ISSN: 2278-4632
Vol-10 Issue-5 No. 14 May 2020

TESTING THE WEAK FORM OF MARKET EFFICIENCY IN COMMODITY MARKET: A STUDY ON GOLD AND CRUDE OIL PRICES

Dr. Pragyan Parimita Sarangi
Associate Professor, Srusti Academy of Management, Bhubaneswar
E. mail: pragyansarangister@gmail.com
Mob. No. 9437282167

Mr. Sangram Kesari Panda
Assistant Professor, Srusti Academy of Management, Bhubaneswar
E. mail: sangramgcwa@gmail.com
Mob. No. 7978621739

ABSTRACT

Since the introduction of "Efficient Market Hypothesis" (EMH) by Eugene Fama there have been a lot of researches which supports and contracts the theory. Very few studies have been conducted on the efficiency of commodity market which is a major area of focus by the investors in the present scenario. The present study tests the weak form of efficiency in ICOMDEX GOLD and ICOMDEX CRUDE OIL of MCX. The daily prices of both the indices have been retrieved from MCX India Ltd. for the period from December 2016 to February 2020. Non-parametric tests like run test, Auto correlation test and Augmented Dickey Fuller Test (Unit Root Test) have been adopted to test the weak form of market efficiency. All the tests show the acceptance of null hypothesis. So it could be concluded that both the gold return and the Crude oil return follow random walk and demonstrates the weak form of efficiency.

***Key words*:** Efficiency, Commodity market, Random Walk theory, Efficient Market Hypothesis, weak form of efficiency.

INTRODUCTION

Technical analysis has been an important instrument for forecasting the investment patterns by the portfolio analysts as well as the individual investors. But the concept of efficient market hypothesis (EMH) (Samuelson,1965, Fama,1970) studied by various researchers tells that the stocks always trade in their intrinsic values or fair values which makes it impossible for the investors to buy stocks which are undervalued or sell stocks which are overvalued. The market is said to have weak form of efficiency if the current price of a security fully reflects all the information contained in its historical or past prices. This theory contradicts the theory of technical analysis that study of the past price patterns will help in predicting the future market trend. The connotation of the weak form of efficiency is denoted by random walk hypothesis which says that consecutive price changes are randomly and serially independent. The present study seeks to analyse the presence of weak form of efficiency in the commodity market.

ISSN: 2278-4632
Vol-10 Issue-5 No. 14 May 2020

SIGNIFICANCE OF THE STUDY

With the establishment of three major exchanges in India- Multi-Commodity Exchange (MCX), National Commodity and Derivatives Exchange (NCDEX) and National Multi-Commodity Exchange of India Ltd., the commodity market has witnessed a noteworthy growth since 2003. With the escalating global amalgamation among the financial markets, several economies have experienced large fluctuations in the prices of almost all the commodities, which lead to the augment of speculative activity. Moreover, this exposed the investors to continuous risk of loss on account of uncertain price fluctuations in future. To reduce the impact of clatter created by unapprised speculators on commodity prices, become a major apprehension for the regulatory authorities. The cost of controlling the risk and volatility in the prices of commodities by the government through subsidies would result in increased taxation. Moreover, these steps are counterproductive, which lay strain on national resources and heads towards promoting inefficiencies (Khindri, Arora, 2020).

Oil, currencies and gold are the main indicators of the most important processes in the global economy. Among all the commodities, Gold and crude oil were the commodities which reflected a strong resistance in terms of price stability during the Global Financial Crisis 2007-09. Same trend has been observed till now, which paved the way for speculation in its trading. In the beginning of 2019, gold was up by about 20%. Given how shaky were the other investments during the year; the 10-year return of gold was just 8.3%, which hardly justifies the volatility. (Economic Times, 2019). Oil is also the strategic commodity whose market has become the biggest commodity market in the world over the past several decades. Oil is the world's leading fuel with 33% share in global primary energy consumption, which is has been forecasted to decrease to 28% by 2030 (Popescu 2016). The concept of efficient market is predominantly applied to the stock markets instead of commodities. Gold being one the most attractive investment alternates specially in the Indian economy; the rise in price rise is not followed by the proportionate increase in value of asset classes in our country. But, Gold is considered as a hedge against inflation. So, it becomes imperative study to study efficiency of Indian Gold Market. Similarly, since the 1970s the economists have opined the price of oil as one of the important sources of economic fluctuations, and a driver of global economic shocks. Subsequently, the oil prices have been watchfully analyzed by the researchers. An understanding of the signals from the oil prices is very relevant as both, long-run and short-run decisions are based on information provided by the price of this essential resource i.e., oil, which still remains an essential input factor impacting a variety of investment decisions in all economic sectors.(Gorska, Krawiec,2016)

