Weak Form Market Efficiency: Evidence from Indian Gold Futures Market

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Abstract

Market efficiency is an important concept for investors. This paper tests the weak form efficiency of gold market futures in India. For this the Future Prices of Gold is collected from MCX (Multi Commodity Exchange) for the years 2015 and 2016. There are six contracts respectively in each year. The evidence of Runs Test and ADF test suggests that the series follows Random Walk Model and the Indian Gold Market is weak form efficient.

Introduction

Efficient market hypothesis (EMH) is an important concept of capital market. It gives the idea that investors have no opportunity of having abnormal gains. The only way is to invest in more and more risky securities to earn high profits. According to this theory it is difficult to predict the price movements on the basis of new information released in the market regarding the financial securities. Every investor is interested to know whether he could earn some abnormal returns from these information sentiments or not. Hence, the concept is getting more importance nowadays. Investors mostly make gold as a part of their portfolio so as to reduce the risk of price fluctuation in the stock market. The other reason of including gold in investment portfolios is to diversify the risk as gold has a tendency to move in the opposite direction of stock market and currency values. Due to these investors try to study the past behaviour and market information which affects the future prices of the gold. In our study we will discuss that it is difficult to predict such news sentiments and their impact on future prices gold future contracts. The concept was first introduced by Fama (1960), Fama (1965) and Samuelson (1965) that the anticipated price of an asset fluctuates randomly around its expected value. In 1970 Fama discovered the concept of Efficient Market Hypothesis and also discussed about the three forms of the market efficiency- a) **Weak Form:** A market is said to be weak form efficient when there is no correlation between the past prices and predicted future prices. b) **Semi-Strong Form:** A market is said to be semi-strong efficient when prices can be adjusted according to public information like announcement of dividends, stock splits etc without any bias. c) **Strong Form:** A market is said to be strongly efficient when an investor cannot earn excess return on the basis of some inside information i.e. private and public information regarding the security. These were the three forms of the market given by Fama and these are applied by every investor and economist all over the world while analysing efficiencies of the markets in which they are going to invest.

Literature Review

The research made by Fama (1970) is followed by many researchers across the world. Dimson (2000), in his paper "Market Efficiency" analysed the statements of a large number of researchers that though it is difficult to analyse the EMH but it had been successfully tested empirically by many researchers and all of them has suggested a number of ways to test the same. There are some studies which show the market to be weak form efficient. Ramasastri (1999), tested Indian stock markets using ADF test and concluded the markets to be weak form efficient. Gupta and Yang (2011) had applied ADF, PP and KPSS test on the BSE and NSE stocks and found the market efficient in case of monthly data. Similarly there are various other studies on Indian markets which have not supported the random walk hypothesis. Poshakwale (1996), used daily BSE Index data for the period 1987 to 1994 and found the market to be inefficient. Borges (2008) applied a number of tests like Serial Correlation, Runs test, Augmented Dickey Fuller test and the Multiple Variance Ratio test were used on the daily and monthly data of stock market indices of France, Germany, UK, Greece, Portugal and Spain. The results showed that except Greece and Portugal rest of the countries followed the random walk. Srinivasan (2010), applied ADF and PP test on market return of two major Indian Indices S&P CNX NIFTY and SENSEX but the results showed the market to be inefficient. Dr. A. Patrick and Mrs. R. Sushama (2011) used Autocorrelation and run test on stocks of NSE and New York Stock Exchange (NYSE). Dr. Nishi Sarma (2013) tested 13 sector indices of BSE from 2006-2012 and applied Autocorrelation and Jarque- Bera. Haritika Arora (2013) tested S&P CNX NIFTY from January 2000 to December 2011 and used ADF, Autocorrelation, Ljung-Box test and found the market to be weak form inefficient.

Data and Methodology

Data used for the purpose of study is secondary in nature. Data of future gold prices has been collected from MCX India Ltd. for the years 2015 and 2016. There are six future contracts in each year. To compute the daily gold returns the following formula is used:

$R_{t=} \text{Ln } P_t - \text{Ln } P_{t-1}$

Where, R_t represents daily returns of gold for period t, P_t and P_{t-1} denote gold prices for period t and period t-1. Normality of the data is tested using descriptive statistics and also by applying Jarque Bera and Shapiro Wilk test.

After that to test the presence of unit root in the data we will use Augmented Dickey-Fuller Test. It is used to test the stationarity of the time series as it is an important condition in random walk and it is tested as follows:

