Estimating Power of Commodity Derivative Trade in Defining the 'Gross Value Addition' of India

Sajan K [1] & Dr. Sajikumar K B [2]

[1] *Assistant Professor of Commerce, GPM Govt College Manjeshwram, Kasaragod & Part-time Research Scholar, PG & Research Department of Commerce, Maharajas College Ernakulam.*

[2]*Associate Professor of Commerce, Panampilly Memorial Government College, Chalakudy & Research Guide, PG & Research Department of Commerce, Maharajas College Ernakulam.*

Abstract - This paper tries to explore the relationship between commodity derivative trading and the GVA. That is whether or not commodity derivative trading could explain GVA of a country. The study also aims to assess, the extent of such relationships. This paper assesses, how much GVA in an economy could be explained by the commodity derivative trading. The commodity derivative market is assumed to be an efficient market in which all information are discounted and future price is discovered based on such information. The commodity prices are assumed to have an effect on countries GVA because it affects the consumption. Availability of commodities, its supply, demand etc are few important factors that affect the commodity prices and its consumption in a country. Effects of such variables are discounted in the commodity derivative market. Thus it is assumed that the commodity derivative market could explain GVA of the country to a considerable extent. Further it is assumed that various asset classes in the commodity derivative market have varying effect on GVA. The analysis was carried out using OLS regression estimation.

Index Terms - Commodity Derivative Market, GVA, OLS Regression, Time Series.

I. INTRODUCTION

Derivatives are financial properties that are traded for hedging financial risks, speculation and for short term investments (Hull & Basu, 2010). In a typical derivative contract, there will be two parties, one buyer and a seller. In such a contract, the seller and buyer agree to buy and sell the underlying asset in a future date for price agreed for now. Commodity derivatives are financial asset that derives its value from an underlying asset which is commodity. For example, Silver futures are derivatives that derive its value from the value of Silver. Derivatives, in its crude form, were traded in India and in many parts of the world even in ancient days (Frederic, 2002; Swan, 2000). Derivatives got its present day importance due to breakdown of the 'Bretton Woods System' during 1972-73 (Trade and Development Report 2023, 2023). With the failure of '*Pegged Exchange Rate System*', businesses and country Governments were exposed to an additional risk of exchange rate volatility (Garber, 1993). It increased the risk of doing international business. Thus business started looking for someone who is willing to take up such risks, for a cost either in the form of risk premium or as speculative profit (Hull & Basu, 2010). Since the collapse of 'Bretton Woods System', there evolved so many varieties of derivatives for hedging various risks (Remolona, 1992). At present, in the market, there are wide verities of derivative products which suites to hedging various types of risks. A commodity derivative is one such product that suits to the people who want to shift the risk arising due to changes in the prices of the commodities. In commodity derivative, the underlying assets are physical commodities (Williams, 2011; Hull & Basu, 2010).

In India, on liberalising, derivative trade can be done on both physical and financial assets. Commodity derivative market got a new begging from 2000 and it got a momentum from 2004 onwards with the establishment of national level multi commodity exchanges (Sumalatha & Roy, 2023). The total volume traded was growing year by year, both in quantity and in value terms. The derivative trade in commodities can be further divided into Agriculture, Bullion & Metals and Energy.

In economics, the term Gross Value Addition (GVA) resemble the total added value of goods and services to a nations economy during a specified period of time, say one year (Romer, 2005). It is the basis for calculating Gross Domestic Product (GDP). Countries GDP can be calculated from the GVA by adding taxes and deducting subsidies from it. This mean GVA is a value which is neither affected by the taxes or subsidies (Froyen, 2013). Thus GVA values

can give more effect to analysis by eliminating the effects of tax and subsidies.

