A study of Domestic and Global Demand and Supply of Gold

Nikeeta Gupta
Assistant Professor
Public College Samana

Abstract
Investment is an important vehicle that derives an economy of all the available investment avenues, gold has become the most popular investment source due to its feature of store of value. The present paper studies the demand for gold in the form of Jewellery, Physical Bar, Metal & Imitation coins. The supply of gold in the form of Mine production along with its production cost in India and worldwide over different years. The Compound Annual Growth Rates are also calculated on yearly basis and for the complete period of study for demand, supply and production cost of gold. Weak Form efficiency of gold prices is also tested using Runs Test.

Introduction

Investment is an important vehicle driving an economy. Investment is basically putting money into an asset with the expectation of capital appreciation, dividends and interest earnings. There are various types of investment products available to investors like stocks, bonds, real estate, precious metals, financial derivatives, etc. People invest their money in various types of securities to generate additional funds and to secure their future. Of all the available investment avenues, gold has become the most popular investment product. Gold is an important asset and has a store of value. It has been investor's favorite during times of worldwide financial and political crisis due to its importance as a hedge against inflation and a safe investment product. Investors generally buy gold as a hedge against economic, political, or social currency crises. Gold is basically considered as an investment that appreciates over years and provides a hedge against inflation. Gold is also considered as a medium that can be pledged easily during difficult times for securing financial accommodation. At the global level the annual demand for gold during the last five years (2008-2012) on an average is estimated to be over 4000 tonnes. In today's market both physical and derivative form of gold is traded which determines the daily gold prices

Indian Gold Market

Besides other countries, India too is the cornerstone of the world's physical gold market. Gold is one of the most preferred investment option after bank deposits when it comes to the preference for investment in India and is considered a saving and investment vehicle. India is the world's largest consumer of gold. People invest in gold mostly in the form of jewellery. India fabricates annually more than 1,000 tonnes of gold jewellery (Grendon International Research, 2002). Prior to 1962, India was the world's largest gold market with its main trading center at Bombay. In 1962, the Government enacted the Gold Control Act, which prohibited the citizens of India from holding pure gold bars and coins. Government had lost it reserves during the Indo-China war so it declared that the old holdings in pure gold had to be compulsorily converted into jewellery and the pure gold bars and coins were to be dealt only by licensed dealers. But, due to this legislation the official gold market was adversely affected as large number of unofficial

market sprung up and lead way to smuggling and black marketing. In India, the gold industry is subject to the regulations, notifications and public notices of many government institutions including Ministry of Finance, Reserve Bank of India, Ministry of Commerce and Industry, Ministry of Consumer Affairs, Food and Distribution and Ministry of Coal and Mines. The Government is also associated with commercial gold-related activities through several institutions that are wholly or partly government-owned like Public Sector Banks (PSB's), Public Sector Undertakings (PSU's), and Bureau of Indian Standards (BIS), Nationalized gold mining companies and India Government Mint, Mumbai.

India is the most price-sensitive market for gold in the world. In India, the investment demand for gold is lower when compared with demand for gold for consumption purpose. There is widespread recognition that investments in gold are extremely risky due to uncertainty about the economic impact, demand and supply conditions, policies of central banks and other regulatory bodies, social conditions like war and emergencies and finally the value of US Dollar. In recent years, there has been rise of investment in gold in India due to reasons like gold being highly liquid asset i.e. easily convertible into cash, banks accept gold as security against loan, investors can also invest in gold bonds or certificates to earn interest on them and on maturity investor can take the delivery of physical gold or an amount equivalent to it, investment in gold is more stable then currencies etc. But to further entice investments in gold there is need for spread of financial literacy regarding gold and its related instruments like Physical Metal including jewellery, gold coins, tola bars and kilo bars; Gold Exchange Trade Funds, Gold Fund of Funds, Gold Futures and Paper Gold / Gold Saving Account (GSA).The present study shall be an attempt to study the weak form of pricing efficiency of Indian gold market to test whether the investor could earn abnormal profits or not by making an investment in such market.

