Relation of Economic Growth and Macro Economic Variables

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Abstract: Indian economy is experiencing a downturn in its business cycle, the relation between growth, inflation, exchange rate, trade openness, investment, export and import is examined, to understand how these variables influence the GDP of an economy. In this context this article is an attempt to identify the factors which helps to fasten the process of economic growth for India when it is passing through a phase of recession. Cointegration among variables in both short and long term is observed. Granger causality results indicate that all the variables cause/influence each other. The regression of the macro economic variables on GDP indicates that import, trade openness is significant and negatively related; whereas investment is positively related. Results of the study indicate investment in the economy will contribute to growth as it will reduce dependence on import.

Keywords: Economic Growth, Inflation, Exchange rate, Trade Openness, Export, Import, Cointegration, Causality and Regression

I. INTRODUCTION

Economic growth has been center of discussion for both developed and developing nations. Sustained economic growth is essential for improving productivity of nation and removing social vices such as poverty. Globalized economies of world strive to achieve sustained economic growth for enhancing the process of development. Some regions of globe are experiencing rapid growth while others are lagging behind. The regions with rapid economic growth are termed as 'growth miracles' and other regions try to achieve growth like them. Models of economic growth have highlighted the importance of human capital accumulation, advancement of capital and government role. Economic growth accentuates production of goods and services which in turn enhances profit and reduces inflation. The increase in production will accelerate domestic and international trade. The income per person rises leading to increase in consumption thereby giving boost to economy. Economic growth can be increased by most efficient use of inputs or by increasing the available inputs. The traditional macro-economic theory focused on "what to produce, how to produce and how to supply". Countries are not equipped with all forms of capital to meet all the demands of its citizens. Thus to increase efficiency in production, distribution India started to engage in trade with other nation. Export, import and trade openness play a significant role in improving economic growth.

It acts as fiddle to increase domestic production and consumption. Economic growth has been center of policy making for developing countries.

II. LITERATURE REVIEW

An increase in inflation lowers growth and low inflation influence growth positively. Signs of rising price level are harmful for a nation as it erodes the process of economic growth, Bruno and Easterly (1998)[1].Mallik and Chaodhry (2001)[2], using co-integration and error correction model it was found that in long run growth rate of GDP has a relation with rise in price for Bangladesh, Sri Lanka, Pakistan and India. A mild inflation has positive influence on economy.Chughtai.et al 2015[3], regression between the variables interest rate, economic growth, inflation and exchange rate of Pakistan using secondary data shows rate of price rise and interest rate negatively influence economy and exchange rate has positive impact.

Das and Paul (2011) [4] using data for Asian countries from 1971-2009 by GMM for panel data found that opening trade has an encouraging effect on economic growth and similar result was obtained for Nigeria and Ghana using data for period 1980-2016, Khobai, et al 2017 [5], and also for developing nations by Manni and Afzal (2012)[6] ; Yeboah et al (2012) [7] a country has strong exchange rate when it has low inflation and it sends signals of strong economy. Habib,et.al 2016 [8] used panel data of 150 countries and recorded that an appreciation of currency harms country's growth and vice versa. Jacob, 2016 [9] reported that exchange rate has positive relation with GDP growth along with some control variables. Barguellil, et.al 2018 [10], nominal and real exchange rate volatility hampers economic growth, he used data of 45 developing and emerging countries from 1985-2015. A cointegration test for Bangladesh by Khondker, et.al,2012 [11] shows that in the over the years fall in value domestic currency leads to less rise in aggregate output compared to short-run.

Opening the economy for trade contributes positively to economic growth. Adam Smith theory of trade between nations cites that a nation will trade in goods for which it has absolute advantage and import goods with absolute disadvantage. Ricardo cites that a country will trade goods with comparative cost advantage, whereas as per Hecksher Ohlin theory country will export products produced by using the abundant factor. Wacziarg et al (2008:1) [12] study showed that most of the world economies had engaged in international trade by 2000 and it assisted in the attainment of steady income. Hassan (2005) [13] stated that productivity of nation is increased by trade openness.

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III. OBJECTIVE

1. The study investigates influence of export, import, inflation, investment, trade openness and exchange rate on economic growth of India.
2. To put forward important policy for efficient economic growth.

IV. DATA AND METHODOLOGY

Impact of variables inflation rate, exchange rate, trade openness and investment on economy of India is examined. For the period 2000 – 2018 data was collected from World Development Indicator, it is in constant 2010 U.S. dollar.

Economic Growth: Economic growth is measured in terms of gross domestic product per capita .GDP is the sum of gross value added by all producers within the country in the economy plus any taxes and minus any subsidies but here it does not include depreciation of assets.

