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Explaining Economic Growth using Futures Trade in Physical Assets

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Abstract: *Every country calculates and publishes the figures related to economic growth periodically. In many cases there is a lot of controversy attached to such figures. Economic growth has both economical and political dimensions. But it is difficult to approve or disapprove the growth figures since such figures are the results of a very difficult and time consuming process with high cost implications. Economic growth is stated commonly by Gross Domestic Product figures, which is the value of all goods and services produced in a country during a given period of time. Increase in goods and services produced will lead to increased economic growth. Further we assume that an increased production of goods will lead to an increase in derivative trade in goods because risk averse producers will use derivatives (commodity derivatives) increasingly to cover up possible risks. Thus theoretically we can conclude that an increase in countries economic growth will lead to an increase in derivative trade in physical commodities. Thus there will be some relationships between derivative trade and economic growth. In this paper we explore such relationships using empirical data with the use of econometric tool OLS regression technique. The analysis was done on three asset classes of futures trade such as agricultural, metals and energy which are taken as independent variables and economic growth as dependent variables. The result shows a valid relation among the variables.*

Keywords: Economic Growth, Commodity Derivative Market, Futures, OLS Regression.

INTRODUCTION

Estimating or measuring economic development of a country is a very difficult and time consuming process. Every country invests a lot of time, energy and resources in the process of measuring or estimating economic growth, yet it gives rise to controversies, mostly with regards to authenticity of data used in estimation, acceptability of base period etc (Angrist et al 2021). It is because economic growth figures not only have economic dimensions but also have political dimensions. But, once calculated, proving or disproving the authenticity of growth figures is very difficult, since a re-estimation requires the same amount of resources as required for estimation (Nagaraj, 2017). Thus, it necessitates having some other methods or techniques for assessing the validity of a country's growth estimate. It can be done by correlating the economic growth with other index or data series for example 'Annual Survey of Industries' etc (Dholakia et al 2018). In this paper we try to estimate whether or not the economic growth can be explained by the futures trade in physical commodities such as agricultural, metals, energy.

Economic growth of a country is commonly estimated through approximating the total value of goods and services produced during a given period of time, usually a year, within the geographical boundaries of a country and comparing it with the previous period figures (Romer, 2006). The estimated figure can be denoted either as Gross Domestic Product or Gross Value Addition happened during the given time period. This is a widely accepted method of measuring economic growth of a country.

Derivatives are financial contracts that derive its value from an underlying asset. The underlying asset can be anything for example, a stock, a cash flow, a physical asset, a share market index or even a carbon credit or a weather prediction. The purposes of derivative trade are to hedge financial risks, speculation and short term investment (Hull & Basu, 2010). The failures of '*Pegged Exchange Rate System*' happened during the 1970s, exposed business to a new risk of exchange rate volatility (Garber, 1993) which increased risk of doing international business. Thus business started looking for someone willing to take up various business risks, either for risk premium or for speculative profit and this contributed to the growth and development of so many varieties of derivatives (Remolona, 1992). Derivative varieties can range from simple forward contracts to buy and sell an underlying

asset in future time to most exotic carbon credit derivative or weather derivatives. Futures are one type of derivative which are standardised and are traded through an exchange platform (Hull & Basu, 2010). Derivatives (futures) can be classified into many based on the underlying asset also. Widely accepted categorisation, based on the underlying asset, is given by the Bank for International Settlements (BIS) in which it classifies derivatives into the seven major asset groups, such as Equity, Interest Rate, Currency, Energy, Agriculture, Metal and Others (About BIS Statistics, 2024). In the above categories; energy, agriculture and metals including bullions have physical existence and so said as physical assets. It is also known as commodities.

THEORY

As stated earlier, economic growth can be represented by the total value of goods and services produced in a country during a given period. While, commodity derivative trade is primarily ended to cover the price risks arising out of future price fluctuations of the underlying commodity. Fama (1970) stated that the futures market can describe future spot prices of the underlying asset accurately, if both the futures and spot markets are efficient. In a country an increase in the goods and services produced will lead to increased economic growth. Further, we assume that an increased production of goods will also lead to an increase in the derivative trade in goods, because risk averse producers will use derivatives (commodity derivatives) increasingly to cover up possible future price risks. Thus theoretically we can say that an increase in a country's economic growth will lead to an increase in derivative trade in physical commodities. That is, there is a direct positive relation between economic growth and commodity derivative trade. If such a positive relation exists, we can hypothesise that the commodity derivative trade can explain the economic growth of a country to an extent. In this research paper, we tried to test the above proposed theory empirically. For this, we made use of secondary data on the Indian economy and Indian physical commodity derivative markets collected from various sources which are explained in detail in the methodology section of this research paper.

REVIEW OF RELATED LITERATURE AND RESEARCH GAP

Before moving into modelling and estimation, we searched for relevant literature related to present problems. It was expected that such literature will provide us with important insights for developing the estimation model. The general assessment put forward by (Hull & Basu, 2010) states that the volume of commodity derivative trade is supposed to predict the future price and so, the future consumption. The researchers Ge & Tang in 2020 found that economic growth can be explained by commodity derivative trade to an extent. Another study on African economies, Deaton (1999) found that commodity trade and price can influence economic growth. Emara et al, (2015) by scrutinising the 'commodity terms of trade' of many countries establish that the terms of trade of commodities have a positive effect on economic growth. We could not find any studies conducted on Indian context indicating the research gap for the present study.

