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An Enquiry in to the Trickling down effect of key Macro Economic Variables on GDP Growth

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Abstract

The development of an economy is measured through the changes in its GDP.A lot of thought has gone into what policies should be adopted in order to increase the growth of GDP .We have selected this area for study so as to equip ourselves with the knowledge of the causal relationship of GDP with other economic variables. The variables used in the study are GDP, GOVT FINAL CONSUMPTION, PVT FINAL CONSUMPTION, CHANGE IN STOCK, EXPORT and IMPORT .Vector error correction model was applied to understand the nature of relationship with these variables.Our model results point on the association between variables both long and short runs. The study found that there is bi-directional causality and positive correlation between GDP and export growth and vice versa for India.

Keywords: Macro Economic- Variables- GDP - VECM Model

Introduction

Economic growth theories and models try to bring out the influence of productivity and output on future economic developments. They have also tried to identify sources that may lead to continued economic growth. Researchers and economists opine that for a developed society and economy we need economic growth. The economic growth theories have evolved over time due to the improvements in mathematical and statistical tools. Why economic growth? What factors lead to growth? Many researchers, economists and Nobel Prize winners went out on quest for these answers the significance of these questions slowly unveil themselves when we look into the rich- poor divide in the global economy. The total national output also known as Gross Domestic Product (GDP) is one of the essential markers used to measure the strength of a nation's economy. Hence, it becomes imperative to understand the nature, relationship and impact of GDP on the Indian Economy. This would help us to improve our productivity and growth through suitable policy formulation.

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Objectives of the Study

The present study attempts to achieve the following objectives:

1. To study the impact of various macro-economic factors on GDP components.
2. To develop aVECM model for GDP and Macroeconomic variables

Literature Review

Factors affecting GDP growth

Factors influencing the growth rate of an economy are inter-related. There are four supply factors- natural resources, capital goods, human resources and technology. The other two factors are efficiency and demand. The supply factors have a direct effect on the value of goods and services supplied.

Economic growth measured by GDP is actually determined by Public expenditure, capital formation, private or public investment, employment rates, exchange rates etc. There are also socio-political factors ,economic

and non-economic determinants. “Proximate” or economicdeterminants refers to factor s like capital accumulation, technological progress, labour and“ultimate” or non-economic sources refers to factors like government efficiency, institutions,political and administrative systems, cultural and social factors, geography and demography(Acemoglu, 2009).

The main determinants of economic growth are as follows.

Public expenditure

There are many conflicting views regarding the effects of public expenditure on economicgrowth. Ghosh and Gregoriou(2008) and Benos (2009) had different outcomes even if they usedthe same methodology (the generalized method of moments). Ghosh and Gregoriou (2008)showed that the current component of public spending had a significant and positive effect ongrowth for a sample of 15 developing countries. Meanwhile, Benos (2009) affirmed thatminfrastructure and human capital had a significant effect on long-run growth for a group of 14 EUstates.Lamartina and Zaghini (2008), Arpaia and Turini (2008), Szarowská (2012), tested the linkbetween public spending and economic growth using the Wagner’s law. For example the resultsof the analysis made by Lamartina and Zaghini (2008) confirmed Wagners theory, because thepublic expenditure elasticity coefficient compared to GDP takes values above par. The analysisalso concludes that the expected long-term elasticity coefficient values are higher in countrieswith lower GDP per capita, suggesting an attempt to realize economic development funded bythe state.Szarowská (2012) analyzed the direct link between public spending and output (GDP) in shortand long-term for Bulgaria, Czech Republic, Hungary, Romania and Slovakia and alsoinvestigated if public spending is countercyclical. Her results reject the countercyclical effect ofthe two variables. Many recent papers for OECD, developing countries, Latin America showedthat contrary to the theory, public spending is pro cyclical (Alesina et al. 2008; Abbott and Jones,2011). The literature also emphasized the importance of education on growth. Researcherconsider that a grate contribution to this subject was made by researchers like Barro (1991), Sala-i-Martin et al. (2004). Also education is a key measurement tool and proxy for the quality ofhuman capital in the sense that educated and skilled workers can have an important contributionto production and growth.Benoit (1978), Pieroni (2009), Ho and Chen (2014) investigated the influence of militaryspending on economic growth. Many researchers concluded that defence spending has a negative
effect on growth. Benoit (1798) was the pioneer in his field and found that for less developedstates military spending had a positive effect on economic growth. The assumption that thiscomponent of public spending can have a positive effect depends on the samples, the differenttheoretical specifications and the time period. McDonald and Eger (2010) affirmed that defenceexpenditure had a small or rather insignificant effect on economic growth. On the other handPieroni (2009), Ho and Chen (2014) concluded that military expenditure has a negative influenceon economic growth.Boldeanu and Tache (2015) analyzed for 30 European countries the correlation between publicspending and growth using the COFOG methodology. They disaggregated each component ofpublic expenditure into their sub-classification and used 3 statistical methods for analysis theimpact of public spending on growth. The results showed that most of the governmentexpenditures had a negative impact on economic growth.

