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Ajanta Prakashan

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5. Information Linkages between Commodity and Equity Markets: Evidence from India

Prof. Guntur Anjana Raju

Professor, Department of Commerce, Faculty of Commerce and Management Studies; Goa University, Goa, India.

Ms. Jambotkar Mrunali Manohar

Ph.D. Research Scholar and Assistant Professor, Narayan Zantye College of Commerce, Bicholim-Goa, Goa, India.

Abstract

The dramatic increase in financialisation of commodity futures, which implies increase in inflows of funds to commodity futures market by considering commodities as an alternative asset for investment and not purely as consumables in recent decades which has generated an intensive debate in academic literature that whether commodities as an investible asset move in sync with other financial assets or not. In this context the present study attempts to examine the co-movements between Commodity and Equity Markets by applying Correlation analyses and Cointegration over a time frame ranging from January 2009 to December 2018. The research has recognized that there is no evidence of long run relationship between equity and commodity markets which signifies the role of commodity futures as an effective investment vehicle to get diversification benefits in a traditional portfolio.

Keywords: Financialisation, Equity, Commodity futures, Cointegration, Portfolio diversification.

Introduction

The Commodity Market actively started trading in India in 2002. In 2008 the strong Global financial crises hampered most of the equity markets of the world. During this phase there was a sharp upsurge in investment in commodity markets. Such a large scale investor aptitude for commodities was on account of financialisation of commodity futures market wherein commodities were also considered as an investible asset Class. Thus the emergence of financialisation of commodity markets may affect the pricing of other financial markets. The uncertainty in the equity market has also resulted in shifting the attention of portfolio managers to some other alternative asset class like commodities. Commodities also bear a low or negative

correlation with other traditional financial assets and also factors which determine the prices of commodity are different from that of other financial assets. Besides this Commodities also act as natural hedge against inflation as during such periods value of traditional assets like stocks and bonds falls but commodity prices shows increasing trend to that of inflation. Such increasing role of commodity futures has put various researchers in dilemma on the issue that, whether there exist linkages of commodity markets with other markets including equity markets? Or Whether Commodity Markets move independently?

Literature Review

For financial researchers, commodities are also of interest for their potential role in asset allocation decisions. In this regard, recent papers by **(Buyuksahin Bahattin, 2010)**, has given an insight on linkages between US commodity and equity indices through dynamic correlation and recursive cointegration techniques. The result shows that the returns on the investible commodity and US equity indices have not changed significantly during the sample period of 15 years.

Similarly, **(Y.Bansal, 2014)** examined the implications for portfolio diversification through Cointegration and Causality analyses between equity and commodity future prices and the results revealed no long run relationship which will provide a benefit to investor in long run by including commodity futures to traditional portfolio. **(Arvind Kumar Singh, 2015)**, compared the return on commodity and equity for a period ranging from 2003 to 2010. By investigating the investment pattern during the business cycles the results evidence a low correlation between commodity and stock indices. The findings also exhibit opportunities of diversified portfolio for hedging risk in different time spans and cycles. **(Swamy, 2011)**, examined extent of inter-linkages among equity and commodity markets by considering global financial crises. The results indicated high degree of co-movement during crises as well as post crises period.

The conditional Correlation between Goldman Sachs Total Return Commodity Index, Sub-indices of GSCI and the S&P 500 index was examined by **(Buyuksahin Bahattin M. S., 2010)** through bivariate GARCH framework. By using data from January 1991 to June 2011, the findings revealed that diversification benefits diminishes over the sample period as the conditional correlation is low enough for commodities to provide meaningful diversification benefits to investors. Similarly by considering the panel of 25 commodities and relying on Dynamic conditional correlation (DCC) GARCH framework **(Anna Creti, 2013)**, examined links between Commodity and stock markets over a time span ranging from January 2001 to