METHODOLOGY

The empirical test of the proposed theory was done using secondary data. The economic growth was assessed using the proxy, quarterly growth rate of Gross Domestic Product in percentage and the commodity derivative trade in physical assets were estimated using proxy - quarterly growth rate of commodity futures trade value in percentage corresponding to the periods of growth data. The value of commodity futures trade is collected for three commodity asset classes such as Agriculture, Metals including Bullions and Energy for the same period as that of economic growth. Thus, for the estimation, we used four data sets such as economic growth, futures trade value of agriculture, metals including bullions and the energy commodities. The raw data was collected from OECD data set on India, various annual reports of erstwhile Forward Market Commission and SEBI hand books of statistics. The data was collected from quarter one of the 2009-10 financial year to quarter four of the financial year 2023-24. The quarterly growth rate is estimated by the following equation.

$$EG_{di} = \frac{d_i}{d_{i-1}} 100 \quad \ldots 1$$

Where, EG_{qi} is the Quarterly Growth Rate of data 'd' for the quarter period 'i', d_{i-1} is the data for the 'i-1'th period. After calculating the growth rate, we used econometric techniques for estimation. Since we are required to find, whether or not futures trade could define economic growth or not, it was decided to use extensively adopted method of simple regression method ordinary least square (OLS) technique, in which we took 'economic growth' as regressand or dependent variable and all other data sets as regressors or explanatory variable. Patterson in 2000 stated that the results of an OLS estimation is valid only if all the data sets used for regression estimation is to be stationary either at level or at its first difference, else it will lead to spurious results. Thus the data sets were tested for stationary using Augmented Dickey-Fuller test for Unit Root (Dickey & Fuller, 1979). Table 1 provide the result of Unit Root test.

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 including that of OLS regression (Cooray, 2008; Patterson, 2000). Thus all the data sets were tested for the stationary using Unit Root test. The result of the Unit Root test is given in table 1, which shows that all data sets, except that of economic growth is stationary at level with a significance level of 0.01 (99% confidence) but the data on economic growth is significant only at 0.05 level (95% confidence). Cooray (2008) had stated that 0.05 level of significance is an acceptable level in social science. Thus we decided to proceed with the level data to estimate proposed effects using OLS technique.

Table 1: Result of ADF test - (at level)

	λ	SE	t	p
EG	-0.69	0.301	-2.95	0.011**
EF	-1.11	0.016	-61.82	0.00***
AF	-1.31	0.212	-5.61	0.00***
MF	-0.68	0.114	-5.17	0.00***

Note: 1. *EG is Economic growth, EF is Energy futures; AF is Agricultural futures and MF is Metal & Bullion futures.2.*

*ƛ is Constant, SE is standard Error, t is t- statistics and p is P value. 3. ** & *** denotes significance at 0.05 and 0.01 level respectively*

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

$$y = \alpha + \sum_{v=1}^{n} \beta_v x_v + e \qquad \ldots.2$$

In which 'y' is economic growth which is the dependent variable; α & β are the coefficients of the regression equation, x_v is the v^{th} independent variable from 1 to 'n' and here there are three independent variables such as Energy futures, Agricultural futures and Metal & Bullion futures. e is the random error term with 0 mean and standard deviation 'σ'. The estimated OLS model is given below.

$$\text{Economic Growth} = \alpha + \beta_1 \text{Agriculture} + \beta_2 \text{ Metals \& Bullion} + \beta_3 \text{Energy} + \ldots.3$$

RESULTS AND DISCUSSIONS

Results of OLS regression estimated using '*Eviews*' software are given in Table 2. The OLS estimation result shows that the net effect of the derivative trade in physical commodities such as Agricultural, Metal & Bullion and Energy futures could explain 7.9% of the changes in the economic growth.

Table 2: OLS Estimation Results

	ƛ	SE	t	p
α	7.91	1.55	9.01	0.081*
β_1	0.03	0.02	0.87	0.086*
β_2	0.02	0.03	0.76	0.461
β_3	-0.02	0.001	-1.100	0.081*
R^2: 0.16, AI Criterion: 6.22, Adjusted R^2: 0.124, Schwarz criterion: 6.42, D-W statistics: 1.45 and HQ criterion: 6.25				

Note:

1. *β_1, β_2 & β_3 are the coefficients of is Agricultural futures, Metal & Bullion futures and Energy futures respectively.*
2. *ƛ is Constant, SE is standard Error, t is t- statistics and p is P value.*
3. ** denotes significance at 0.1significance level*

But if we take the three asset classes separately, only agricultural futures and energy futures are having significance and that also only at 0.1 level (90% confidence). Further it may be noted that Agricultural futures could explain 3% variation in economic growth while Energy futures could explain 2% variations in growth figures. In the case of Energy futures, the coefficient is negative which denotes that the increase in the energy futures trade will affect economic growth negatively. The future trade in energy goes up when the participants expect higher risk in energy prices due to an increase in the prices. High energy prices can slow down economic growth (Zhao et al., 2023). It means the result of the present study validates the existing knowledge in this regard.

The estimated model is valid because the D-W statistic is near to acceptance level (Datalab, 2022). Further, out of three 'Information Criterion' the value of Akaike criterion is smallest and the Adjusted R^2 value is less than D-W statistic, thus the stated model is appropriate and the results can be accepted.

CONCLUSION

The economic growth of a country can be affected by numerous factors. Almost all economic decisions taken by the Governments have a say on the growth of the country's economy. But there is only less opportunity to verify the economic growth figure. Economic growth can be affected by the different aspects such as inflation, investment, interest rate, industrial output etc and all these factors can define a portion of the economic growth. By comparing the variation in such factors and the variation in economic growth, we assume that the growth figures can be verified to a considerable extent when it is required.

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