Inflation: The growth rate of the GDP annually implicit of deflator helps to measure inflation. A basket of goods is selected, and the rate at which the average price level increases is termed as inflation.

Exchange Rate: Rate at which one nation's currency is exchanged for other is termed as exchange rate. Annual average of the monthly average is used for estimating exchange rate (local currency units relative to the U.S. dollar).

Investment: Gross capital formation is the index for investment. It is the additions to the fixed assets of the economy plus net changes in the level of inventories.

Import: It represent the value of all goods and other market services received from the rest of the world.

Export: **It** represent the value of all goods and other market services provided to the rest of the world.

A. Stationarity

To test the stationarity properties of the time series, Augmented Dickey-Fuller (ADF) unit root test (Dickey and Fuller, 1981) has been used. The ADF unit root test estimates the regression:

$$X_t = \alpha + \beta t + \rho X_{t-1} + \varepsilon_t$$

Where, α is the intercept, β is the co-efficient of lagged term, ρ is the number of lagged term chosen to ensure that ε is white noise. Akaike Information Criteria (AIC) chooses optimal lag length.

H_0: ρ= 1, i.e., time series is non-stationary; presence of unit root

H_1: ρ< 1, i.e., time series is stationary; absence of unit root.

ADF Test Result (2003-2013)

Variables	ADF test Statistic	Critical values(Davidson and Mackinnon, 1993)	Decision
GDP	2.837 [0]	-3.00	Non-stationary at level
Export	-0.052 [0]	-3.00	Non-stationary at level
Import	0.099 [0]	-3.00	Non-stationary at level
Trade Openness	-1.782 [0]	-3.00	Non-stationary at level
Inflation	-1.582 [0]	-3.00	Non-stationary at level
Exchange Rate	0.415 [0]	-3.00	Non-stationary at level
Investment	1.810 [0]	-3.00	Non-stationary at level
DGDP	3.204 [0]	-3.00	Stationary at first difference
DExport	-5.110 [0]	-3.00	Stationary at first difference
DImport	-3.479 [0]	-3.00	Stationary at first difference
DTrade Openness	-6.727[0]	-3.00	Stationary at first difference
DInflation	-5.859 [0]	-3.00	Stationary at first difference

DExchange Rate	-14.092 [0]*	-3.00	Stationary at first difference
DInvestment	-6.315 [0]*	-3.00	Stationary at first difference

Source : Authors calculation

Indicates 5% significance level i.e represents rejection of null hypothesis of unit root at 5% of the critical values. The figure in the [ ] indicates lag order.

The variables are nonstationary, transforming both the variables into their first differences, GDP and other macro variables turns stationary.

B. Johansen Co integration Test:

The Johansen Co integration test can be applied if series are integrated of same order. The test is carried out by using; the Trace Statistic (λ_{trace}) and Max-Eigen Value Statistic (λ_{max}).

(a) The trace test (λ_{trace}) is:

Trace $= -T \sum_{r+1}^{n} (\log \lambda_i)$

H_0 : trace test evaluates that there is r or less cointegrating vectors.

H_1: evaluates the existence of more than r co integrating vectors

(b) The maximum Eigen value test (λ_{max}) is:

$\lambda_{max} = -T \log(1 - \lambda_i)$ (2)

Null hypothesis states that there are exactly r no. of cointegrating vectors and the alternative hypothesis that there are r+1 cointegration vectors.

Computed statistics must be significantly different from zero for both 'Maximum Likelihood method' and 'Eigen value statistics', for co- integration to exist. The variables tend to move together linearly in a stable pattern in the long run, if the variables are found to be co-integrated.

Johansen's Test of Cointegration Results:

Null Hypothesis($\lambda_{trace\ test}$)	Trace Statistics	5% Critical value
r=0	0.001*	45.28
r = 1	23.58 *	39.37
r=2	241.8342	33.46
r =3	39.3719	27.07

Source : Authors calculation

** Implies at 5% critical level no cointegration i.e reject null hypothesis. **r** refers to the number of cointegrating equation*

Trace Statistics were undertaken for estimating co integration between the variables. Above table, shows that Trace statistics for null hypothesis for no cointegration relations is not rejected. Trace statistics confirms the existence of more than 2 cointegrating relation among the variables. Long run significant relationship among GDP and other macroeconomics variable is confirmed by the unrestricted cointegration rank test.

C.Vector Error Correction Modelling (VECM):

It test the short run connection between any two cointegrated variables. Partial short run adjustments in form of series by the error correction term (speed of adjustment) gradually corrects long run disequilibrium. VEC specifications require the variables to be stationary on their first difference for analyzing the short run causality among variables.

