0}$ in source time

P_{i0} : ith firm price in source time

q_{i0} : The number of stocks by ith firm price in source time

n : The number of the firms included in the index

4.1.3. Industrial Index

Its calculation formula is similar to TEPIX and indicates change in stock value of industrial firms and it is calculated separately for every industry.

4.1.4. TSE-50-AVE Index

This index shows general level of price of 50 more active firms in Tehran stock market which is calculate by two different methods: simple average is used in the first method, and the second method is similar to the method used for TEPIX calculation leading to calculation of index of 50 more active firms (balanced average).

Top firms are identified according to one or more of following criteria:

Stock liquidity power meaning its high rate of interactions

Extent of firm influence on the market or its share in market current value

Firm status in terms of financial ratios, especially its profitability per stock

In Tehran stock market, top firms are identified based on a combination of and extent of firm influence on the market. It is done within framework of following three criteria:

Trades in transaction forum including:

The number of exchanged stocks

The value of exchanged stocks

Frequency of stock exchange in transaction forum including:

The number of trading days

Trades frequency

Variables of impact on the market including:

Average number of issued stocks

Average of current value of firm stock in study period. (Raei, 2005)

4.1.5. Tehran Exchange Dividend Price Index (TEDPIX)

Changes in this index indicate total return of the stock which is influenced by price changes and return for cash payments. Its way of weighting and calculation is similar to TEPIX except that they are different in adjustment method.

$$TEDPIX_t = \frac{\sum_{i=1}^n P_{it} q_{it}}{RD_t} \times 100$$

Where,

P_{it} : ith firm price in time t

q_{it} : The number of stocks issued by ith firm price in time t

RD_t : Basic price index and cash returns in time t and it is equal to in source time.

4.2. Independent Variable

4.2.1. GOLD

Gold price in global level is determined according to its offer and demanding. Gold producers, Central banks and gold sellers are among its biggest providers to global markets. Gold makers, Industrials, gold ingot speculators and investors are main demanders of gold market. Gold applications are jewelry production, coin, money and industrial consuming. In addition to demanding and offer, there are various effective factors on gold price such as economical and political crisis, fluctuations of main exchanges namely US Dollar. (Sarfaz & Afsar, 2005).

5. Research Method

5.1. Research Model

5.2. Hypotheses Testing

5.2.1. Time Series Reliability

Since the study is of time series type and it is extracted from time series data and because ordinary least squares method was used for estimation in hypotheses and prerequisite for using linear regression model in ordinary least squares method is reliability of pattern variables, it is necessary to perform reliability and unreliability test for research variables. To this end, augmented Dickey-Fuller test (ADF) was used. The optimal intervals for Dicky Fuller test were specified using Schwarz Info Criterion, so that the interval with highest Schwarz value would be the best one (Bidram, 2003).

H_0 and H_1 hypotheses are as follows:

H_0 : respective variable has unit root

H_1 : respective variable doesn't have unit root (statement of stasis condition for the variable)

Results for Dicky Fuller test at variables level are given in table 1.

Regarding Prob value for all variables, H_1 is supported, that is, these variables don't have unit root, thus they are static. Therefore, regarding ADF test results on first order differential of model variables' values, H_0 is rejected and is accepted implying model variables are static. According to econometric concepts, existence of serial correlation leads to incorrect estimations of the standard error and thus, wrong incorrect statistical inference for equation factors. Since serial correlation is probable in these time series, Phillips-Perron test is used. It is used for determining statistic condition of a time series when serial correlation is probable in time series. Thus two hypotheses are introduced:

H_0 : variable has unit root (it is not static)

H_1 : variable doesn't have root unit (it is static)

Results for Phillips-Perron test at variables level are given in table 2.

