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EFFICIENCY OF GOLD OPTION CONTRACTS IN INDIA

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Abstract *India has emerged as the number 1 consumer for gold, globally. India is heavily dependent on gold imports to meet its demand. The New Economic Policy 1991 and globalization have increased the risks of buying gold due to increased volatility in prices. The government of India introduced gold option futures with the aim that option futures on gold will be fundamentally used for hedging the risks associated with gold price changes. But there is a question whether that gold option contracts are effective in hedging price. The paper tries to answer this question. The paper aims to find the hedging efficiency of gold option contracts in Multi Commodity Exchange (MCX). The paper uses Simple linear regressions (OLS model) for testing hedging efficiency. The paper found that there is significant relationship between the spot prices and gold option prices and the R2 shows that there is a hedging efficiency of 88%. The result of this paper shows the attractiveness of the gold derivative markets as a platform for hedging price risks. The paper also see that there should be adequate awareness needed for the major stakeholders in realising the major benefits of option contracts, there by using the exchange traded platforms and derivative instruments to its full potential.*

Keywords: *Gold Options, Gold Futures, Hedging Efficiency, MCX, Derivatives*

INTRODUCTION

In India purchase of gold is regarded as an investment opportunity and a vehicle that will help them to mitigate inflationary effects. For Indians gold is part of their life. It is not just a symbol of wealth or status but regarded as a traditional culture for thousands of years. Gold is adored for its beauty, stored for its liquidity and bought for its investment qualities (MCX, 2018). In global gold demand index 2017, jewellery accounts for 53% of the demand (Council, 2017). It is common to see that without gold there is no Indian wedding whether poor or rich. Because of this craze for gold, India has emerged as the number 1 consumer for gold, globally. India is thus heavily dependent on gold imports to meet its demand.

The new economic policy 1991 and globalization have increased the risks of buying gold due to increased volatility in prices. To hedge against these increased price volatilities, certain derivative instruments have been introduced. In India futures was used to hedge against these price volatilities until SEBI allowed option trading from 26 March 2017. India, whose demand for gold is high needs derivative instruments like gold options to protect various stakeholders like mining companies, market intermediaries, merchandisers, jewellers and designers, importers and exporters, bullion and jewellery traders and customers from the price risks. So on the auspicious day of the "Dhanteras (October 17, 2017)" the finance minister launched the option contracts on gold.

For India to become an attractive investment destination it was important that the option markets to be open. In MCX the gold option contracts are traded at keeping gold (1 kg) futures contract as the underlying asset. Thus the main purpose of introducing gold option on futures is to hedge the risks associated with gold price changes. The major difference in hedging between a future contract and option contract is that in option contracts the hedger need not take two market positions in opposite directions. That is in future contract a hedger will have to offset the gains/losses with an alternative position in another market (MCX, 2018). Thus futures contracts requires taking equal and opposite positions in different markets. Whereas, through option contracts, a hedger need to take only one position as it can protect him against any undesired price movements and also benefit from an advantageous price movement.

The annual report of 2016-2017, Titan Industries Ltd., said the company uses derivative financial instruments to

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manage risks associated with gold price fluctuations relating to certain highly probable forecasted transactions, foreign currency fluctuations relating to certain firm commitments. The company has designated derivative financial instruments taken for gold price fluctuations as 'cash flow' hedges relating to highly probable forecasted transactions (Titan company ltd., 2017). There are a lot of jewellers and mining companies that uses financial instruments to hedge price risks. The finance act 2013 has provided coverage for derivative transactions undertaken in recognized commodity exchanges under Section 43(5) of the Income Tax Act 1961. Commodity exchanges are also promoting participants to take suitable hedging positions. MCX introduced liquidity enhancement scheme (this is whereby brokers are given incentives for bringing in liquidity by generating investors interest) from April 24, 2018 to promote the option contracts.

But here there is a question as to whether option contracts are effective in hedging price risk. This paper will be the answer to that question. Hence, the paper aims to find the hedging efficiency of gold option contracts in Multi Commodity Exchange (MCX).