One important component of GVA is the value addition happening in the primary sector, which includes agriculture, mining, forestry etc (Froyen, 2013). The outputs of the primary sector are; agricultural outputs such as Wheat, Rice, Cotton, Rubber etc, mined products such as metals, petroleum etc. Derivatives on many of these products are traded in the commodity derivative markets by the producers and/or users. If the quantum of value addition happening in primary sector is high, then there should be increase in commodity derivative trade because of increased hedging and speculative requirements. Further, commodity prices are basic thing that can determine the economic development, consumption, standard of living, and many other variables in any country. It is because commodity price have a pervasive effect on economy. For instance if the price of the fuel (petroleum) goes up, it can slowdown consumption and increase inflation (Sun et al., 2023; Blanchard & Gali, 2007; Ge & Tang, 2020). Thus, it can be inferred that there can be some relationships between the GVA and the quantum of commodity derivative trade in commodities. This research paper is an attempt to assess and quantify such effects.

II. REVIEW OF RELATED LITERATURE AND RESEARCH GAP

The commodity derivative trading volume is assumed to predict the future price and so, the consumption. Ge & Tang in 2020 found that commodity derivative can explain the GDP growth to an extent. Deaton (1999) had conducted a study on African economies concluded that any increase in prices of commodity will be good for the countries exporters. Emara et al, (2015) by analysing the commodity terms of trade of 45 countries found that there is positive effect on GDP growth and the terms of trade of commodities. In India authors could not find any such studies. Thus it is considered as the research gap.

III. METHODOLOGY

We used time series data of from the 2004-05 to 2023-24 financial year. The data sets used were four such as total GVA for each year, total yearly volume of trade in three commodity asset classes such as Agriculture, Bullion & Metals and Energy for the same period. The data sets were tested for stationarity since many of the tools and theories of time series can be used only with stationary time series data sets (Cooray, 2008; Patterson, 2000). Thus all the data sets were tested for the stationary using Augmented Dickey-Fuller test for Unit Root (Dickey & Fuller, 1979). The result of the Unit Root test is given in table No 1.

The results of ADF test on variable set states that all data set, except GVA, is stationary at level with a significance level of 0.01 and GVA is stationary at 0.05 level of significance. In social science research a significance level of 0.05 is an accepted level (Patterson, 2000). Thus we decided to proceed with the 'level data' for further analysis. Since, all the data sets were stationary 'at level'; so, we used the Ordinary Least Squares technique of regression estimation (Cooray, 2008; Patterson, 2000).

IV. REGRESSION EQUATION

The Ordinary Least Squares (OLS) regression technique is used for estimating relation between an independent variable and one or more dependent variables (Chatfield, 2003). The regression model used OLS technique with 'n' number of explanatory (dependent) variables, is written as:

$$Y = \alpha + \sum_{j=1}^{n} \beta_j X_j + e \qquad \ldots.1$$

In which; 'Y' is the explained or dependent variable; α & β are regression equation coefficients, X_j represent the j^{th} explanatory (dependent) variable of the model in which j is from 1 to 'n'. The term e is error variable which is considered as random and has 0 mean with a constant standard deviation 'σ'.

The GVA is the independent (exogenous) variable and data on commodity derivative asset classes - Agriculture, Bullion & Metals and Energy - are taken as explanatory (dependent) variables for the present study. We used a multivariate regression model based on OLS as described below;

$$GDP_j = \alpha + \beta 1 * \text{Agriculture}_j + \beta 2 * \text{Bullion \& Metals}_j + \beta 3 * \text{Energy}_j + \varepsilon_i \qquad \ldots.2$$

V. RESULTS

The OLS regression estimation was done using '*Eviews*' software and the results are discussed below;

The residual of the regression estimator is important because it says the how much the observed and the OLS estimated value of the dependent variable differ

between. The below given graph in Figure No.1 give the comparison between actual, fitted and the residual data of the OLS regression estimation.

The residuals graph of the equation do not show any hitch, except for data which is affected by the 'Covid-19 pandemic'. During that period the data is varying abnormally. But still it has been considered for estimation, because it is assumed that the effect of 'Covid-19' was same on commodity derivative trade and GVA growth. The results obtained on estimating the equation 2, on *'Eviews'*, is detailed in table No.2.

