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AN EMPIRICAL INVESTIGATION ON PERFORMANCE OF GOLD & CRUDE OIL DURING PANDEMIC - BLACK SCHOLES MODEL

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ABSTRACT

Commodity derivatives are not capable mitigate the causes of commodity price volatility but only intend to manage risks liked to the volatility. A study is focus on how to predict market price of selected commodities and also how exchange rate affected to the buying and selling of the derivative contract. Black Scholes model indicated variance on bid price and ask price. Researcher found that sustained imbalance of competing bids and offers can drive prices away from theoretically expected values. Imbalances can be caused by factors such as a sudden political event or unexpected news regarding a particular market. These factors cannot be quantified and can have an effect on both gold & crude oil.

Keywords: *MCX Indices, Volatility, Correlation, Option Sensitivities, Gold Contract*.

Introduction

The history of Indian capital market in India dates back to the eighteenth century when East India Company securities were traded in the country. Until the end of the nineteenth century securities trading was unorganized and the main trading centers were Bombay and Calcutta. Of the two, Bombay was the chief trading center wherein bank shares were the major trading stock during the American Civil War (1860-61). Bombay was an important source of supply for cotton. Hence, trading activities flourished during period, resulting in a boom in shares price. This boom, the first in the history of the Indian capital market lasted for half a decade. The bubble burst on July 1, 1865 when there was tremendous slump in shares price. This led to a slump in the market capitalism at the BSE by about 20 percent overnight and the stock market did not open for nearly a fortnight. Later come buoyancy in the stock markets when the multinational companies (MNCs) forced to dilute their majority stocks in their Indian ventures in favor of the Indian public under FERA 1973. Several MNCs opted out of India. One hundred and twenty-three MNCs offered shares worth Rs 150 corer, creating 1.8 million shareholders within four years. The offer prices of FERA shares were lower than their intrinsic worth. Hence, for the first the FERA dilution created an equity cult in India. It was the spate of the Indian stock markets.

In Sptember,2020 Brent crude oil prices declined 6.58%, to close at $42.30 per barrel on 30th day of the month vis $45.28 per barrel on August 31,2020 on the International Petroleum Exchange (IPE). Oil prices remained lower through most of the month owning to demand growth concerns following spike in coronavirus cases globally and reports that Saudi Arabia could cut prices in October. However, renews hopes for the US fiscal stimulus and fall in the US crude oil supply cut short the fall.

Role of Derivatives

The term “derivative” stands for a contract whose prices is derived from or is dependent upon an underlying asset. The underlying asst could be a financial asset such as currency, stock and market index, an interest-bearing securities or a physical commodity. Financial transactions are loaded with several risk factors. Derivatives are instruments in separate from those risk factors from traditional instruments and shifting risks to those entities that are ready to take them. If exchange rate risk is high even though a substantial profit may have been made overseas currency and may erode a significant amount of investment earnings. Interest rate risk is simple the reduction of value of securities and bonds due to the rise of interest rates over a given period of time. Commodity price risk arises whenever a movement in commodity prices either positively or negatively, impact on contact financial position.

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Role of MCX in India

Multi Commodity Exchange (MCX) is an independent commodity based in India. It was established in 2003, located at Mumbai MCX offers future trading in bullion, ferrous and non-ferrous, metals, energy and number of agricultural commodities. MCX is India's number one commodities exchange with 83% market share in 2009. Globally, MCX ranks no.1 silver, no2 in natural gas, and no.3 in futures trading. The highest traded item is gold.

Role of MCX-SX in India

MCX-SX Clearing Corporation Limited (MCX-SXCCL), was jointly promoted by MCX Stock Exchange Limited (MCX-SX), Multi-Commodity Exchange of India Limited (MCX) and Financial Technologies India Limited (FTIL), as a new age Clearing Corporation constituted to undertake clearing and settlement of deals in multi asset classes. The company offers best-in-class services to its clearing members with the help of its state of the art risk management framework and unparalleled clearing and settlement systems with dedicated linkages with clearing partners

Review of Literature

Wing Yan, David Stephens, Sofia "Hedging strategies and minimal variance portfolios for European and Exotic options in a levy market" Mathematical Finance, Vol 20 , no 4, October 2010, 617-646. It is shown how variance portfolios can be used to hedge the higher order terms in a Taylor expansion of the pricing potentially variance can be used to hedge the higher order terms in Taylor expansion of the pricing function.

