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ANALYSIS ON IMPACT OF COMMODITY TRADING ON STOCK MARKET VOLATILITY

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ABSTRACT

The Purpose of the study is to examine the impact of commodity trading on stock market volatility. The sample data consist of closing prices of NCDEX as well as closing prices of four stocks.

The study uses GARCH model to capture nature of volatility over the period of time. The evidences suggest that there is a significant change in the volatility of NCDEX, but the structure of volatility has changed to some extent.

The Finding suggests that a commodity trading has reduced the volatility in post-derivative period. However, results show mixed effect in case of 4 individual stocks. These results can assist investors in making investment decision. It also helps to identify need for regulation.

KEYWORDS: Commodity, Commodity Market, Stock Prices (Futures)

INTRODUCTION

Ever since the dawn of civilization commodities trading have become an integral part in the lives of mankind. The very reason for this lies in the fact that commodities represent the fundamental elements of utility for human beings. The term commodity refers to any material, which can be bought and sold. Commodities in a market's context refer to any movable property other than actionable claims, money and securities. Over the years commodities markets have been experiencing tremendous progress, which is evident from the fact that the trade in this segment is standing as the boon for the global economy today. The promising nature of these markets has made them an attractive investment avenue for investors.

In the early days people followed a mechanism for trading called Barter System, which involves exchange of goods for goods. This was the first form of trade between individuals. The absence of commonly accepted medium of exchange has initiated the need for Barter System. People used to buy those commodities which they lack and sell those commodities which are in excess with them. The commodities trade is believed to have its genesis in Sumeria. The early commodity contracts were carried out using clay tokens as medium of exchange. Animals are believed to be the first commodities, which were traded, between individuals. The internationalization of commodities trade can be better understood by observing the commodity market integration occurred after the European Voyages of Discovery. The development of international commodities trade is characterized by the increase in volumes of trade across the nations and the convergence and price related to the identical commodities at different markets. The major thrust for the commodities trade was provided by the changes in demand patterns, scarcity and the supply potential both within and across the nations.

Derivatives as a tool for managing risk first originated in the commodities markets. They were then found useful as a hedging tool in financial markets as well. In India, trading in commodity futures has been in existence from the nineteenth century with Organized trading in cotton through the establishment of Cotton Trade Association in 1875. Over a period of time, other commodities were permitted to be traded in futures exchanges. Regulatory constraints in 1960s resulted in virtual dismantling of the commodities future markets. It is only in the last decade that commodity future exchanges have been actively encouraged. However, the markets have been thin with poor liquidity and have not grown to any significant level.

India has a long history of commodity futures trading, extending over 125 years. Still, such trading was interrupted suddenly since the mid-seventies in the fond hope of ushering in an elusive socialistic pattern of society. As the country embarked on economic liberalization policies and signed GATT agreement in the early nineties, the government realized the need for futures trading to strengthen the competitiveness of Indian agriculture and the commodity trade and industry. Futures trading began to be permitted in several commodities, and the ushering in of the 21st century saw the emergence of new National Commodity Exchanges with countrywide reach for trading in almost all primary commodities and their products.

NEED FOR THE STUDY

- The issue of the impact of commodity trading on stock market volatility has received considerable attention during past few years. Although many factors contribute to stock market volatility, there is concern about the impact of Commodity trading on stock market volatility.
- Theoretically the impact of stock index futures and options on the stock market volatility is still not clear. The linkage between these commodity markets and the stock market is generally established through arbitraging activities.

OBJECTIVES OF THE STUDY

Primary objectives

- To study the volatility and the impact of copper prices in the commodity market

Secondary Objectives

- To study the volatility of copper prices
- To compare the volatility of copper prices with other metals
- To study the impact of copper prices with other metals such as zinc, nickel, steel and gold

Review of Literature:

Using a simple present value model, Shiller (1981) finds that the level of stock market volatility is too high relative to the variation in the underlying micro and macro fundamentals. Specifically, he finds that the changes in real dividends and real interest rates cannot explain the level of market volatility. Studies that examine the variation in market volatility also conclude that standard macro factors and corporate characteristics cannot explain the time-varying nature of equity volatility. Specifically, Officer (1973), Black (1976), and Christie (1982) find that financial leverage only weakly explains the variation in market volatility.

Schwert (1989) finds that standard macroeconomic variables, such as inflation, money growth, and industrial production, also do not sufficiently explain the variation in the market volatility. Therefore, non fundamentally based volatility drivers likely exist and may have better explanatory powers.