REVIEW OF LITERATURE

According to the Weak form efficiency in Efficient Market Hypothesis, the current prices of stock are not dependent on their past prices. Several studies have been conducted to test the weak form of market efficiency in India. There are numerous studies which concluded the market to be weak form efficient. Ramasastri (1999), in his study on Indian stock markets tested the efficiency using ADF test and found that the markets have weak form of efficiency. Gupta and Yang (2011) in his research had also applied ADF, and KPSS test on the BSE and NSE stocks and inferred that the monthly data supported the randomness of the prices

ISSN: 2278-4632
Vol-10 Issue-5 No. 14 May 2020

whereas the daily and weekly data discarded the weak form efficiency. Likewise there are several other research works which have not supported the random walk hypothesis Poshakwale (1996), studied on the daily BSE indices for the period 1987 to 1994 and concluded the market to be inefficient. Srinivasan (2010), applied ADF and PP test on market return of two major Indian Indices S&P CNX NIFTY and SENSEX, the results reflected the markets to be inefficient. Autocorrelation, Runs test, Unit Root test and Variance ratios have been also used to deduct that the stock markets have not followed a random walk and hence the investors could have earned the arbitrage benefits due to market inefficiencies. Siddiqui and Gupta (2010); Mishra (2011) applied a number of Parametric and Non- Parametric tests, their results have also found the markets to be inefficient.

RESEARCH GAP

An extensive literature review reveals that very few literatures have been found the test of weak form of efficiency in the commodity market. Gupta and Sinha (2018) studied the weak form of efficiency through Runs Test, Autocorrelation and Variance Ratio Test and suggested that the Indian Gold Market is weak form efficient. Gorska and Krawiec (2016) studied the weak form of efficiency for crude oil. Their results, however, do not clearly predict whether oil markets are efficient in a weak-form. This opens a door to further investigations with the use of alternative methodology.

OBJECTIVES OF THE STUDY

Based on the literatures reviewed the following objectives have been conducted for the study.

1. To test the weak form of efficiency in the gold index ICOMDEX GOLD.
2. To test the weak form of efficiency in crude oil index ICOMDEX CRUDE OIL.

RESEARCH METHODOLOGY

The study is conducted using secondary data. The daily prices of gold index ICOMDEX GOLD and crude oil index ICOMDEX CRUDE OIL has been retrieved from MCX India Ltd. for the period from December 2016 to February 2020. The daily returns is calculated using the formula:

$$R_t = Ln\ (P_t - P_{t-1})$$

Where, R_t is daily returns of gold index and crude oil index for period t, Pt and Pt-1 denote index prices for period t (end date) and period t-1 (previous date). The normality of the data has been tested using descriptive statistics and Jarque Bera test. Since the returns are not normally distributed, so non-parametric tests have been adopted to test the hypothesis. The weak form of market efficiency is tested using run test, Auto correlation test and Augmented Dickey Fuller Test (Unit Root Test).

The following hypothesis has been taken in order to test the weak form of market efficiency

- H0: The returns on daily gold index are random.
- H1: The returns on daily gold index are not random.

ISSN: 2278-4632
Vol-10 Issue-5 No. 14 May 2020

- H0: The returns on daily crude oil index are random.
- H1: The returns on daily crude oil index are not random.