In the VECM specification the value coefficient represents the proportion of disequilibrium that is corrected in the future period; when the coefficients of the error correction terms is statistically significant, it indicates a state of short run disequilibrium and vice versa.

Results of VECM Test

Variables	GDP
ECT	-.128(.103)
DGDP(-1)	1.368**(.248)
DExport(-1)	.888** (.391)
D Import(-1)	.041(.332)

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DTrade Openness(-1)	1.08** (5.19)
Dinflation(-1)	-2.64(3.37)
DInvestment(-1)	-1.119** (.417)
DExchange ratet(-1)	5.68 (2.01)
CONST	1.16(1.76)
R-sq	0.99
Chi2	799.15**

Source: Authors calculation

*Standard errors are given in ( ). ** Significant at 5 %,*

The VECM test results are provided in Table, (ECT), is significant and has "- ve" sign. Short run causal relationship exists among the study variables as lagged variables of GDP, export; trade openness and investment are significant.

D.Granger Causality Tests:

C. W. J. Granger (1969) suggested the Granger Causality Test in the VAR framework. To test causality between GDP and other macro-economic variables; the test has been used. Suppose there are two variables X and Y, if lagged values of X helps the prediction of present values of Y, then for a time series, X, is said to Granger-cause another time series, Y.
H0: The two variables do not have a casual relation
H1: The two variables have a casual relation

Granger Causality Test

Lag	H0 hypo	F- Statistics
2,2	ALL VARIABLES does not cause GDP	**.24079 **
2,2	GDP does not cause Export	**.48572 **
2,2	GDP does not cause Import	**.24079**
2,2	GDP does not cause Trade Openness	**.48572**
2,2	GDP does not cause Inflation	**.24079**
2,2	GDP does not cause Exchange rate	**.48572**
2,2	GDP does not cause Investment	***.24079****

Source : Authors calculation ** *Significant at 5%*

Granger Causality test reveal that all the variables are associated with each other. GDP growth causes other variables to move and similarly movements in other variables causes movement in GDP.

Employing annual data, extracted online from the World Bank indicators 2014, covering the period from 2000- 2018.
E. **E.**

REGRESSION:

The model employed is of the following form:

GDP = f (TO, X, I, Inv, R, IF), where GDP = Gross Domestic Product, X= Export, I = Import, Inv = Investment, R = Exchange rate, IF = Inflation

The specific econometric model was constructed and it appears as follows:

$GDP = \beta + \beta_1 TO + \beta_2 X + \beta_3 I + \beta_4 Inv + \beta_5 R + \beta_6 IF + \varepsilon$

Where:

β is a constant, and $\beta_1 \ldots \ldots \beta_6$ are the elasticities of each variable and ε is the error correction term.

Regression Results (Dependent Variable GDP):

GDP	Co efficient	Standard error	t- value	p-value
Constant	4.377	2.853	1.53	0.152
Export	0.807	0.698	1.16	0.270
Import	-0.692	0.368	-1.88	0.084
Trade Openness	-1.045	5.186	-2.02	0.067
Inflation	4.633	8.322	0.56	0.588
Exchange Rate	3.519	4.559	0.77	0.456
Investment	2.787	0.352	7.92	0.000

Source: Authors calculation

The regression of macro variables on GDP indicates that only import, trade openness and investment are significant. The macro economic variables have their directions as per theories. For India, import is negatively related to GDP. Even though India is rich in assets but lack of efficient utilization of its assets; India has to import most of its essential commodities.

The high import by India is creating burden on Balance of Payment of India, thus negatively impacting GDP. Excess import leads to a condition where even trade openness of the country is hampering GDP of the nation. Thus, both import and trade openness has inverse relation with GDP. Investment and GDP has positive relation with each other and they move in same direction. Government must make investment in both human and physical capital to enhance GDP. Investment generates employment and income for the nation.

V. CONCLUSION

The time series data for India for the period 2000 -2018 are stationary on first difference. The cointegration test and VECM test reveals that GDP and other variables (Export, Import, Trade Openness, Investment, Inflation and Exchange rate) are cointegrated with each other. Granger causality test of the variables states that GDP granger cause them and the variables too granger cause GDP. The regression test indicates that import and trade openness has negative relation with GDP of developing nation India, whereas investment impacts GDP positively.