November 2011. The results reported that correlations evolve over time and are highly volatile since global financial crises. Some commodities namely oil, coffee and cocoa exhibited a speculation phenomenon whereas gold evidenced its safe-haven role, maintaining its value during the financial crises. (Walid Mensi, 2013), employed VAR-GARCH Model to investigate the return links and volatility transmission between S&P 500 and Commodity Markets over a period from 2000 to 2011 and evidenced relatively high conditional correlations of S&P 500 with both Gold and WTI indexes. Overall the findings suggest significant implications for portfolio hedgers in optimal portfolio allocations, risk management and forecasting of future volatility. There were also studies which considered individual commodity futures for instance (Jin-Su Kang, 2013), investigated the international linkages between international food commodity future prices and daily Chinese stock indices including Shanghai Stock Exchange (SSE) and Shenzhen stock Exchange (SZSE). The empirical analyses conducted during 2000-2010 supports bilateral causality flow from Chinese stock indices to wheat, corn, soybean and soybean oil futures while unidirectional flow was depicted from rough rice futures to Chinese stock indices. Furthermore, the results of impulse response function depict negative response of stock prices to international commodity future prices and vice versa. The above articles highlight a thin existing literature to explore linkages equity and commodity markets. So the present study is an attempt to fill this notable gap in the existing literature. Having noted down this the present study explores the role of commodity as an investible asset and its linkages with other financial assets.

Objectives and Research Methodology of the Study

- 1) To examine the correlation within the Indian commodity Indices and with the Nifty Fifty Stock Index.
- 2) To model the long run equilibrium relationship between Indian commodity Indices and Nifty Fifty Stock Index.

Hypothesis of the Study

- 1) H_{01} : There is no correlation within the Indian commodity indices and with the Nifty Fifty Stock Index.
- 2) H_{02} : There exist no long run equilibrium relationship between Indian commodity Indices and Nifty Fifty Stock Index.

The study employs daily time series data of daily closing futures prices of four major commodity indices and the Spot prices of Nifty Fifty Stock index. The study span extends from January 2009 to June 2018 considering 1783 observations. For the purpose of empirical analyses, all the data on commodity indices and the Stock index were obtained from the official website of Multi Commodity Exchange of India (www.mcxindia.com and www.nseindia.com) and modeled it into its natural logarithm.

The statistical tool such as correlation analysis has been used to see the existence of positive or negative correlation within the commodity indices and with the Stock index. A choice of appropriate econometric model is a significant empirical decision to achieve the formulated hypothesis. Since the data employed is time series in nature the analyses proceed to determine the stationarity properties of data. The use of non-stationary time series data in the estimation of financial models leads to unreliable and spurious results which in turn distorts forecasting and understanding. Transformation of the data into stationary data is thereby necessary in order to avoid spurious regression results. The Augmented Dickey Fuller (ADF) Unit Root test is applied to determine stationarity properties. This test is based on null hypothesis $H_0: Y_t$ is not $I(0)$. If the calculated ADF statistic is less than the critical value, then the null hypothesis is rejected, otherwise it is accepted.

$$\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \sum \gamma_j \Delta Y_{t-j} + \epsilon_t$$

When two non stationarity series are integrated then their linear combination may provide for stationarity. Therefore the prerequisite for Cointegration suggests that the series should follow an $I(1)$ Process. The Johansen's and Juselius co-integration approach with two test statistics namely Trace and Maximum Eigen value is superior model applied to examine the existence of the long run equilibrium relationship among the variables. The test evaluates the number of cointegrating vectors in the long run.

Empirical Analyses

Table 1 Summary Statistics of Commodity prices and Foreign Exchange rates

Particular	Mean	Standard deviation	Skewness	Kurtosis	Jarque-Bera	Probability	Observations
MCX COMDEX	0.000 232	0.008549	-0.148829	6.312696	1140.826	0.0000**	2475
MCX METAL	0.000 333	0.009138	-0.482878	-9.546997	4516.448	0.0000**	2475
MCX	9.13E	0.016009	0.105858	5.337027	567.8597	0.0000**	2475

ENERGY	-05						
MCX	0.000	0.009721	-4.346046	105.7657	1096873	0.0000**	2475
AGRI	189						
Nifty 50	0.000	0.011456	0.970743	21.20196	34555.20	0.0000**	2475
	515						

Note: ** indicates rejection of null hypothesis at 0.05 level.