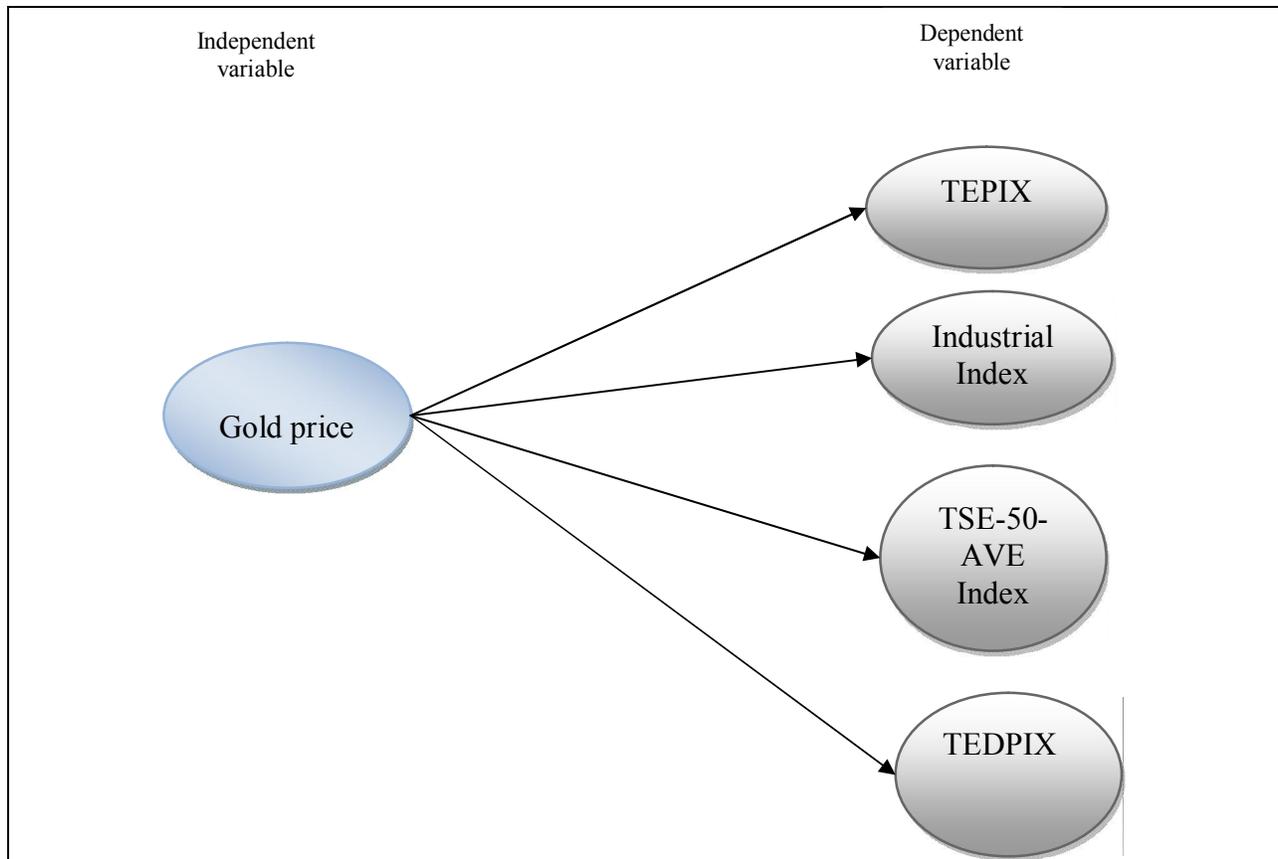


Figure 1. Test

Table 1: Dicky Fuller test results for pattern variables

Variables	The number of appropriate intervals	Intercept	Trend	Augmented Dickey-Fuller test statistic	MacKinnon critical values			Prob
					1%	5%	10%	
Gold	Level	+	+	-5.71	-3.63	-2.95	-2.61	0.000
TSE-50-AVE Index	Level	+	+	-3.68	-3.63	-2.94	-2.61	0.008
Industrial index	Level	+	+	-4.05	-3.63	-2.94	-2.61	0.003
TEDPIX	Level	+	+	-4.24	-3.63	-2.94	-2.61	0.002
TEPIX	Level	+	+	-4.02	-3.63	-2.94	-2.61	0.003

Table 2: Phillips-Perron test results

Variables	The number of appropriate intervals	Intercept	Trend	Phillips-Perron test statistic	Test critical values			Prob
					1%	5%	10%	
oil	Level	+	+	-7.13	-3.63	-2.94	-2.61	0.000
TSE-50-AVE Index	Level	+	+	-3.64	-3.63	-2.94	-2.61	0.009
Industrial index	Level	+	+	-4.03	-3.63	-2.94	-2.61	0.003
TEDPIX	Level	+	+	-4.20	-3.63	-2.94	-2.61	0.002
TEPIX	Level	+	+	-3.99	-3.63	-2.94	-2.61	0.004

Regarding Prob value for all variables, H_1 is supported, that is, these variables don't have unit root, and thus they are static.

5.2.2. Testing Hypotheses

Correlation is a statistical tool to determine the type and degree of correlation between a quantitative variable with another one. Correlation coefficient is one of the criteria used in determining correlation between two variables. Correlation coefficient shows severity and direction (direct or inverse) relationship. In this study, Pearson correlation coefficient is used regarding data type. This coefficient calculates correlation between two interval or relative variables. Results for investigation of relationship between variables are given in table 3.