Equilibrium models of cyclical volatility are often difficult to apply; in addition, they often do not match well to data or offer insufficient degrees of freedom for empirical calibration. For this reason, statistical models are often relied upon for modeling stochastic volatility; these statistical models can be used with great flexibility for asset pricing or asset allocation exercises. Various statistical volatility models have been Jason C. Hsu and Feifei Li developed specifically to capture and measure time-varying volatilities.

Engle (1982) and Bollerslev (1986) provide the basic framework for such modeling with the ARCH/GARCH process (autoregressive conditional heteroskedasticity/generalized autoregressive conditional heteroskedasticity). The technique has been applied widely to the estimation of the time-varying equity market volatility. Recent researches have proposed new techniques that could improve forecasting power through the usage of high-frequency tick-by-tick data. Anderson et al. (2001, 2003, 2005) use 5-minute realized volatility with a vector auto regressive model of log standard deviation, which eliminates much of the serial dependence in the volatilities and appears to outperform the traditional ARCH/GARCH specifications. Ghysels et al. (2006) also use higher-frequency data but propose a regression model using a beta weighting function to estimate and forecast volatility. Their model appears to be easier to parameterize and provides better forecasts against traditional ARCH/GARCH models. Vasilellis and Meade (1996) show that the implied stock volatility from option prices is an efficient forecast for future volatility.

Poon and Granger (2003, 2005) show that option-implied volatility provides the best forecast for future volatility; they used option-implied volatility data from the last 20 years and compare against volatility models such as time-weighted volatility, rolling volatility, ARCH/GARCH, and other stochastic volatility models. So why should we care about time-varying market volatility? If we do not properly characterize the time-varying nature of volatility and covariance for the various capital markets we invest in, our asset pricing model would be flawed, our portfolio allocation would be suboptimal, and our ex ante risk assessment would be incorrect.

Bentz (2003) and Bollerslev et al (1988) show that using a time-varying covariance estimate (beta estimate) can improve the application of the capital asset pricing model for forecasting returns. Horasanh and Fidan (2007) show that applying GARCH estimates for volatility can improve portfolio allocation efficiency.

Blake and Timmermann (2002) find evidence that some pension funds seem to vary asset allocation to take advantage of time-varying asset class volatilities and risk premia. Myers (1991) finds that using GARCH models can improve the effectiveness of hedging fixed-income exposure relative to traditional regression approach with constant variance. Baillie and Myers (1991) extend the study into the commodities market and find that GARCH-based hedging provides a substantial improvement in risk reduction effectiveness.

COMMODITY

Commodity includes all kinds of goods. FCRA [Forward Contract(Regulation) Act,1952] defines “goods” as "every kind of movable property other than actionable claims, money and securities". Futures trading are organized in such goods or commodities as are permitted by the central Government. At present, all goods and products of agricultural (including plantation), mineral and fossil origin are allowed for futures trading under the auspices of the commodity exchange recognized under the FCRA. The National commodity exchange have been recognized by the central Government for organized trading in all permissible commodities which include precious metals (Gold & Silver) and non-ferrous metals; cereals and pulses; ginned and un-ginned cotton; oilseeds, oils and oilcakes; raw jute and jute goods; sugar and guar; potatoes and onions; coffee and tea; rubber and spices, etc.

COMMODITY MARKET

Commodity market is an important constituent of the financial markets of any country. A commodity exchange or market is a common platform, where market participants from varied spheres trade in wide spectrum of commodity derivatives.

It is the market where a wide range of products, viz., precious metals, base metals, crude oil, energy and soft commodities like palm oil, coffee etc. are traded. It is important to develop a vibrant, active and liquid commodity market. This would help investors hedge their commodity risk, take speculative positions in commodities and exploit arbitrage opportunities in the market.

DETERMINATION OF FUTURE PRICE

Futures prices evolve from the interaction of bids and offers emanating from all over the country – which converge in the trading floor or the trading engine. The bid and offer prices are based on the expectations of prices on the maturity date.

How do Professionals Predict Prices in Futures?

Futures price evolve from the interaction of bids and offers emanating from all over the country – which converge in the trading floor or the trading engine. The bid and offer prices are based on the expectations of prices on the maturity date.

There are two methods for predicting futures prices – fundamental analysis is concerned with basic supply and demand information, such as, weather patterns, carryover supplies, relevant policies of the government and agricultural reports.