Review of Literature

Investment in gold has always been a subject of discussion for investors and researchers. The inherent reason is the efficiency of the market and the risk - return relationship. Various researchers have made efforts at different time intervals and made remarkable contribution to this subject. Some of their work has been submitted below:-

Joshi (2002) in his thesis on "Capital Market Efficiency : An Empirical Study of Indian Capital Market", studied the recent developments and performance of shares in the Indian Capital Market, tested the weak form market efficiency and the perceptions of the investors and the stock brokers in context with Indian Capital Market. The weak form of market efficiency was analyzed by using rank correlation and for this the sample shares had been assigned ranks and then tested at 1% & 5 % level of significance. The study found that various developments have been introduced in the Indian Capital Market like National Stock Exchange (NSE) introduced automated screen based trading which leads to an equal access to the investors all over the country etc. and also the short term capital gains accrue from holding shares for 1 or 2 months, medium term gains from 1 to 2 years holding and long term Gains from 4 to 5 years holding. It was further found that the market was not weak form efficient, the investors favored the introduction of screen based trading as it brings transparency and were also satisfied with the services of brokers. The study also revealed the reason behind broker's entry to the Capital Market was to earn regular income.

Mahendru and Sharma (2009) in their research paper titled "Efficiency Hypothesis of the Stock Markets: - A case of Indian Securities", examined the validity of the efficient market hypothesis on the Indian Securities Market using sample of 11 securities listed on the Bombay Stock Exchange (BSE). The study used run test and the auto-correlation test to evaluate the efficiency of the stock market. It was found that an investor could not earn abnormal profits by using the share price data as the current share prices already reflected the effect of past shares and the effect of past stock prices on future prices was very meager.

Hamid et.al (2010) in their paper titled "Testing the weak form of Efficient Market Hypothesis: Empirical evidence from Asia-Pacific Markets", analyzed the weak form efficiency of the stock market returns of Pakistan, India, Sri Lanka, China, Korea, Hong-Kong, Indonesia, Malaysia, Philippines, Singapore, Thailand, Taiwan, Japan and Australia using statistical tools like auto correlation, Ljung-box Q statistics, variance ratios, runs test and unit root test. Monthly observations from January 2004 to December 2009 were considered. The study concluded that the monthly prices in all the countries of Asian-Pacific region had not followed random walk and therefore the markets were not weak form efficient. It was further observed that the arbitrage benefits might be gained by the investors due to market inefficiency.

Mehtab et. al (2011) in their study titled "Testing weak form market efficiency of Indian capital market: A case of National Stock Exchange (NSE) and Bombay Stock Exchange (BSE)" tested the weak form efficiency of Indian capital market. The daily closing values of NSE and BSE indices from the period 1st April, 2000 to 31st March, 2010 were considered. The Runs test was employed to analyze the data. The research concluded that Indian market was not weak form efficient and had not followed the random walk model.

Nisar, Hanif (2012)

In their study titled "Testing the weak form of Efficient Market Hypothesis: empirical evidence from South -Asia" tested the weak form of market efficiency on the four major stock exchanges of South-Asia including India, Pakistan, Bangladesh and Sri Lanka. They used monthly, weekly and daily data for a period of 14 years (1997 -2011). They study employed 4 statistical tests including runs test, serial correlation, unit root and variance ratio test. The research revealed that none of the major stock markets of South Asia are random and hence are not weak form efficient.

Patil and Antony (2012) in their study titled "Gold Prices and Indian spot FX Market", studied the impact of gold price fluctuation in Indian spot FX Market and explained the importance of gold in Indian finance markets. The study found that gold had been a valuable investment alternative to the US Dollar and is also denoted by XAV. It was also considered as a hedge against inflation. It was further revealed that of all the major asset classes gold had given maximum return on investment and international and domestic gold prices are positively related but a negative relation existed among the spot rupee and the gold prices. The study supported that movement in USD & INR in the inter – bank Spot FX Market was not only affected by the gold but also by other factors like political, social and geographical factors.