Trade components and FDI

There are numerous research papers that analyzed the link between FDI and trade components(exports, imports openness, trade restrictions) and growth. A big number of papers have shownthat states that have economies open to trade have higher per capita GDP and grow much faster(Romer, 1990; Barro, 2003).

Tekin (2012) found that a raise in exports has a positive effect on growth. Sultan and Haque
(2011) and SimuţandMeşter (2014) determined a long-term and direct influence between sometrade determinants on economic growth. SimuţandMeşter (2014) identified a direct correlationand causality between exports, openness and economic growth for 10 East European states andSultan and Haque (2011) found that there is a long-run relationship between exports and growthfor India.

The influence of trade on economic growth in the Middle East has been analysed by many
researchers. AL - Raimony (2011) investigated the relationship between real export and real
import growth and economic growth in Jordan. He concludes that real export growth positivelyaffects growth, while real import growth negatively affects economic growth. In 2014 Abu-Eidehanalyzed real domestic exports and imports of goods and services and how they affect real grossdomestic product in Palestine (Abu-Eideh 2014). He stated that real domestic exports have apositive impact on growth in Palestine while real domestic imports a negative one.

Openness can have an important influence on economic growth through a multitude of differentchannels like through technological transfers, competitiveness advantage and increase ineconomies of scale (Chang et al. 2009). Edward (1992) showed that trade openness has afavourable effect on real GDP and that trade liberalization will accelerate economic growth andcountries will be capable to enter more easily foreign markets. Ynikkaya (2003) also analyzedthe influence of trade openness on growth for 120 countries between 1970 and 1997. He usedseveral variables to measure openness like for example volume of exports, volume of imports,the sum exports and import and the volume of trade with developed countries. He also used tradepolicy variables for measuring restriction or openness of trade. The result concluded that fordeveloped and developing states the indicators that measure the volume of trade have a

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positiveeffect on growth. An interesting result in our opinion is that trade restrictions have the effect ofaccelerating growth of GDP for developing countries.

Methodology

In India, Gross Domestic Product (GDP) Growth rate is charecterised by GDP at Market Price. Over the past two decades there has been a remarkable growth in consumption, import and export which resulted in growth of GDP at market price. This paper presents projections of the GDP at Market Price on a time series and an econometric model. Data of GDP at Market Price, Consumption, Export and Import were collected for a period from 1961-2017.

An **error correction model (ECM)** belongs to a category of multiple time series models most commonly used for data where the underlying variables have a long-run common stochastic trend, also known as cointegration. ECMs are a theoretically-driven approach useful for estimating both short-term and long-term effects of one time series on another. The term error-correction relates to the fact that last-period's deviation from a long-run equilibrium, the *error*, influences its short-run dynamics. Thus, ECMs directly estimate the speed at which a dependent variable returns to equilibrium after a change in other variables.

A descriptive panel data research design is adopted for the study and it is analysed with the help of Eviews10 (Statistical tool).