On the other hands, technical analysis includes analysis of movement of prices in the past. Many participants use fundamental analysis to determine the direction of the market, and technical analysis to time their entry and exit.

ADVANTAGES OF THE FUTURES TRADING

(i) Leverage: Trading a futures / commodity contract allows one to trade higher quantity with less money.

(ii) Ability to go short: Most traditional stock mechanisms do not permit traders to short sell without large account size, or large experience. With futures going short is as simple and as common as going long. There are also no margin penalties or additional requirements for going short.

(iii) Hedging: This is beneficial when protecting a stock portfolio by going short futures, or buying futures, or other various strategies. This is also very important for the world producers of commodities such as coffee, where they can lock in their price for delivery at a price as sometime in the future.

(iv) Portfolio diversification: Trading commodities and futures is probably a great idea for large investors who can diversify from traditional portfolio models like bonds, stocks, and cash.

(v) Automated, Emotionless trading: Systems trading helps avoid the risky decisions an investor tends to make when a strategy in not in place at the time the position is entered.

(vi) Flexible point of entry: Entry timing becomes irrelevant because some trades will go long, some short, some will reverse, etc. and it really doesn't matter what market prices are or what day of the week it is to get started.

DIFFERENT TYPES OF COMMODITIES TRADED

World-over one will find that a market exits for almost all the commodities known to us. These commodities can be broadly classified into the following:

PRODUCTS	COMMODITIES
Precious Metals	Gold, Silver, Platinum etc
Other Metals	Nickel, Aluminium, Copper etc
Agro-Based Commodities	Wheat, Corn, Cotton, Oils, Oilseeds
Soft Commodities	Coffee, Cocoa, Sugar etc
Live-Stock	Live Cattle, Pork Bellies etc
Energy	Crude Oil, Natural Gas, Gasoline etc

COPPER

Copper is an element, reddish brown in color, having atomic number 29 and pertaining to the scientific symbol 'Cu'. Coming from the same family of silver and gold, this element shares numerous common characteristics with those precious metals. The consumption of copper stands at the third position among the most consumed metals in the world after steel and aluminium. The consumption of this metal is concentrated in the highly industrialized countries namely

1. Western Europe (29%)
2. United States of America (19%)
3. Japan (14%)
4. Russia (10%)
5. China (6%)

STEEL

Steel is a major input in the construction, shipbuilding, automobile and oil industries. Although the U.S. and

Western Europe were largely responsible for the initial development of this industry, since about 1970, China has become a major force in the steel industry. Chinese steel production has grown from 13% of world steel production in 1995 to 32% in 2005. However, China's demand for steel has grown just as fast, and it remains a net importer of steel. On May 18, 2009, global steel prices fell to a six-year low.

NICKEL

Nickel is a metal which is mainly used as an alloying element of stainless steel, major ingredient of brass, and for electroplating. Nickel is also used together with lanthanum in the nickel metal hydride (NiMH) battery. Nickel is highly resistant to corrosion and is widely used to create corrosion resistant alloys and is also used heavily in the electroplating process. Nickel is used with Chromium to create Nichrome, which has a high melting point and is used for the efficient conversion of electricity to heat. Annual world production was 1.4 million tonnes in 200

NICKEL PRODUCERS

Nickel deposits are classified as either sulphide or laterite deposits. Economical viable laterite deposits are huge but with lower concentration of the ore in comparison with sulphide deposits. The primary ore associated with sulphide deposits is Mille rite. Biggest producers are Vale S.A. (VALE), Xstrata PLC (XTA-LN) and BHP Billiton (BHP).

Nickel prices are reacting significant to over or undersupply of the markets with the metal. Prices peaked at more than 50,000 USD/tonne in March 2007 and subsequently declined to less than 10,000 USD/tonne in February 2009.

ZINC

Zinc is available in the atmosphere in large quantities. The various external sources in which zinc is concentrated in the atmosphere are electric services, petroleum refining, crude petroleum and natural gas extraction, manufacturing of fabricated rubber products and metal heating and plumbing products, production of inorganic chemicals etc.

The world consumption of zinc annually totals up to around 10774000 tons. The three major nations arising the highest demand for zinc are China, USA and Japan

TOOL FOR ANALYSIS

UNIT ROOT TEST

As we have used return variables calculated from log values, we do not need to test the problem of stationarity. But because of it being a compulsory condition for GARCH implication, we have tested the stationarity for all the basic variables. To solve the problem of stationarity, the Augmented Dickey-Fuller Test has been applied that is the most frequently used test for unit root test.