REVIEW OF LITERATURE

Sl. No.	Title, Author, Year	Reviews
1	Options on the spot and Options on futures, (Brenner, Courtadon, & Subrahmanyam, 2019)	The study compares options based on their underlying asset that is on (Irwin & Sanders, 2011) the on spot assets and other futures. The paper finds out that assets that have no interim payments like gold etc., option futures on call has more value than spot options and option futures on put has lower value than spot options.
2	International use of futures and options markets, (Malick Ousmane Sy, 1990)	The paper analysis whether corporate management can use options and futures for managing risk of their portfolio and as a standard tool for managing risk. The study finds out that options and futures can be used to attract additional capital and facilitate additional borrowings for inventories.
3	The impact of options trading on the market quality of the underlying security: An empirical analysis, (Kumar, Sarin, & Shastri, 1998)	The paper examines whether option listing has a negative impact on the market of underlying assets or a beneficial impact. The paper finds out that option listings have a beneficial impact on the underlying asset as it increases greater price efficiency, lower information asymmetry and greater liquidity.
4	Pricing and hedging spread options, (Carmona & Durrleman, 2003)	This paper addresses the fundamental problem faced by many applied mathematicians in the field of finance. The paper analysis formulas for pricing and hedging financial instruments. The paper finds that there is no efficient method to compute implied volatilities and implied correlations from a set of market prices of financial instruments.
5	Index funds, financialization, and commodity futures markets, (Irwin & Sanders, 2011)	The paper analysis the heated debate whether index funds impact commodity markets. The paper finds that index funds have been become a size able participant in the commodity market, but there is little evidence that index funds increases or decreases price movements in commodity markets.
6	Commodity booms and busts, (Carter, Rausser, & Smith, 2011)	The paper analysis the booms and busts in commodity markets on the given economic changes like globalization, climate change, urbanization, agricultural production etc. The paper analysis events of 1929 and 2008 and finds that we can predict the future booms and busts if prevalent market information is available. The paper also finds that supply and demand largely influences commodity markets.
7	Commodity investing, (Rouwenhorst & Tang, 2012)	The paper studies whether index investors influences the prices of commodities. The paper finds out that even though there has been an increase in index investors, they have not been the influencers of increase in commodity prices.
8	Characteristics of investors' risk preference for stock markets, (Wen, He, Dai, & Yang, 2013)	This paper shows the risk return preference of investors according to gains and losses. It also examines risk and return on the basis of behavioral theory. The paper finds out that risk aversion is increased when the gains are increasing and risk seeking is increased when the losses are increasing.
9	Commodity futures hedging, risk aversion and the hedging horizon, (Conlon, Cotter, & Gençay, 2016)	The paper examines hedging strategies and associated performance with management risk preference. The paper find out that hedgers that have high risk aversion and short time horizon show reduce risk in their portfolio than to low risk aversion investors.
10	Optimal hedging with options and futures against price risk and background risk, (Yu & Sun, 2017)	The paper examines the optimal hedging strategies of options and futures against price risk and background risk. The paper finds that one instrument cannot hedge price and background risk so paper suggests that futures and options should be used for optimal hedging.