McKenzie, D Gerace, Z. Subedar "An empirical investigation of the Black Scholes model: evidence from the Australian Stock Exchange" Australian Accounting Business and Finance Journal. 1(4), 2007. Available at:http://ro.uow.edu.au/aabfj/voll/iss4/5: This paper evaluates the probability of an exchange traded European call option being exercised on the ASX200 Option Index. The results also provide evidence that the use of implied volatility and a jump-diffusion approach, which increases the tail properties of the under laying lognormal distribution, improves the statistical signification of the Black-Scholes model.

Stan Beckers (2007) investigate the efficiency of its pricing procedures, to verified put-call parity. Result shows no profitable riskless evidence of arbitrage opportunity and no evidence for market inefficiency. However, result shows black Scholes model not appropriate for gold option, so alternative pricing model can be used.

Beckers (1980) tested the Black-Scholes assumption that the historical instantaneous volatility of the underlying stock is a function of the stock price, using S&P index option 1972-1977. Beckers (1980) finds the underlying stock is an inverse function of the stock price.

Rubinstein (1944) illustrates that the implied volatility for S&P 500 index options negatively skewed and leptokurtic. Jackwerth and Rubinstein (1996) show the distribution of the S&P 500 before 1987 exert lognormal distribution, but since have deteriorated to resemble leptokurtosis and negative skewness.

Das and Sundaram (1999) indicate jump-diffusion and stochastic volatility mitigate but do not eliminate volatility bias. Das and Sundaram (1999) identify jump-diffusion and stochastic volatility process does not generate skewness and extra kurtosis resembled in reality.

DeanTeneng "Limitations of Black-Scholes Model" International Research Journal of Finance and Economics ISSN 1450-2887 Issue 68 (2011); Black-Scholes model is considered the biggest success in financial theory both in terms of approach and applicability. This paper explores the weaknesses in this model and illustrates some consideration when dealing with such models.

H.Reynaerts & m.Vanmaele "A Sensitivity Analysis for the Pricing of European call Options in a Binary Tree Model" This model is very general in the sense that it can be applied if one describes it by fuzzy numbers in option. The conclusion is that the price option is a strictly increasing function of the volatile.

An Introduction of Gold & Crude oil Derivative Market

Gold: Pandemic Impact

Sr. No.	Change	Amount	%
1	Today	+1065.25	+0.78
2	Last 30 days	-2414.16	-1.74
3	6 Months	+4880.30	+3.70
4	1 Years	+31888.97	+30.45
5	5 Years	+65981.53	+93.43
6	20 Years	+123961.29	+980.50

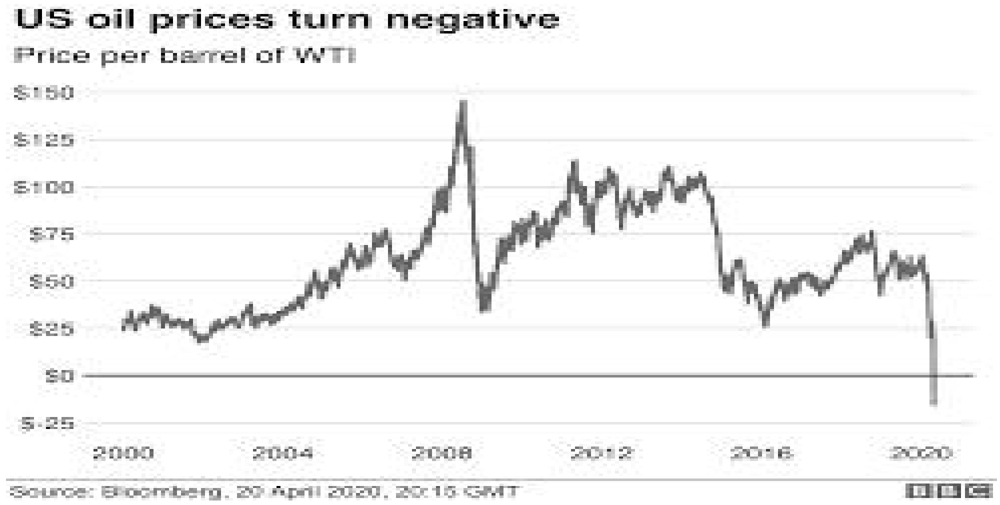
Sources: goldprice.org

The gold market is subject to speculation as are other markets, especially through the use of futures contracts and derivatives. The history of the gold standard, the role of gold standards, the role of gold reserves in central banking, gold's low correlation with other commodity prices, and its pricing in relation to fiat currencies during the 2007-2012 global financial crisis, suggest that gold behave more like a currency than a commodity.