Unit root, random walk and non-stationary are near about similar things. A formal test model to solve the problem of stationarity was firstly proposed by Dickey and Fuller that is known as Dickey - Fuller Test (DF Test). The model or procedure tests for the presence of a 'unit root' in the time series. The DF test starts with the assumption that a series y_t is following an Auto Regressive (1) process of this form: $y_t = a_1 y_{t-1} + e_t$

And then testing for the case that if the coefficient a_1 is equal to one (unity), hence “unit root” or Yt series is non stationary.

In case of $a_1 = 1$ then the above equation can be expressed as: $\Delta y_t = e_t$

And the y_t series is said to be integrated of order one (I(1)) or non-stationary; while the Δy_t is integrated of order zero (I(0)) or stationary.

In fact instead of testing for $a_1 = 1$ we can test an alternative version of the same thing using this equation:

$$\Delta y_t = \gamma y_{t-1} + e_t$$

And now testing whether $\gamma = 0$, which is clearly equivalent to the above mentioned case.

Dickey and Fuller (1979) actually consider three different regression equations that can be used to test for the presence of a unit root:

$$\Delta y_t = \gamma y_{t-1} + e_t$$

$$\Delta y_t = a + \gamma y_{t-1} + e_t$$

$$\Delta y_t = a + \gamma y_{t-1} + a_2 t + e_t$$

The difference between the three regressions concerns the presence of the deterministic elements a and a_2.

The parameter of interest in all the regression equations is γ, if $\gamma = 0$, the series contains a unit root. The test involves estimating one (or more) of the equations above using OLS in order to obtain the estimated value of γ and associated standard error. Comparing the resulting t-statistic with the appropriate value reported in the Dickey-Fuller tables allows the researcher to determine whether to accept or reject the null hypothesis $\gamma = 0$.

The most frequently used test for unit roots is the **augmented Dickey-Fuller** test, an advanced form of DF Test. The ADF test simple includes AR(p) terms of the Δy_t term in the three alternative models. Therefore we have:

$$\Delta y_t = \gamma y_{t-1} + \sum_{i=1}^{n} \beta_i \Delta y_{t-i} + e_t$$

$$\Delta y_t = a + \gamma y_{t-1} + \sum_{i=1}^{n} \beta_i \Delta y_{t-i} + e_t$$

$$\Delta y_t = a + \gamma y_{t-1} + a_2 t + \sum_{i=1}^{n} \beta_i \Delta y_{t-i} + e_t$$

The difference between the three regressions again concerns the presence of the deterministic elements a and a_2. The lag length n should be determined according the AIC and SBC criteria. Also, note that in the ADF tests note that we use different statistical tables with critical values in each case.

DATA ANALYSIS AND INTERPRETATIONS

DESCRIPTIVE ANALYSIS

Table: 1. Showing Descriptive Statistics for the Metals

Particulars	COPPER	GOLD	NICKEL	STEEL	ZINC
Mean	337.5735	17969.00	975.9504	25133.16	97.07431
Median	341.4000	18138.00	1002.650	24820.00	100.0000
Maximum	387.3000	20493.00	1234.700	29420.00	119.1000
Minimum	287.7000	16068.00	737.7000	22860.00	75.65000
Std. Dev.	22.21099	1223.837	120.7799	1444.592	9.754799
Skewness	-0.098535	0.110584	-0.256111	1.042294	-0.191189
Kurtosis	2.253994	1.636154	2.308013	3.686310	2.118198
Jarque-Bera	6.276109	20.12394	7.813663	50.77426	9.738256
Probability	0.043367	0.000043	0.020104	0.000000	0.007680
Sum	85406.10	4546158.	246915.5	6358690.	24559.80
Sum Sq. Dev.	124318.7	3.77E+08	3676119.	5.26E+08	23979.34
Observations	253	253	253	253	253

INFERENCE

The main purpose of studying the descriptive statistics of the return series is to analyze the nature of normality.

RESULTS OF STANDARD DEVIATION

Standard deviation is an important tool to measure volatility. The standard deviation of copper is 6% is less compared to metal nickel (12%). It also noted that gold price volatility is also 6% hence it clear that both copper and gold has the same rate of volatility

RESULTS OF KURTOSIS

The results of kurtosis are fat tailed for greater than3.