Source: All analytical work is Author's compilation.

The summary statistics for all the daily return series are observed in **Table 1**. The data reports a positive return for all the indices but Nifty Fifty index offers a highest average daily return during the sample period. Similarly the risk or standard deviation of MCX COMDEX has been noticed highest as compared to equity and other commodity sub indices. Skewness and Kurtosis values state the normality in the data series. As it has been observed that Nifty Fifty and MCX Energy indices, tend to be positively skewed whereas MCX COMDEX, MCX Metal and MCX Agri are negatively skewed. Thus there is greater probability to seek positive returns from Nifty Fifty and MCX Energy index. Further in terms of kurtosis the returns are end up with fatter tail as kurtosis values are higher than normal distribution. In fact this data series do not follow normal distribution has been proved by Jarque-Bera test with significant p-values.

Table 2 Correlation Analysis of Commodity Indices within them and with Nifty Fifty Stock Index

Indices	COMDEX	MCXAGRI	MCXMETAL	MCXENERGY	NIFTY FIFTY
COMDEX	1	0.6586	0.9043	0.8775	0.2130
MCXAGRI	0.6586	1	0.5990	0.4301	0.0081
MCXMETAL	0.9043	0.5990	1	0.6060	0.4351
MCXENERGY	0.8775	0.4301	0.6060	1	0.0238
NIFTY FIFTY	0.2130	0.0081	0.4351	0.0238	1

Source: All analytical work is Author's compilation.

In the **Table 2**, we had given the correlation analysis of Indian Commodity indices within them and with leading Nifty Fifty stock index of India. The result of the study reported that commodity indices within them have a strong positive correlation (highest correlation value of 0.9043 being observed in the case of COMDEX index and MCX Metal index). On the other hand a very weak form of correlation has been noted in the case of commodity indices and Nifty Fifty Stock index (lowest correlation value has been observed in the case of MCX Agri index and Nifty Fifty Stock index).

Table 3 ADF Unit Root Test of Commodity and Equity Indices

Variables	ADF (level)- I(0)			ADF (1 st Difference)- I(1)		
		t- statistics	Prob.		t- statistics	Prob.
MCX COMDEX	ADF t-stat	- 2.621612	0.0886	ADF t-stat	- 35.22786	0.0001**
	Test Critical Values @5%	- 2.862366		Test Critical Values @5%	- 2.862366	
MCX METAL	ADF t-stat	- 2.753054	0.0654	ADF t-stat	- 55.56243	0.0001**
	Test Critical Values @5%	- 2.862366		Test Critical Values @5%	- 2.862366	
MCX ENERGY	ADF t-stat	- 1.910584	0.3276	ADF t-stat	- 35.31214	0.0000**
	Test Critical Values @5%	- 2.862366		Test Critical Values @5%	- 2.862366	
MCX AGRI	ADF t-stat	- 2.286300	0.1765	ADF t-stat	- 50.85156	0.0001**
	Test Critical Values @5%	- 2.862366		Test Critical Values @5%	- 2.862366	
NIFTY FIFTY	ADF t-stat	- 0.952373	0.7717	ADF t-stat	- 46.59358	0.0001**
	Test Critical Values @5%	- 2.862508		Test Critical Values @5%	- 2.862508	

Note: ** indicates rejection of hypotheses at 0.05 levels

Source: All analytical work is Author's compilation.

The present study specifically employs ADF Unit root test to determine the stationarity properties of spot and future prices of Equity and Commodity Indices of India. The results exhibit that the null hypothesis of non stationarity is accepted at the conventional Level of significance. However at First Difference the formulated null hypothesis of unit root is rejected as the value of t- Statistics is greater than critical values at 5% level of significance and the probability values are also less than 0.05. The common suggestion derived from the test is that variables are integrated at I(1) justifying the further conduct of cointegration test.