Table 1

Year	GDP	PVT FINAL CONSUMPTION	GOVT. FINAL CONSUMPTION	EXPORT	IMPORT
1	2	3	4	7	8
1961-62	4522.70	3638.95	274.15	188.56	304.95
1962-63	4655.27	3686.36	330.78	187.47	316.87
1963-64	4934.32	3823.49	406.47	203.22	327.62
1964-65	5302.07	4051.90	424.64	189.99	338.69
1965-66	5162.32	4055.48	465.80	163.65	301.25
1966-67	5159.46	4108.19	473.80	205.93	387.47
1967-68	5563.24	4340.61	486.58	216.14	372.19
1968-69	5751.72	4454.63	512.11	222.92	318.74
1969-70	6127.87	4620.08	560.50	218.60	277.19
1970-71	6443.89	4776.97	613.70	287.59	326.85
1971-72	6549.76	4869.92	673.86	290.62	385.78
1972-73	6513.52	4902.54	680.31	314.56	378.49
1973-74	6728.18	5022.85	679.36	330.17	409.06
1974-75	6807.93	5019.07	653.98	357.24	356.87
1975-76	7430.85	5304.09	717.15	416.00	361.43
1976-77	7554.43	5409.85	770.84	498.45	368.29
1977-78	8102.49	5850.99	797.19	480.67	469.18
1978-79	8565.34	6208.59	856.18	518.18	469.41
1979-80	8116.68	6069.33	909.75	575.97	560.11
1980-81	8663.40	6615.62	951.96	606.14	640.51
1981-82	9183.74	6903.31	992.03	601.19	704.74
1982-83	9502.94	6972.35	1087.47	637.38	729.09
1983-84	10195.60	7513.52	1136.12	631.55	889.37
1984-85	10585.15	7730.09	1220.59	677.64	761.92
1985-86	11141.33	8052.71	1349.24	634.85	867.61
1986-87	11673.50	8306.82	1476.10	669.34	1015.83
1987-88	12136.39	8591.53	1597.05	754.52	998.89

1988-89	13304.86	9127.79	1684.58	810.91	1090.73
1989-90	14096.15	9580.75	1774.60	908.05	1113.46
1990-91	14876.15	10008.67	1834.88	1008.88	1150.94
1991-92	15033.37	10224.58	1831.80	1106.37	1151.11
1992-93	15857.55	10488.25	1895.03	1160.50	1394.32
1993-94	16610.91	10944.17	2007.51	1320.41	1662.97
1994-95	17717.02	11476.07	2035.29	1492.65	2038.83
1995-96	19058.99	12174.72	2194.12	1961.28	2612.27
1996-97	20497.86	13121.14	2295.94	2084.64	2548.53
1997-98	21327.98	13513.42	2554.29	2036.10	2884.95
1998-99	22646.99	14391.95	2865.72	2318.80	3486.34
1999-00	24563.63	15266.89	3203.20	2736.17	3730.12
2000-01	25540.04	15792.01	3247.27	3232.88	3901.32
2001-02	26802.80	16732.09	3323.69	3372.21	4016.19
2002-03	27850.13	17212.38	3317.53	4083.24	4498.00
2003-04	30062.54	18232.27	3409.62	4474.50	5122.50
2004-05	32422.09	19175.08	3545.18	5690.51	6259.45
2005-06	35432.44	20833.09	3860.07	7174.24	8299.26
2006-07	38714.89	22598.92	4005.79	8634.59	10081.98
2007-08	42509.47	24713.97	4389.19	9146.28	11109.63
2008-09	44163.51	26496.10	4844.59	10481.40	13633.02
2009-10	47908.46	28453.03	5517.03	9990.30	13341.80
2010-11	52823.84	30923.73	5835.45	11950.03	15424.28
2011-12	87363.29	49104.47	9683.75	21439.31	27155.54
2012-13	92130.17	51790.91	9742.63	22898.36	28790.79
2013-14	98013.70	55573.29	9798.25	24682.69	26445.55
2014-15	105369.84	59023.86	10738.94	25121.76	26676.58
2015-16	113810.02	62623.73	11097.25	23786.87	25107.53
2016-17	121898.54	68066.24	13400.86	24860.07	25686.80

Notes : 1. Data for 2012-13, 2013-14 are Third Revised Estimates (New Series), for 2014-15 are Second Revised Estimates and for 2015-16 are First Revised Estimates. 2. Data for 2016-17 are Provisional Estimates. 3. Data for the base year 2011-12 has been revised on account of using new series of IIP and WPI. also, see Notes on Tables. Source: Central Statistics Office (CSO). https://rbi.org.in/Scripts/PublicationsView.aspx?id=17779

Research Methodology

The descriptive analysis of the study is done below.