SKEWNESS

1. Copper , nickel and zinc is negatively skewed hence the price these metals is not constant
2. Gold and steel price is positively skewed. Hence the price is constantly increasing

CORRELATION ANALYSIS BETWEEN THE METALS

	COPPER	GOLD	NICKEL	STEEL	ZINC
COPPER	1.000000	0.345433	-0.140578	0.112567	-0.501958
GOLD	0.345433	1.000000	0.729492	-0.110772	-0.117429
NICKEL	-0.140578	0.729492	1.000000	-0.347055	0.241679

STEEL	0.112567	-0.110772	-0.347055	1.000000	-0.609073
ZINC	-0.501958	-0.117429	0.241679	-0.609073	1.000000

Source: Secondary Data

INFERENCE

1. Copper price is positively correlated with GOLD at (0.345) and steel price at(0.11) . It is negatively correlated with other metals such as zinc and nickel
2. Gold price is positively correlated nickel price at (0.729). It is negatively correlated with other metal such as steel and zinc.
3. Nickel price is negatively correlated with steel at (-0.34) .It is positively correlated with gold and zinc.
4. Steel price is negatively correlated with gold, nickel and zinc. It is positively correlated with copper price at (0.11)
5. Zinc price is positively with nickel price at (0.24). Its negatively correlated with other gold and steel

UNIT ROOT TEST COPPER

The time series data need to be stationary for further analysis. To check the stationary of data unit root test is conducted

UNIT ROOT TEST AT LEVEL

Null Hypothesis: COPPER has a unit root

			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-1.483479	0.5415
Test critical values:	1% level		-3.441074	
	5% level		-2.866163	
	10% level		-2.569291	

INFERENCE

The above table indicates the series are not stationary at level (> 0.05) so we are conducting the unit root test at first difference

Table 2: Showing Results of Unit Root Test at First Difference

			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-23.82096	0.0000
Test critical values:	1% level		-3.441093	
	5% level		-2.866171	
	10% level		-2.569295	

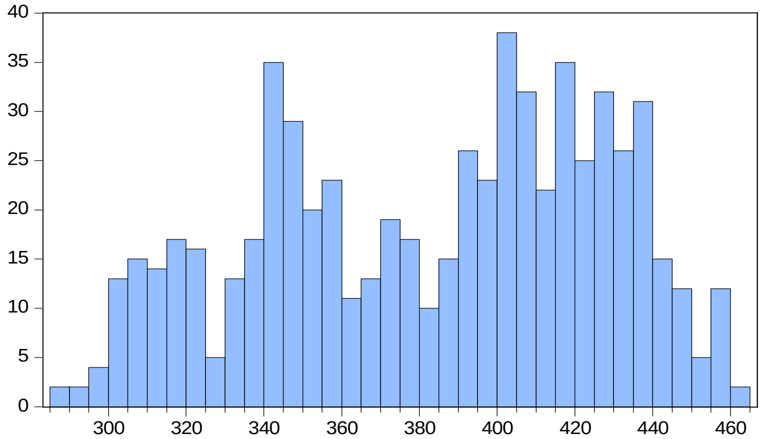
INFERENCE

The result shows the copper price data is stationary at first difference and significant at 0.05% level

HISTROGRAM: COPPER

Null Hypothesis (H_0): The residual are normally distributed.

Alternative Hypothesis (H_1): The residual are not normally distributed



Series: CLOSE_PRICE	
Sample 1/11/2010 10/18/2011	
Observations 646	
Mean	383.7159
Median	392.1250
Maximum	464.9500
Minimum	287.7000
Std. Dev.	43.61440
Skewness	-0.268083
Kurtosis	1.943161
Jarque-Bera	37.80132
Probability	0.000000

Mean = 383.71, Std .dev = 43.61, Rate of volatility = 8.7%

Skewness: Here the value is –0.2680 for copper. It is negatively skewed

Kurtosis: It is less than 3 hence it is flat tailed. Hence graph is up trend

Inference: The residual are not normally distributed.

CONCLUSIONS

The study reveals the importance of the futures contract and tells how the futures contract is used as a hedging tool in the commodity exchange market. How the commodities are traded in the commodity market. Since the study was with special reference to copper, zinc, nickel, steel, the volatility of the copper future price has been derived and it shows that the price is highly volatile. Investing in the copper is more profitable and less risky since, copper price is expected to increase further in the long run. Today, copper prices float freely in accordance with supply and demand, responding quickly to political and economic events. These findings are of considerable importance for copper investors and traders.

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