The result of the OLS estimation reviles that the commodity derivative trading cold explain about 12.4 percent changes in GVA, since the Adjusted R-squared value is 0.124. But, only Agriculture and Energy are significant, that also with low significance of 0.01 level. It may be noted that the sign of the coefficient for Energy is negative. The estimated model is valid since the Durbin–Watson statistic is near to acceptance level (Datalab, 2022). Further, out of the three 'Information Criterion' the value of Akaike criterion is smallest, thus the present model is suitable and can be adopted for the study.

VI. RESULTS AND DISCUSSIONS

The result of the analysis shows that the GVA is explained by the commodity derivative trade only to an extent of 12.4 percent, and only Agriculture and Energy are significant in predicting GVA. But such effects are very small because the significance level is only 0.01. Energy commodities have negative effect on GVA means increase in Energy derivative trade will reduce GVA, but such effects are negligible.

VII. CONCLUSION

The GVA in a country is proved to be affected with an assortment of variables such as investments, interest rate, inflation, savings, political stability, availability of natural resources etc. The study could state that the GVA can be explained by commodity derivative trading also. New researches can be conducted in this direction, so that better assessment of various factors that can affect the GVA growth and fluctuations can be estimated. Such estimations can supplement and validate the GVA calculations. Further, as a concluding remark we also state that the present study was carried out with data from 2004 onwards only. It should be considered as a limitation of the present study.

ANNEXURE

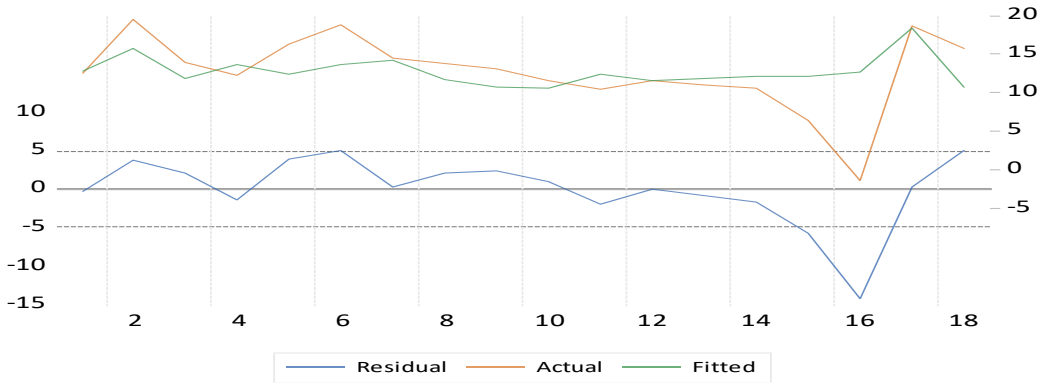
Table No.1: Result Unit Root Test (ADF statistic - at level).

Variable	GVA	Energy	Agri.	B & M$
Coefficient	-0.778	-1.005	-1.214	-0.591
Std. Error	0.255	0.0156	0.212	0.114
t-Statistic	-3.05	-64.71	-5.718	-5.186
P	0.041**	0.00***	0.00***	0.00***
* denotes significance at 10% (0.1) level; ** denotes significance at 5% (0.05) and *** denotes significance at 1% (0.01) level. $ is Bullion & Metals.				

Table No. 2: Result of OLS Estimation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Agriculture	0.018	0.021	0.875	0.086*
B & M$	0.020	0.027	0.757	0.461
Energy	-0.001	0.001	-1.100	-0.090*
C	12.07	1.355	8.905	0.000
Other information on model estimation				
R-squared	0.157	Akaike info criterion		6.221
Adjusted R-squared	0.124	Schwarz criterion		6.420
Durbin-Watson statistics	1.448	Hannan-Quinn criterion		6.249
* denotes significance at 10% (0.1) level; ** denotes significance at 5% (0.05) and *** denotes significance at 1% (0.01) level. $ is Bullion & Metals.				

Figure No.1 Graph of Actual, Fitted and Residual data of dependant variable.



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