ANALYSIS AND INTERPRETATION

Table-1: Descriptive Statistics

	GOLD RETURN	CRUDE OIL RETURN
Mean	0.000328	-0.000286
Median	0.000170	0.001000
Maximum	0.050740	0.144000
Minimum	-0.026730	-0.073000
Std. Dev.	0.007293	0.020903
Skewness	0.631572	0.172029
Kurtosis	7.673723	6.129021
Jarque-Bera	1045.975	442.1957
Probability	0.000000	0.000000
Observations	1071	1071

Source: primary source

The **Table–1** portrays the descriptive statistics of the return from the Gold Index and the Crude Oil Index. From the data of skewness and the Kurtosis it is evident that the returns are not normally distributed and both of them are positively skewed. Moreover, it is visible that the Jarque-Bera Statistics of gold return and Crude oil Returns are 1045.97 and 442.195 with p values of 0.000, which indicates the rejection of the null hypothesis that is the return series are normally distributed. This indicates that both the return of the indices are not normally distributed.

Table – 2: Correlation

		CRUD OIL RETURN	GOLD RETURN
CRUDE OIL RETURN	Pearson Correlation	1	.013
	Sig. (2-tailed)		.681
	N	1071	1071
GOLD RETURN	Pearson Correlation	.013	1
	Sig. (2-tailed)	.681	
	N	1071	1071

Source: primary source

The return series of the both the index are considerably correlated to each other to the extent of 68% as indicated by the Pearson correlation coefficient presented in the table-2. Thus it can be inferred that the movement in one index is associated with the positive movement of the other index.

Table -3: Augmented Dickey-Fuller test

ISSN: 2278-4632
Vol-10 Issue-5 No. 14 May 2020

Particulars	Crude Oil Return	Gold Return
Observed Value	-33.10731	-32.59175
Critical Value	-2.864031	-2.864031
P-Value	0.0000	0.0000
Alpha	0.05	0.05

Source: primary source

The ADF test is done to test the presence of unit root in the time series with the null hypothesis of H_0: there exists a unit root in the time series. From the table -3 it can be observed that the test statistics of crude oil return and gold return are both more than the critical value and also the p-values are less than 0.05. This leads to the rejection of the null hypothesis and acceptance of the alternative hypothesis. Therefore we can conclude that the both the time series are not stationary and in other words they does not follow any random walk. Hence both the time series are efficient and the present index values are not affected by any past values.

Table-4: Runs Test

	CRUD OIL RETURN	GOLD RETURN
Test Value[a]	-.00029	.00033
Cases < Test Value	499	547
Cases >= Test Value	572	524
Total Cases	1071	1071
Number of Runs	557	536
Z	-1.412	-.015
Asymp. Sig. (2-tailed)	.158	.988
a. Mean		

Source: primary source

The run test is done to test the randomness of the time series. The table – 4 shows the results of the run test for the Crude Oil Return and the Gold Return. The Z values of Gold Return and the Crude oil return are -0.015 and -1.412 respectively, which are less than the respective critical values 0.00033 and -0.00029. Their p-values are also more than the level of significance 0.05. This leads to the acceptance of the null hypothesis that both the series does have a random walk. This infers that both the series are efficient in the weak form.

Table-5: Auto Correlation

Lag	CRUDE OIL RETURN			GOLD RETURN		
	AC	Q-Stat	Prob	AC	Q-Stat	Prob
1	-0.015	0.2289	0.632	-0.002	0.0057	0.94
2	-0.008	0.301	0.86	0.02	0.4534	0.797
3	0.035	1.6388	0.651	0.009	0.5432	0.909
4	0.014	1.864	0.761	-0.012	0.6985	0.952
5	0.025	2.5167	0.774	0.027	1.4898	0.914

6	-0.027	3.3087	0.769	0.023	2.0636	0.914
7	0.03	4.2766	0.747	-0.069	7.2479	0.404
8	0.031	5.3074	0.724	0.032	8.3221	0.403
9	-0.047	7.6639	0.568	-0.028	9.1639	0.422
10	0.073	13.399	0.202	-0.014	9.3776	0.497
11	-0.125	30.265	0.001	0.008	9.439	0.581
12	-0.024	30.904	0.002	0.068	14.514	0.269