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	IMPORT	EXPORT	GOVT__FIN...	PVT_FINAL...
Mean	5158.968	4404.378	2755.013	15413.45
Median	1090.730	810.9100	1684.580	9127.790
Maximum	28790.79	25121.76	13400.86	68066.24
Minimum	8.000000	7.000000	4.000000	3.000000
Std. Dev.	8273.392	7313.467	3117.678	16265.39
Skewness	1.886971	1.991844	1.864242	1.934084
Kurtosis	5.196367	5.625945	5.698688	5.809312
Jarque-Bera	45.28332	54.06772	50.31321	54.28052
Probability	0.000000	0.000000	0.000000	0.000000
Sum	294061.2	251049.5	157035.8	878566.4
Sum Sq. Dev.	3.83E+09	3.00E+09	5.44E+08	1.48E+10
Observations	57	57	57	57

Table 2
Development of VECM Model

1. Lag Selection
2. Johnsen Test of Cointegration
3. VECM

Lag Selection

VAR Lag Order Selection Criteria
Endogenous variables: GDP PFCONS EXPORT IMPORT
Exogenous variables: C
Date: 02/01/18 Time: 20:19
Sample: 1 51

Included observations: 47

Table 3

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1565.779	NA	1.20e+24	66.79912	66.95658	66.85837
1	-1292.745	487.9755	2.15e+19	55.86151	56.64880	56.15777
2	-1269.002	38.39414	1.57e+19	55.53199	56.94912	56.06526
3	-1230.076	56.31800	6.16e+18	54.55643	56.60340	55.32671
4	-1181.448	62.07814*	1.66e+18*	53.16800*	55.84481*	54.17531*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Johnsen Test of Cointegration

Date: 02/01/18 Time: 20:50
Sample (adjusted): 4 51
Included observations: 48 after adjustments

Table 4
Trend assumption: Linear deterministic trend
Series: GDP PFCONS EXPORT IMPORT
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.608770	80.44911	47.85613	0.0000
At most 1 *	0.454917	35.40309	29.79707	0.0102
At most 2	0.105440	6.275876	15.49471	0.6629
At most 3	0.019139	0.927564	3.841466	0.3355

**MacKinnon-Haug-Michelis (1999) p-values

Trace test indicates 2 cointegration eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.608770	45.04602	27.58434	0.0001
At most 1 *	0.454917	29.12721	21.13162	0.0030
At most 2	0.105440	5.348312	14.26460	0.6974
At most 3	0.019139	0.927564	3.841466	0.3355

Max-eigenvalue test indicates 2 cointegration eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

GDP	CONS	EXPORT	IMPORT
-0.000460	0.001023	-0.002204	0.002147
0.000974	-0.001366	0.005166	-0.003345
0.002613	-0.003437	-0.007204	0.005228
0.003580	-0.004379	0.002869	-0.004689