Sl. No.	Title, Author, Year	Reviews
11	Interest rate volatility and risk management: Evidence from CBOE treasury options, (Markellos & Psychoyios, 2018)	The paper studies US treasury market volatility and investigates ways to manage the risk of interest rate volatility. The paper finds that volatility is linked to macroeconomic new and monetary news; the paper suggests that use of diversified investment can manage these risks. The use of option and futures are suggested by this paper.
12	An empirical investigation of the market for comex gold futures options, (Bailey, 1987)	The paper studies whether market price of the gold option futures varies according to interest rates and other factors affecting the underlying asset. The study show that market price of gold option futures does not offer any economically significant arbitrage opportunities. The study through competing pricing model suggests that market prices can be predicted accurately by stochastic interest rates.
13	Tests of the random walk hypothesis for London gold prices, (Smith, 2002)	The paper assumes that London gold prices follow a random walk hypothesis. The paper analysis this assumption by taking data from morning and afternoon closing prices and test with multiple variance ratios test. The finds that the best estimator for today's closing price is yesterday's closing price but new information change the closing price of tomorrows, thus there is no point in estimating because news cannot be predicted.
14	Dynamic correlations and hedging effectiveness between gold and stock markets: Evidence for BRICS countries, (Chkili, 2016)	The paper examines the relationship between stock and gold markets from examining data from BRICS countries. The paper finds that gold can be used when there is extreme volatility in stock markets and by adding gold to portfolio it will reduce risk without impacting the returns from the portfolio.
15	Options trading in commodities, (Pavaskar, 2006)	The paper examines the pros and cons of option trading and suggests a road map for introducing such trading. It also shows the various developments that have been gone through for introducing the trading. The paper suggests that option trading should be introduced and option contracts of less than one week should be avoided.
16	Working of commodity futures markets, (Sabnavis & Jain, 2007)	The paper shows a broad view of the working of commodity futures markets, it also shows the various developments and advantages of commodity markets. The says that price volatility has come down since the start of commodity market era and more number of persons are using these market for hedging risks.
17	A study on investors' preference in Indian commodities market, (Sivarethinamohan & Aranganathan, 2013)	The paper examines about the investors preference in commodity markets and identify factors that influence the commodity markets. The paper suggests that an investor in the commodity market should go for long term investments and long term investments give stable returns than short term investment.
18	Investors' risk preference characteristics based on different reference point, (Wen, He, Gong, & Liu, 2014)	The paper assumes that prior gains and losses affect the risk preference of the investors and these two are the only factors that influence risk preference of investors. The paper shows that prior gains reduces risk aversion and prior losses increases risk aversion.
19	Hedging the price risk of crop revenue insurance through the options market, (Tiwari, Coble, Harri, & Barnett, 2017)	The paper analysis how insurance companies can use options as a hedging instrument to reduce risk. The paper finds that the crop insurers can offset price risks through using standard hedging tools by allocating its asset strategically. Insurance companies should avoid using only put options has the major hedging tool.
20	Results of a survey of stakeholders in gold value chain and their hedging practices, (Soundararajan & Goswami, 2017)	The paper examines the various factors that affects the stakeholders in using commodity markets for hedging. The paper finds out that there is lack of awareness among jewellers about the hedging and less than half jewellers use hedging instruments. Gold is still used as the major tool for hedging against price risk.

The paper finds that there has been a lot of studies in commodity derivative markets. Studies of, (Soundararajan & Goswami, 2017), (Conlon et al., 2016), (Sivarethinamohan & Aranganathan, 2013) a zero discharge work was started by the authorities in 1997. The initiation of the work was a White Paper from the Norwegian Ministry of Environment: Environmental Policy for a Sustainable Development (1996-97 studies risk preference behavior and hedging horizon and practices of commodity markets. Other studies of (Malick Ousmane Sy, 1990), (Kumar et al., 1998), (Bailey, 1987), (Menachem Brenner et al., 2019) studies about the options market which shows the use and impact of options trading on risk management and on the underlying assets. Further, Studies of (Sabnavis & Jain, 2007), (Pavaskar, 2006) shows the working and trading mechanism of Indian derivative markets. The Review of literature found that there is no evident research conducted in the testing of efficiency of gold options market of India. Thus the paper aims to analyze the efficiency of gold options in India. For fulfilling this aim, we hypothesis:

H1. There is no significant relationship between spot prices and option prices of gold.

METHODOLOGY

The paper considers data from October 17, 2017 to November 30, 2018. Data of gold options price and spot market prices of gold has been taken from MCX database. The reason for choosing gold options is that it has overall economic importance for various stakeholders in India. There are three methods available for testing hedging efficiencies such as the dollar offset method, the variability reduction method and the regression model (KPMG, 2011). This paper uses regression through ordinary least squares (OLS) estimators for testing hedging efficiency. The main reason for choosing this method is because of its reliability and the effectiveness of gold options in hedging can be measured through the relationship between spot prices and option prices. In the model, we use the price of spot market as the dependent variable (Y) and the price of options as the independent variable (X). The co-efficient Beta (slope) is the hedging ratio and the R^2 represents the hedging efficiency (KPMG, 2011). Augmented Dickey Fuller test has been used to check the stationary or the presence of unit root in the time series data.