Table 4. Cointegration Analyses of Equity and Commodity Indices

Table 4(a)					Table 4(b)				
Co-integration Test for Nifty 50 and MCX COMDEX					Co-integration Test for Nifty 50 and MCX Metal				
Unrestricted Cointegration Rank Test (Trace)					Unrestricted Cointegration Rank Test (Trace)				
No. of CE(s)	Eigen value	Trace Statistic	0.05 Critical Value	Prob.**	No. of CE(s)	Eigen value	Trace Statistic	0.05 Critical Value	Prob.**
None	0.002915	7.352740	15.49471	0.5370	None	0.002911	7.683331	15.49471	0.4999
At most 1	5.65E-05	0.139559	3.841466	0.7087	At most 1	0.000194	0.480377	3.841466	0.4883
Trace test indicates no cointegration at the 0.05 level					Trace test indicates no cointegration at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level					* denotes rejection of the hypothesis at the 0.05 level				

Table 4(c)					Table 4(d)				
Co-integration Test for Nifty 50 and MCX Agri					Co-integration Test for Nifty 50 and MCX Energy				
Unrestricted Cointegration Rank Test (Trace)					Unrestricted Cointegration Rank Test (Trace)				
No. of CE(s)	Eigen value	Trace Statistic	0.05 Critical Value	Prob.**	No. of CE(s)	Eigen value	Trace Statistic	0.05 Critical Value	Prob.**
None	0.003115	8.969814	15.49471	0.4580	None	0.002188	5.488124	15.49471	0.7550
At most 1	0.000146	0.360982	3.841466	0.5480	At most 1	3.03E-05	0.074895	3.841466	0.7643
Trace test indicates no cointegration at the 0.05 level					Trace test indicates no cointegration at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level					* denotes rejection of the hypothesis at the 0.05 level				

Table 4(e)				
Co-integration Test for MCX COMDEX and MCX Metal, MCX Agri, MCX Energy				
Unrestricted Cointegration Rank Test (Trace)				
No. of CE(s)	Eigen value	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.177563	570.9619	47.85613	0.0001
At most 1	0.003880	20.48154	29.79707	0.3908
At most 2	0.002385	9.533398	15.49471	0.3183
At most 3	0.000997	2.810338	3.841466	0.0937
Trace test indicates one cointegrating equation at 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				

After determining the precondition for non stationarity of time series data, the analyses proceed further to test the long run relationship among the variables. The above **Table 4** summarizes the results of cointegration test through application of Johansen-Juselius cointegration analyses. The values of trace test and maximum Eigen value test are less than critical value at 0.05% significance level so we accept the null hypothesis of no cointegrating vectors between Nifty Fifty and MCX COMDEX, MCX Agri, MCX Energy, MCX Metal. Thus the results confirm that the prices of all the commodity indices are not driven by the equity indices indicating no long term linkages among the commodity and equity markets. However the results of Cointegration between the commodity index and its sub indices indicate statistically significant co-movements in the long run as the null hypothesis of no cointegrating relationship has been accepted.

Conclusion

This study sets out to investigate the inter-linkages between commodity futures and equity market by considering the validated time span ranging from January 2009 to December 2018. The estimates of the correlation analyses reported that commodity indices within them have a strong positive correlation and on the other hand a very weak form of correlation has been noted in the case of commodity indices and Nifty Fifty Stock index. Further the empirical conclusions of co-integration test given an evidence of weak long run linkages between equity and commodity indices. The analyses also suggest the diversifying properties of commodity futures as an alternative asset class. Furthermore improved understanding of such a price behavior pattern has substantial applications for commodity market participants including investors, commodity traders, commodity exchanges, regulatory bodies, hedgers, arbitrageurs in determining portfolio diversification and hedging strategies.

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