Trace test indicates 2 co integration eqn(s) at the 0.05 level

Max-eigenvalue test indicates 2 co integration eqn(s) at the 0.05 level

VECM Model

Dependent Variable: D(GDP)
Method: Least Squares (Gauss-Newton / Marquardt steps)
Date: 26/1/18 Time: 21:04
Sample (adjusted): 6 51
Included observations: 46 after adjustments
D(GDP) = C(1)*(GDP(-1) - 1.5863762724*CONS(-1) + 1.61628535526
*EXPORT(-1) - 3.14882734588*IMPORT(-1) + 8832.50003598) + C(2)
*D(GDP(-1)) + C(3)*D(GDP(-2)) + C(4)*D(GDP(-3)) + C(5)*D(GDP(-4))
+ C(6)*D(CONS(-1)) + C(7)*D(CONS(-2)) + C(8)*D(CONS(-3)) + C(9)
*D(CONS(-4)) + C(10)*D(EXPORT(-1)) + C(11)*D(EXPORT(-2)) + C(12)
*D(EXPORT(-3)) + C(13)*D(EXPORT(-4)) + C(14)*D(IMPORT(-1)) +
C(15)*D(IMPORT(-2)) + C(16)*D(IMPORT(-3)) + C(17)*D(IMPORT(-4))
+
C(18)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.516138	0.076946	-6.707796	0.0000
C(2)	-0.083695	0.272138	-0.307547	0.7607
C(3)	-0.276408	0.252380	-1.095208	0.2828
C(4)	0.392746	0.253641	1.548434	0.1327
C(5)	0.258408	0.266077	0.971176	0.3398
C(6)	-0.473320	0.495651	-0.954946	0.3478
C(7)	-0.348058	0.458383	-0.759317	0.4540
C(8)	-1.303139	0.455006	-2.864001	0.0078
C(9)	-2.026063	0.510514	-3.968676	0.0005
C(10)	0.509900	0.419860	1.214450	0.2347
C(11)	-0.125288	0.404421	-0.309796	0.7590
C(12)	1.013311	0.557736	1.816830	0.0800
C(13)	-1.106698	0.419936	-2.635398	0.0135
C(14)	-0.560748	0.389311	-1.440360	0.1609
C(15)	-0.013698	0.348876	-0.039263	0.9690
C(16)	-1.695127	0.374234	-4.529593	0.0001
C(17)	-0.140693	0.468587	-0.300249	0.7662
C(18)	3943.651	566.5702	6.960569	0.0000

R-squared	0.971582	Mean dependent var	1112.352
Adjusted R-squared	0.954329	S.D. dependent var	1187.398
S.E. of regression	253.7568	Akaike info criterion	14.19680
Sum squared resid	1802991.	Schwarz criterion	14.91236
Log likelihood	-308.5264	Hannan-Quinn criter.	14.46485
F-statistic	56.31195	Durbin-Watson stat	2.063890
Prob(F-statistic)	0.000000		

Long run casualty if c (1) is negative in sign and significant.

Then to test short run casualty check for c (6) = C (7) = C (8) = C (9) =0

c (10) = C (11) = C (12) = C (13) =0

c (14) = C (15) = C (16) = C (17) =0

Normality Test **Table 5**

RESID01	
Mean	3.63e-13
Median	-18.86335
Maximum	394.2198
Minimum	-393.6060
Std.Dev.	200.1661
Skewness	0.013512
Kurtosis	2.299009
Jarque-Bera	0.943228
Probability	0.623994

Desirable
Source and Nature of Data

Data for this study has been collected fromRBI site with the number of 55 observations starting from 1961-2017

Results and Discussions

Table 6

The following are the results using eviews				
1) OLS METHOD				
Model 1: OLS, using observations 1986-2014 (T = 29)				
Dependent variable: TOTAL__DEBT__SERVICE				
	coefficient	std. error	t-ratio	p-value
const	21.3193	1.86833	11.41	4.84e-012 ***
Mean dependent var	21.31931	S.D. dependent var	10.06127	
Sum squared resid	2834.415	S.E. of regression	10.06127	
R-squared	0.000000	Adjusted R-squared	0.000000	
Log-likelihood	−107.5925	Akaike criterion	217.1850	
Schwarz criterion	218.5523	Hannan-Quinn	217.6132	
rho	0.849810	Durbin-Watson	0.230464	

Summary of results and discussion
Lag selection criteria - 4 lags were selected. The selected macroeconomic variables were found to be nonstationary in nature.Johanson Cointegrationtest found a significant cointegrationbetween GDP and PFCE (Private Final Consumption Expenditure).
Negative long run causality exists between GDP and PFCE.Short run causality exist between GDP and the selected macroeconomic variables - GFCF, Export and import
Multicollinearity and heteroscedasticity were found to be at only desirable levels
Normality levels were also found to be satisfied

CONCLUSION:

Negative long run causality exists between GDP and PFCE. Short run causality exists between GDP and the selected macroeconomic variables - GFCF, Export and import.
The policy recommendations that could be reasonably made from this study include the following- government needs to increase investment in inventories, state and local spending, increase productivity, diversify the economy and industrialize the country to have various consumer goods and services. This of course will boost consumption expenditure, reduce unemployment, increase the labor force, increase export and reduce import as large amount of consumption and investment spending are spent on imported goods.

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