ANALYSIS AND INTERPRETATION

The data collected from MCX for the date 17/10/2017 to 30/11/2018 of spot prices and option prices has been analyzed by using Augmented Dickey Fuller (ADF) test. The purpose for using ADF test is to check the stationary i.e. the mean and variance of spot price data and option price data are constant and should not change according to time. The formula used for checking unit root in ADF is:

$$\Delta yt = \alpha + \beta t + \gamma y_{t-1} + \delta_1 \Delta y_{t-1} + u_t$$

The null hypothesis (H_0) for testing is the prices of spot market are non stationary and have a unit root. The test was conducted by using constant and linear trend model. The number of lagged dependent variables included in the model to correct any possible autocorrelation is 15. The Table 1 shows the test results at level.

Table 1: Augmented Dickey Fuller (ADF) Test for Spot Prices

		t-Statistic	Prob.
Augmented Dickey fuller test statistic		-1.755751	0.7235
Test critical values:	1% level	-3.991412	
	5% level	-3.426073	
	10% level	-3.136231	

Interpretation: From the ADF test results we can see that the value computed t-statistic (-1.755751) for spot price is greater than (or lies to the right of) all critical t- statistic values. This implies that at level the spot prices are non-stationary and we cannot reject the null hypothesis. Now to check whether the first difference of spot price series has a unit root, we repeat the test by running it in first difference. The test was conducted by using constant model. The number of lagged dependent variables included in the model to correct any possible autocorrelation is 15. The Table 2 shows the test results at first difference.

Table 2: Augmented Dickey Fuller (ADF) Test for First Difference of Spot Prices

		t-statistic	Prob.
Augmented Dickey fuller test statistic		-17.39565	0.000
Test critical values:	1% level	-3.453823	
	5% level	-2.871768	
	10% level	-2.572293	

Interpretation: From the ADF test results we can see that the value computed t-statistic (-17.39565) for spot price is lower than (or lies to the left of) all critical t-statistic values. This implies that the spot price series in first difference form is stationary.

Now we check whether the option price series has a unit root. For this the null hypothesis (H_0) for testing is the prices of option market are non stationary and have a unit root. The test was conducted by using constant and linear trend model. The number of lagged dependent variables included in the model to correct any possible autocorrelation is 15. The Table 3 shows the test results at level.

Table 3: Augmented Dickey Fuller (ADF) Test for Option Prices

		t-statistic	Prob.
Augmented Dickey fuller test statistic		-1.671113	0.7616
Test critical values:	1% level	-3.991534	
	5% level	-3.426132	
	10% level	-3.136266	

Interpretation: From the ADF test results we can see that the value computed t-statistic (-1.671113) for option prices is greater than (or lies to the right of) all critical t- statistic values. This implies that at level the option prices are non-stationary and we cannot reject the null hypothesis. Now to check whether the first difference of option price series has a unit root, we repeat the test by running it in first difference. The test was conducted by using constant model. The number of lagged dependent variables included in the model

to correct any possible autocorrelation is 15. The Table 4 shows the test results at first difference.

Table 4: Augmented Dickey Fuller (ADF) Test for First Difference of Option Prices

		t-statistic	Prob.
Augmented Dickey fuller test statistic		-23.14994	0.000
Test critical values:	1% level	-3.453823	
	5% level	-2.871768	
	10% level	-2.572293	

Interpretation: From the ADF test results we can see that the value computed t-statistic (-23.14994) for option price is lower than (or lies to the left of) all critical t-statistic values. This implies that the option price series in first difference form is stationary.