Thus, for Indian economy to grow more investment should be made in both physical capital and human capital. Government must identify sectors investment in which will contribute to accelerate growth. At the same time investment in export sector will help to reduce import for the nation. Increased investment will help to reap the benefit of trade openness and fasten the process of GDP. Formation of capital in phase of economic downturn will contribute positively to growth and the study identifies that import will have negative impact on growth.

REFRENCES:

1. M.Bruno & W. Easterly (1998), "Inflation crises and long run growth", Journal of Moentary Economics, Vol 41, Issue 1, 3-26,
2. G. Mallik, A & Chowdhury, (2001). "Inflation and Economic Growth: Evidence from four South Asian countries". Asia Pacific Development Journal, Vol 8, No.1.
3. M. W. Chughtai, M. W. Malik & R. Aftab (2015), "Impact of major economic variables on economic growth of Pakistan", Acta Universitatis Danubius. OEconomica, Danubius University of Galati, Vol 11 Issue 2, 94-106.
4. A. Das & B. P. Paul, (2011),"Openness and growth in emerging Asian economies: Evidence from GMM estimations of a dynamic panel," Economics Bulletin, vol. 31, Issue 3, 2219-2228.
5. H. Khobai, N. Kolisil & C. Mayo,(2017), "The relationship between trade openness and economic growth: The case of Ghana and Nigeria", MPRA Paper No. 81317, https://mpra.ub.uni-muenchen.de/81317/.
6. U.H. Manni & M.N.I. Afzal, (2012), "Effect of trade liberalization on economic growth of developing countries: A case of Bangladesh economy", Journal of business, economics and finance, Vol 1, Issue 2, ISSN: 2146-7943.
7. Osei-Yeboah, C.Naanwaab, S. Saleem & Akuffo A (2012), "Effects of trade openness on economic growth: The case of African countries", Agribusiness, applied economics and Agriscience Education-NC A & T.
8. L. Stracca, M.M. Habib & E. Mileva ,(2016), "The real exchange rate and economic growth: revisiting the case using external instruments", Working Paper series European Central Bank, No 1921, June.
9. Brigitta Jacob,(2016), "Impact of Exchange Rate Regimes on Economic Growth",Undergraduate Economic Review: Vol.12: Issue. 1, Article 11.

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10. A. Barguellil,O. Ben-Salha & M. Zmami (2018), " Exchange rate volatility and economic growth", Journal of Economic Integration, Vol.33 No.2, June, 2018, 1302~1336.

11. B.H. Khondker, S. H .Bidisha & M.A Razzaque,(2012), "The Exchange Rate and Economic Growth:An Empirical Assessment on Bangladesh", Working Paper of International Growth Centre,S-31019-BGD-1, October 2012.

12. R.Wacziarg & K.H. Welch (2008), "Trade Liberalization and Growth: New Evidence", The

13. World Bank Economic Review, Vol.22, Issue 2, 187-231.

14. Hassan, A.F.M. Kamrul, (2005), "Trade Openness and Economic Growth: Search for a Causal Relationship", South Asian Journal of Management, Vol 12, Issue 4, 38- 51.

15. S. Shaheen, M.M. Ali, A. Kauser and F.B. Ahmed (2013), "Impact of trade liberalization on economic growth in Pakistan", Interdisciplinary Journal of Contemporary Research in Business, Vol 5, No 5.

16. A.D. Dickey & A.W. Fuller (1979), "Distribution of the Estimation for Autoregressive Time Series with a Unit Root", Journal of the American Statistical Association, Vol. 74, No. 366, 427-431.

17. R.F. Engle & C.W.J. Granger (1987) , "Co-Integration and Error Correction Representation, Estimation and Testing", Econometrica, Vol. 55, No. 2, pp. 251-276.

18. N. Gujarati 2004. Basic Econometrics. New York: The McGraw-Hill.

19. Soren Johansen, (1988), "Statistical Analysis of Cointegration Vectors", Journal of Economic Dynamics and Control, Vol. 12, Issue. 2 & 3, 231-254.

20. Soren Johansen & Katarina Juselius, (1990), "Maximum Likelihood Estimation and Inference on Cointegration with Applications to the Demand for Money", Oxford Bulletin of Economics and Statistics, Vol. 52, No. 2, pp. 169-210.

21. Halit Yanikkaya,(2003), "Trade Openness and Economic Growth: A Cross-Country Empirical Investigation", Journal of Development Economics, Vol 72, Issue 1, 57-89.

22. World Bank Nationals Accounts Data, and OECD National Accounts data files.

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She has a master's degree in economics and has completed Ph.D from Economics Department Dibrugarh University Dibrugarh in the area of industrial economics. Her area of interest is international economics and macroeconomics. Area of specialization is econometrics and mathematical economics.