Table 3: Results of variables' correlation coefficient

No.	Hypothesis (H_0)	Correlation Coefficient	Relationship Type	Rejection or Support
1	Gold price fluctuation is not associated with TEPIX	-0.120611	Consistent	H_0 rejection
2	Gold price fluctuation is not associated with Industrial Index	-0.127167	Consistent	H_0 rejection
3	Gold price fluctuation is not associated with TSE-50-AVE Index	-0.051086	Consistent	H_0 rejection
4	Gold price fluctuation is not associated with TEDPIX	-0.233849	Consistent	H_0 rejection

According to table 3 it is concluded that TEPIX ($R = -0.12$), industrial index ($R = -0.12$), TSE-50-AVE Index ($R = -0.05$) and TEDPIX ($R = -0.23$) are correlated to gold price fluctuations directly. Then Granger causality test is used for investigating variables influence and influence time.

Granger test defines X causality in Y regarding Y predictability, and Y will be cause of the X if prior values of the Y decrease X predictability error (Nofresti, 2000). In this study, Granger causality test was used following finding correlation between variables in order to examine their influence and delay period. Results of Granger causality test are summarized in table 4.

Table 4: Granger causality test results

	Delay Number	One Year Delay		Two Year Delay		Three Year Delay		H ₀ Support or Rejection
		F-Statistic	Prob	F-Statistic	Prob	F-Statistic	Prob	
1	Gold price fluctuation doesn't influence on TEPIX	0.76	0.38	1.34	0.27	4.07	0.016	Three years delay, H ₀ rejection
2	Gold price fluctuation doesn't influence on Industrial Index	2.35	0.13	1.20	0.31	2.42	0.081	Without delay, H ₀ support
3	Gold price fluctuation doesn't influence on TSE-50-AVE Index	1.41	0.24	0.58	0.56	1.06	0.38	Without delay, H ₀ support
4	Gold price fluctuation doesn't influence on TEDPIX	0.39	0.53	1.10	0.34	2.17	0.11	Without delay, H ₀ support

Regarding findings of the tests in this study, it can be concluded that there is relationship between above mentioned independent variable (gold price fluctuations) and four indices in capital market, and this relationship is an inconsistent one. In fact, correlation between gold price fluctuations and TEPIX, industry, TSE-50-AVE and TEDPIX indices is negative. Granger causality test results show that gold price fluctuation doesn't influence on industry, TSE-50-AVE and TEDPIX indices and it is influential in TEPIX after three years delay.

5.3. Sample

Regarding the fact that macroeconomic indices and capital market indices are investigated in this study, it is not possible to consider a statistical sample, thus considering there is no sample; therefore there is not a population too.

5.3.1. Data Sources

Data related to economic variables was taken from Central Bank and economic indicators and data related to stock exchange indices was obtained from information provided by Tehran Stock Exchange Organization.

6. Conclusion

According to economical situations and state status in inflation and since gold price is good index for explaining inflation pressure, therefore its price increases up during inflation period, exchange market instability or political instability. This leads to motivation increasing of individuals for choosing this wealth in value maintenance. In other side, the fact that most people are likely to achieve most possible profiting, leads to increasing of gold demanding alongside with its price increasing, and as a result, it leads to liquidity direction to this side. Tehran Stock

Exchange is not excluded from this disaster and it faces with liquidity shortage. The Correlation coefficients are similar for TEPIX and industrial index and these Correlation coefficients are also more than Correlation coefficient of TSE-50-AVE Index. It can be said that these corporations (50 more active firms in Tehran stock market) are less faced with liquidity shortage because of their strategies and policies, but according to the fact that the real returns of stock issues can be seen in TEDPIX, we can see that attained Correlation coefficient is higher than other indices and it indicates that capital exit from Tehran Stock Exchange and its fellowship to gold market for its value maintenance and also achieving arbitrary opportunities lead to TEDPIX decreasing.

Granger causality test is used for investigating variables influence and influence time. Granger causality test results show that gold price fluctuation doesn't influence on industry, TSE-50-AVE and TEDPIX indices and it is influential in TEPIX after three years delay.

7. Suggestions for Future Works

- It is recommended that the authors in future work investigate the relationship of other valuable and expensive metals such as copper with Tehran stock exchange indices.
- It is recommended that strategies and policies of 50 top firms on Tehran stock exchange and their influence trend on capital market indices are investigated separately.

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