IV. Analysis and Interpretation

YEARS	Descriptive							
		Date	Skewness	Standard Error	Skewness/ Std. Err	Kurtosis	Standard Error	Kurtosis/ Std.Err
2015	CONTRACT 1	01-12-14 to 05-02-15	0.513	0.365	1.405479452	0.438	0.717	0.610878661
	CONTRACT 2	02-02-15 to 03-04-15	-0.434	0.369	-1.176151762	0.012	0.724	0.016574586
	CONTRACT 3	01-04-15 to 05-06-15	-0.024	0.369	-0.06504065	0.186	0.724	0.256906077
	CONTRACT 4	01-06-15 to 05-07-15	-0.439	0.357	-1.229691877	0.52	0.702	0.740740741
	CONTRACT 5	03-08-15 to 05-10-15	0.109	0.365	0.298630137	0.101	0.717	0.140864714
	CONTRACT 6	1-10-15 to 04-12-15	-0.535	0.369	-1.449864499	0.272	0.724	0.375690608
2016	CONTRACT 1	1-12-16 to 05-02-16	0.023	0.369	0.062330623	0.052	0.724	0.071823204
	CONTRACT 2	1-02-16 to 05-04-16	1.203	0.365	3.295890411	3.713	0.717	5.178521618
	CONTRACT 3	01-04-16 to 03-06-16	0.098	0.365	0.268493151	0.176	0.717	0.245467225
	CONTRACT 4	01-06-16 to 05-07-16	1.972	0.365	5.402739726	8.24	0.717	11.49232915
	CONTRACT 5	01-08-16 to 05-10-16	-0.543	0.361	-1.504155125	1.105	0.709	1.558533145
	CONTRACT 6	01-10-16 to 05-12-16	0.093	0.362	0.256906077	0.174	0.712	0.244382022

Table 1.Test of Normality of Gold Price Returns

Table 1 shows that the Z-statistic for skewness and Kurtosis is mostly found insignificant except for two contracts, that is, contract 2 and contract 4 in year 2016. Similar results are also obtained in Jarque Bera test and Shapiro Wilk test. (Table 2). Since some of the contracts have observed non normal data series, it is considered safe to apply non-parametric tests to validate the weak form efficiency of gold futures markets in India.

Table 2.Test of Goodness of Fit

YEARS	Normality			
		Date	Shapiro Wilk (p value)	Jarque Bera (p value)
2015	CONTRACT 1	01-12-14 to 05-02-15	0.266	0.302
	CONTRACT 2	02-02-15 to 03-04-15	0.187	0.479
	CONTRACT 3	01-04-15 to 05-06-15	0.721	0.986
	CONTRACT 4	01-06-15 to 05-07-15	0.644	0.515
	CONTRACT 5	03-08-15 to 05-10-15	0.706	0.981
	CONTRACT 6	1-10-15 to 04-12-15	0.083	0.272
2016	CONTRACT 1	1-12-16 to 05-02-16	0.148	0.98
	CONTRACT 2	1-02-16 to 05-04-16	0.004	0.0001
	CONTRACT 3	01-04-16 to 03-06-16	0.823	0.984
	CONTRACT 4	01-06-16 to 05-07-16	0.0001	0.0001
	CONTRACT 5	01-08-16 to 05-10-16	0.178	0.162
	CONTRACT 6	01-10-16 to 05-12-16	0.823	0.984

Along with this the data is checked for stationary by using ADF test

Table 3.Unit Root Test

YEARS	Stationarity Test		
		Date	ADF (p value)
2015	CONTRACT 1	01-12-14 to 05-02-15	0.107
	CONTRACT 2	02-02-15 to 03-04-15	0.45
	CONTRACT 3	01-04-15 to 05-06-15	0.055
	CONTRACT 4	01-06-15 to 05-07-15	0.119
	CONTRACT 5	03-08-15 to 05-10-15	0.038
	CONTRACT 6	1-10-15 to 04-12-15	0.427
2016	CONTRACT 1	1-12-16 to 05-02-16	0.029
	CONTRACT 2	1-02-16 to 05-04-16	0.009
	CONTRACT 3	01-04-16 to 03-06-16	0.055
	CONTRACT 4	01-06-16 to 05-07-16	0.052
	CONTRACT 5	01-08-16 to 05-10-16	0.044
	CONTRACT 6	01-10-16 to 05-12-16	0.055

The above table shows that on the basis of following two hypotheses:
H_0: There is a unit root for the series.
H_a: There is no unit root for the series. The series is stationary.
As the computed p-value except in few contracts is higher than the significance level alpha=0.05. So, we will reject the null hypothesis H_0, and accept the alternative hypothesis H_a. Hence, we can conclude that our data does not follow a stochastic process or the gold return follows a random walk.
To elaborate the authenticity of our results we are using Runs test Table (4) to check the randomness of the gold market in India.

YEARS	Randomness Test		
		Date	Run Test (p value)
2015	CONTRACT 1	01-12-14 to 05-02-15	0.288
	CONTRACT 2	02-02-15 to 03-04-15	0.426
	CONTRACT 3	01-04-15 to 05-06-15	0.888
	CONTRACT 4	01-06-15 to 05-07-15	0.228
	CONTRACT 5	03-08-15 to 05-10-15	1
	CONTRACT 6	1-10-15 to 04-12-15	0.888
2016	CONTRACT 1	1-12-16 to 05-02-16	0.268
	CONTRACT 2	1-02-16 to 05-04-16	0.339
	CONTRACT 3	01-04-16 to 03-06-16	0.925
	CONTRACT 4	01-06-16 to 05-07-16	0.975
	CONTRACT 5	01-08-16 to 05-10-16	0.423
	CONTRACT 6	01-10-16 to 05-12-16	0.925

Test interpretation:
H0: Data are randomly distributed
Ha: Data are not randomly distributed
From the above table it is concluded that the p value is greater than alpha in all contracts. So, one cannot reject the null hypothesis. Hence, it is concluded that our data follows random walk behaviour and hence the market is weak form efficient.

Conclusion

The result of ADF and Run test shows that the future gold market follows the Random Walk and is Weak Form Efficient.

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