Ma and Patterson (2013) in his study titled "Is Gold Overpriced?" studied a long history of the price of gold and constructed a quantile regression model to identify distributional relationships between the price of gold , macroeconomic indicators, financial market performance, and other relative factors. They employed a quantile regression framework and compared their results to simple OLS estimates using the same variables. Gold price forecasts based on two economic

scenarios that covered both the long-run and the recent economic environment in 2009 and 2010 were provided. The traditional mean methodology indicated that gold was overpriced and the distributional results from quantile regression revealed that gold was not overpriced in the current economic and financial environment

Sarkar (2013) in his paper titled "Testing Weak Form Efficiency of Indian Stock Market: An Empirical study on BSE", studied the role of Bombay Stock Exchange (BSE), examined whether BSE truly represents Indian stock market and also tested whether BSE is efficient in weak form with respect to long period data. The study was based on the sample of three BSE Indices – BSE SENSEX, BSE -100 and BSE-500. Daily closing index values were considered starting from its inception till 31st march 2011. The study applied statistical techniques like serial correlation test and run test by using SPSS 11.5, E-views and Minitab 15 for analysis. The study concluded that the results of both serial correlation and run test clearly indicates that BSE indices do not follow random behavior in specific and hence Indian stock market at large was inefficient in the weak form of market efficiency.

Need of the Study

The review of literature reveals that there are ample number of studies on weak form efficiency test of capital and stock market. But lesser studies could be found on the weak form efficiency of gold. Gold is considered as an important savings and investment vehicle in India. It is one of the most preferred investment options after bank deposits in India. In an investor's portfolio, gold as an asset class plays a very important role as it not only provides stability in return but also provides them an opportunity to maximize their wealth in the long run. Indian gold market is highly price sensitive. Hence, it becomes very important to study the market efficiency of Indian Gold market.

Objectives of the Study

The main objectives of the proposed study are:-
1.   To test the weak form efficiency of future and spot prices of the Indian Gold Market.
2.   To determine the more profitable option of both the markets.
3.   To test the supply and demand of Gold in India and of the world.

Data of the Study

The data analyzed in this paper has been collected from the website of Multi Commodity Exchange (MCX). The data consists of daily closing prices of future and spot Gold Market from 1st April, 2009 to 31st March, 2012.

Research Methodology

The study aims to test the weak form market efficiency of Indian spot and Future Gold market by employing the Runs Test. Runs Test is a traditional method used in the random walk model which ignores the properties of the distribution. It is a non parametric test and is preferred over auto correlation to test the randomness of the series. It considers the price changes on the basis of change in signs and ignores the absolute value of the series. In this method the actual number of runs is compared with the minimum and maximum range calculated by using the following formula:

Minimum Runs possible = $\mu - 1.96\sigma$

Maximum Runs possible = $\mu + 1.96\sigma$

Where, $\mu = 2n-1/3$

$\sigma = \sqrt{16n-29/90}$

If the actual number of runs falls within this range then the market will be considered efficient and if not then it will be concluded that the market does not follows the random walk and hence it is inefficient.

Findings

The following table will depict the efficiency and inefficiency of the Gold market in India with the help of Runs Test during a period of 3 years.

Table: Market efficiency and inefficiency in various contracts during 1st April, 2009 till 31st March, 2012