The below also indicated the growth of gold market, not national but internationally. The images downloaded from the websitegoldprice.org

Crude Oil

Crude oil surged 19.5 per cent in a day after a drone strike on a Saudi Arabian oil facility. On Monday, oil prices spiked $12 to trade at $71 a barrel in Asia. This is said to be the biggest advance in Oil prices in 28 years. The Indian markets had a negative knee-jerk reaction to the news. The BSE SENSEX fell 250 points on spike in oil prices. Fund managers believe that if the tension between Iran and USA persists, crude oil prices might go up, which is a bad news for Indian markets



Sources: WTI crude oil price

Objective of Study

- First to identify a co-relationship between gold and crude oil derivatives in Indian capital market with use of black scholes model.
- Second, to analyze movement of different crude oil and gold price.

Sample Universe

The sampling universe is the total number of items/events from which you can select or sample for statistical analysis and description. Here, MCX AND MCX-SX all indices.

Sample Unit

- Gold: - gold (10 grams)
- Crude Oil

Sample Period: Pandemic Period

Here, An investigation on gold and currency derivatives for 1 year from 1-JAN-2020 to 31-DEC-2020.

Hypothesis of Study

H_0: There is positive relationship between gold & crude oil

H_1: There is negative relationship between gold & crude oil.

Data Collection

I have used secondary data for analysis of gold and crude oil relationship from MCX, MCX-SX, GOLDRATE.COM, WIKIS etc.…

Tool of Analysis

The black schools model is used to calculate a theoretical call option and put option using the five key determinants of an option's price: stock price, volatility, time to expiration, and short term interest rate. The study will have as core analysis of gold and crude oil by the black schools model, which will be studied, given due – term of option.

$$C = SN\left(d_1\right) - E\ e^{-rT} N\left(d_2\right)$$

Gold: Black Schools Model

Expiry Date: 27th January – 2021

Underlying Price: 50116

Strict Price: 51200

Annualized Volatility: 25%

Risk Free Rate of Return: 7%

Time to Option Expiry: 41Days

Particular	Call Premium	Put Premium
Option	1196.28	2271.78
Delta	0.41	-0.58
Theta	-19.58	-19.37
Gamma	0.001	0.001
Vega	64.98	64.98
Rho	-1.34	-2.55

The strike price (or exercise price) of an option is the fixed price at which the owner of the option can buy (in the case of a call option) or sell (in the case of a put option) the underlying security or commodity. The strike price is mostly used to describe stock, index or commodity options. Listed options have clearly defined rules for strike prices, contract sizes and expiration dates. In short, upon expiration, call options are worth the difference between the price of the underlying security and the strike price.

The buy-and-hold strategy for gold is superior to a managed and diversified portfolio including more parts of the precious metals sector? Not necessarily. During most of the analyzed period, its compare with SENSEX which means that the less volatile part of the precious metals market simply doesn't decline as much as the other index. But, once the bull market truly resumes, the more volatile parts of the precious metals market would be likely to take the lead.

Crude Oil: Black Schools Model

Expiry Date: 15th January – 2021

Underlying Price: 3580

Strike Price: 3400

Annualized Volatility: 25%

Risk Free Rate of Return: 7%

Time to Option Expiry: 29 Days

Particular	Call Premium	Put Premium
Option	212.06	33.06
Delta	0.77	-0.22
Theta	-1.25	-1.28
Gamma	0.0012	0.0012
Vega	2.98	2.98
Rho	-1.17	-0.03

Finding & Conclusion

The main objective behind selecting this project is to investing the performance of gold & crude oil& it selected from MCX and FOREX MARKET. Here, from the above chart we can say that we first should know the option trading strategy and study well before taking decisions on diversification portfolio investment.

It should be noted that while quantifiable factors can explain much of the observable price behavior, supply and demand still play an important part. A sustained imbalance of competing bids and offers can drive prices away from theoretically expected values. Imbalances can be caused by factors such as a sudden political event or unexpected news regarding a particular market. These factors cannot be quantified and can have an effect on both gold &crude oil. That being said, theoretical options pricing is a valuable tool that helps investors and traders anticipate price movements for option positions.

Options involve risks and are not suitable for everyone. Option trading can be speculative in nature and carry substantial risk of loss. Invest only with risk capital or money that you can afford to lose.

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