Source: primary source

Auto correlation test is done to test the impact of the lagged values of a time series data on the present values of the same series. The null hypothesis of this test is, the time series follows a random walk. From the table-5 we can see the auto correlation results of the Crude oil return and the Gold return with a lag starting from 2 to 16. The auto correlation figure of the crude oil return is near to zero and also negative in 6 different lags. The same situation is also there in the Gold return series. The P-values of the auto correlation are also more than the 0.05 level of significance. This leads to the acceptance of the null hypothesis and rejection of the alternative hypothesis. When there is acceptance of null hypothesis it can be concluded that both the gold return and the Crude oil return follow random walk and are efficient in weak form.

CONCLUSION

As we have analysed daily returns of ICOMDEX GOLD and ICOMDEX crude oil it is found that the data departs from the normality. The Run test, Autocorrelation and Unit Root (ADF) test further revealed that the daily Returns of gold and crude oil follow the Random Walk and the market is Weak Form Efficient. Hence, we may conclude that that the price movement of the stocks are fully reflected with all available information. However, there is a further scope to examine how these indices moved in relation to available information. Hence, creating a link between the information and valuation of the indices could have much better insight on the market efficiency. With the evidences from this present study, further studies can be done on how the movements of price are related to the available information, and how the intrinsic value of indices are determined based on the market efficiency.

REFERENCES

Khindri and Arora (2020). “Market Efficiency of Gold Futures-Spot Prices: Testing the Indian Market”. *Our Heritage*, Vol-68-Issue-30 (February-2020), pp.1075-1088.

Economic times, wealth, 2st October 2019.

Gupta and Singla (2018).” Weak Form Efficiency of Gold Prices in the Indian Market”. *International Journal of Engineering Technology Science and Research*, Volume 5, Issue 3 March 2018,pp.396-401

Ryaly Raju Urlankula(2017). "Testing the Weak-Form Market Efficiency in the Indian Stock Market : Evidence from the Bombay Stock Exchange Index (BSE) Sensex". *Indian Journal of Finance*, March 2017, volume 11,issue 3, pp.26-40,.

Gorska and Krawiec (2016). "The Analysis of Weak-Form Efficiency in the Market of Crude Oil". *European Journal of Economics and Business Studies*, May-August 2016 Volume 2, Issue 2, pp.101-112.

Arora, H. (2013)."Testing Weak Form of Efficiency of Indian Stock Market". *Pacific Business Review International*. Vol.5, Issue 12 (June, 2013) pp. 16-23.

Sasikumar and Anoop (2011). "Testing for weak form market efficiency in Indian foreign exchange market". *Munich Personal RePEc Archive*, MPRA Paper No. 37071, posted 03 Mar 2012 19:29 UTC

Fama, E.R. (1970). "Efficient Capital markets: A Review of Theory and Empirical Work". *Journal of Finance*, Volume. 25, Issue-2, Paper and Proceedings of the Twenty Eighth Annual Meeting of the American Finance Association, New York, NY December 28-30, 1969 (May, 1970), 383-417.

Poshakwale, S. (1996), "Evidence on Weak Form Efficiency and Day of the Weak Effect in the Indian Stock Market". *Finance India*, 10(3), pp. 605-616.

Ramasastri, A.S. (1999). "Market Efficiency in the Nineties: Testing Unit Roots". *Pranjan*, 28, pp. 155-161.

Gupta, R., Yang, J. (2011). "Testing Weak Form efficiency in the Indian Capital Market". *International Research Journal of Finance and Economics*, ISSN: 1450-2887, Issue 75 (2011)

Kaur, Gurbandini and Rao, Dabbeeru Neelakanteswar (2010). "Efficiency of Indian Commodities Market: A Study of Agricultural Commodity Derivatives Traded on NCDEX". *SSRN* (May 5, 2010).