| Period of Contracts | No. of Trading Days | | No. of Runs | | | | Remarks | |
| | | | Observed No. of Runs | | Normal Range | | | |
	Spot Market	Future Market	Spot Market	Future Market	Spot Market	Future Market	Spot Market	Future Market
1st April,2009-5th June,2009	50	54	24	25	26.65- 38.01	29.08- 40.92	Inefficient	Inefficient
1st April, 2009-5th Aug,2009	102	106	46	49	58.77- 75.23	61.24 - 78.1	Inefficient	Inefficient
1st April,2009-5th Oct,2009	150	156	71	71	88.99 -109.01	92.77-113.23	Inefficient	Inefficient
6th April,2009-5th Dec,2009	194	204	88	74	116.9- 139.76	123.28 -146.72	Inefficient	Inefficient
6th June,2009-5th Feb,2010	199	205	93	72	120.11- 43.23	123.93-147.41	Inefficient	Inefficient
6th Aug,2009-5th April,2010	194	202	91	82	116.9 -139.76	122.04-145.28	Inefficient	Inefficient
6th Oct,2009-5th June,2010	196	204	93	92	118.18- 41.16	123.28-146.72	Inefficient	Inefficient
7th Dec,2009-5th Aug, 2010	199	204	104	106	120.11 -143.23	123.61-147.05	Inefficient	Inefficient
6th Feb,2010-5th Oct,2010	197	203	96	107	118.81- 41.85	122.65-146.01	Inefficient	Inefficient
6th April,2010-4th Dec,2010	200	206	100	114	120.73- 43.93	124.6-148.11	Inefficient	Inefficient
7th June,2010-5th Feb,2011	202	206	97	101	122.01- 45.33	124.6-148.11	Inefficient	Inefficient
6th Aug,2010-5th April,2011	200	204	91	101	120.73- 43.93	123.28-146.72	Inefficient	Inefficient
6th Oct,2010-4th June,2011	199	204	90	95	120.11- 43.23	123.28-146.72	Inefficient	Inefficient
6th Dec,2010-5th Aug,2011	202	205	91	100	122.01- 45.33	123.92-147.4	Inefficient	Inefficient
7th Feb,2011-5th Oct,2011	199	204	84	109	120.09 -43.25	123.61 -147.05	Inefficient	Inefficient
6th April,2011-5th Dec,2011	198	206	86	102	119.46 – 42.54	124.6-148.11	Inefficient	Inefficient
6th June,2011-4th Feb,2012	202	208	96	102	122 – 145.33	125.83-149.51	Inefficient	Inefficient

This research examines the weak form efficiency of spot and future gold market in India. The study concludes that both future &Spot gold market does not follow random walk on the basis of Runs Test. Hence, the investors can determine the movement of spot & future prices and can make abnormal profits or may incur huge losses by investing in such market.

Similarly demand for gold in the form of physical bar investment in India and the whole world is also studied along with their annual growth rates.

Physical Bar Investment					
	India			World Total		
Year	India	Annual CAGR	Overall CAGR	World Total	Annual CAGR	Overall CAGR
2003	65.6	-	89.32926829	177.2	-	380.4176072
2004	76.2	16.15853659	89.32926829	215.4	21.55756208	380.4176072
2005	102.8	34.90813648	89.32926829	261.4	21.35561746	380.4176072
2006	139.8	35.9922179	89.32926829	237.5	-9.143075746	380.4176072
2007	148.6	6.294706724	89.32926829	237.2	-0.126315789	380.4176072
2008	159.9	7.604306864	89.32926829	666.7	181.0708263	380.4176072
2009	117.5	-26.51657286	89.32926829	561.3	-15.80920954	380.4176072
2010	266.3	126.6382979	89.32926829	943.8	68.1453768	380.4176072
2011	288	8.148704469	89.32926829	1245.1	31.92413647	380.4176072
2012	205.9	-28.50694444	89.32926829	1050.4	-15.63729821	380.4176072
2013	265.8	29.09179213	89.32926829	1408.2	34.06321401	380.4176072
2014	109.8	-58.69074492	89.32926829	850.6	-39.5966482	380.4176072
2015	124.2	13.1147541	89.32926829	851.3	0.082294851	380.4176072

After this the world annual demand and supply of gold is studied along with their surplus and deficit.

	Supply			Demand				
World total demand and supply of gold								
Year	**Total Supply (tonnes)**	**Supply Annual CAGR**	**Supply Overall CAGR**	**Total Demand (tonnes)**	**Demand Annual CAGR**	**Demand Overall CAGR**	**Surplus /Deficit**	**Gold Price (London PM, US$/oz)**
2003	4241	-	1.532657392	4241	-	-2.758783306	Nil	363.32
2004	2948	-30.48809243	1.532657392	2920	-31.14831408	-2.758783306	20	409.17
2005	3372.5	14.39959294	1.532657392	2923	0.102739726	-2.758783306	448	444.45
2006	3252	-3.57301705	1.532657392	2880	-1.471091345	-2.758783306	372	603.56
2007	3095	-4.827798278	1.532657392	2899	0.659722222	-2.758783306	195	695.39
2008	3457	11.69628433	1.532657392	3501	20.7657813	-2.758783306	-44	871.96
2009	4138	19.69916112	1.532657392	3082	-11.96800914	-2.758783306	1056	972.35
2010	4372	5.654905752	1.532657392	3848	24.85399091	-2.758783306	523	1224.52
2011	4552	4.117108875	1.532657392	4560	18.5031185	-2.758783306	-9	1571.69
2012	4511	-0.900702988	1.532657392	4361	-4.364035088	-2.758783306	150	1668.9
2013	4272	-5.298160053	1.532657392	4968	13.91882596	-2.758783306	-695	1411.23
2014	4273	0.02340824	1.532657392	4041	-18.65942	-2.758783	232	1266.4