The spot price series and option price series are stationary at first difference level. Now we move on to check the relationship between spot prices and option prices of 17/10/2017 to 30/11/2018. The main purpose of using simple linear regression model (SLRM) is to find the variations between spot prices and option prices. The *H1* is there is no significant relationship between spot prices and option prices of gold. The formula used for testing relationship is:

$$Y_i = \alpha + \beta X + e_i$$

Here e_i represents estimated residual values, and α, β are estimates of population parameters respectively. And Y is the dependent variable here that is spot price series and X is the independent variable here that is option price series. The Table 5 shows the test results of the above regression model that uses ordinary least squares estimation model.

Table 5: Regression Results

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	2116.880	625.2509	3.385650	0.0008
Option price	0.921035	0.020442	45.05710	0.0000

F-statistic	2030.143
Prob (F-statistic)	0.0000

R-squared	0.879938
Adjusted R-squared	0.879505

Interpretation: From the Table 5 it is clear that one point increase in the value of option price would increase spot price by nearly 0.921035. It is also statistically significant at 1percent i.e. the p value (0.00) < 0.01. The value of R^2 for the estimated model is nearly 0.879938 which implies that option price explained nearly 88 percent of the total variation in spot price. The computed value of R^2 (0.879938) is statistically significant, which is revealed by the significance of computed F-value (0.000) at 1 percent significance level. Thus the *H1* is rejected and it shows there is significant relationship between spot price and option price in gold.

DISCUSSION AND FINDINGS

The data analysis shows that there is significant relationship between spot prices and option prices of gold (p value < 0.01), further we can see that 88 percent (R^2) of the variation in spot prices of gold is explained by option prices of gold. This means that there has been an 88 percent (R^2) of price risk can be efficiently hedged through gold option markets. This is said because the difference between spot prices and option prices of gold shows the efficiency of option market. From the spot and option data of 17/10/2017 to 30/11/2018 it is observed that on 11 December 2017 the price in spot market was Rs. 28542 and the option price was Rs. 29673 for gold, the difference Rs. 1131 shows the efficiency of hedging. That is for jewellery traders or mining company when the price drops he can still sell the gold for Rs. 29673 if he had put option contract. Similarly on 19 February 2018 gold option were selling for Rs. 30144 and in the spot market gold was selling for Rs. 30657 which shows a difference of Rs. 513 that is for jewellery traders can still buy the gold for less than the spot market price if he had a call option contract. By analyzing the entire data from 17/10/2017 to 30/11/2018 it is observed that there is a mean difference of Rs. 298 that is options price of gold is deducted from the respective spot price, day wise, and later the analysis of the date wise differences is taken into consideration . This shows that during the study period of time put option contracts would have helped in hedging efficiently more than call option contracts because the mean difference of Rs. 298 shows that average option price was more than average spot price for that period, it shows that on average gold had less price on spot market than on option market. Thus during this period a jewellery trader or mining company or an individual who has put option contracts would have hedged their risk efficiently from the spot market price risks of gold.

CONCLUSION

The paper is aimed to find an answer to the question whether gold option contracts effectively hedge against price risks of spot market. The paper finds the answer through the simple analysis of data from 17/10/2017 to 30/11/2018 using simple linear regression models and finding the mean differences between spot market prices and gold option prices. Interestingly the paper found that there is significant

relationship between the spot prices and gold option prices and the R^2 shows that there is an hedging efficiency of 88%. Thus paper makes the statement that gold options effectively hedge against the price risks of spot market. The result of this paper shows the attractiveness of the gold derivative markets as a platform for hedging price risks. The paper also observe that there should be adequate awareness needed for the major stakeholders in realizing the major benefits of option contracts, there by using the exchange traded platforms and derivative instruments to its full potential.

IMPLICATIONS OF STUDY

The findings of the paper suggest that gold option contracts can be an effective instrument in tackling the price volatilities associated with gold prices. As gold option contracts are not traded equally as gold future contracts, awareness about the hedging efficiency of gold option contracts can stimulate trade volume in MCX. Thus this papers finding can be used to promote gold option contracts in MCX.

AGENDA FOR FUTURE RESEARCH

The paper observes that there is further research needed in gold option contracts as its trade volume is much lower than gold futures, the cause of this trade volume and why gold options is not as attractive as gold futures has to be researched.

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