Source: Thomson Reuters
Gold production cost in different countries of the world is also studied in different years

Gold Production Cost					
Continent	**Year**	**2012**	**2013**	**2014**	**2015**
	US$/oz				
North America	**Total Cash Cost**	642	686	722	703
	Total Production Cost	841	906	974	979
	All-in Costs	1095	1438	1364	1493
	CAGR	-	31.32420091	-5.146036161	9.457478006
South America	**Total Cash Cost**	640	668	666	668
	Total Production Cost	852	930	916	986
	All-in Costs	1028	1512	1311	1564
	CAGR	-	47.08171206	-13.29365079	19.29824561
Australia	**Total Cash Cost**	933	885	793	693
	Total Production Cost	1191	1163	1018	953
	All-in Costs	1375	2015	1261	1138
	CAGR	-	46.54545455	-37.41935484	-9.754163362
South Africa	**Total Cash Cost**	1062	970	930	910
	Total Production Cost	1255	1154	1110	1062
	All-in Costs	1539	1576	1355	1349
	CAGR	-	2.404158545	-14.02284264	-0.442804428
Other	**Total Cash Cost**	764	775	726	690
	Total Production Cost	948	978	944	908
	All-in Costs	1390	1964	1423	1150

Conclusion

Hence we can say that gold is a very important investment option due to which every investor is interested in studying the trend of its demand, supply, cost and the ways by which one can earn abnormal returns. So, this paper is based on all these factors.

Bibliography

1] Hamid, K; Suleman, M T; Shah, S Z A and Akash, R S I (2010). *"Testing the Weak Form of Efficient Market Hypothesis: Empirical Evidence from Asia- Pacific Markets"*, International Research Journal of Finance and Economics, Issue 58 (2010), ISSN 1450-2887.
http://preciousmetalsresearch.wordpress.com/2013/09/09/can-gold-prices-forecast-the-australian-dollar-movements-2013/

2] Joshi, M (2002). *"Capital Market Efficiency: An Empirical Study of Indian Capital Market"*, Doctoral Dissertation, Punjabi University, Patiala

3] Khan, A Q , Ikram, S , Mehtab, M (2011). "Testing weak form market efficiency of Indian Capital Market: A case of National Stock Exchange (NSE) and Bombay Stock Exchange (BSE)" , African Journal of Marketing management , Vol.3 (6), pp. 115-127, June 2011.

4] Ma, L and Patterson, G (2013). "Is Gold Overpriced?" The Journal of Investing, Vol.22 (1), pp.113-127.

5] Nisar,S , Hanif,M (2012). "testing the weak form of Efficient Market Hypothesis: empirical evidence from South- Asia", World Appliued Science Journal 17 (4).

6] Patil, R and Antony, A (2012). *"Gold Prices and Indian spot FX Market"*, Abhinav National Monthly Refereed Journal of Research in Commerce & Management, May 2012, Vol. No. 1, Issue No. 5, pp. 98-100.

7] Sarkar, S (2013). *"Testing Weak Form Efficiency of Indian Stock Market an Empirical study on BSE",* The Management Accountant Journal, Vol.48, No.3.

8] Sharma, G D, Mahendru, M (2009). *"Efficiency Hypothesis of the Stock Markets: A case of Indian Securities",* International Journal of Business and Management, Vol. 4, No. 3.