

# Analysing Impact of Exports on Economic Growth in India:

## Using Co-integration and Granger Causality

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### Abstract

In today's interconnected global economy, the role of exports in driving economic growth has gained significant attention from policymakers, researchers, and economists alike. This research paper aims to contribute to this discourse by conducting a comprehensive analysis of the relationship between exports and economic growth in India. The study employs the Co-integration and Granger Causality tests to explore both the causal relationship and the direction of impact between these two vital economic variables. The primary objectives of this research are twofold: firstly, to empirically examine the causal relationship between export expansion and economic growth, and secondly, to discern the magnitude and significance of the impact that exports have on the economic growth trajectory of India. To achieve these objectives, the study utilizes a time-series dataset spanning over a significant period, allowing for a robust analysis that captures long-term trends and fluctuations. By discerning the causal relationship, the paper provides insights into the dynamics of these variables and their potential role as drivers or outcomes of each other. By employing Co-integration and Granger Causality tests, the study not only uncovers the causal direction but also evaluates the significance of the impact of exports on economic growth. The insights derived from this analysis can inform policy decisions, guide investment strategies, and facilitate a more nuanced understanding of the interplay between exports and economic growth. As the global economy continues to evolve, the findings of this study hold valuable implications for both academics and policymakers striving to foster resilient and dynamic economic growth trajectories.

*Keywords: Exports, Economic Growth, Co-integration, Granger Causality, India, Policy Implications.*

### Introduction:

Classical Economists like Adam Smith and Ricardo believed in the positive impact of International trade on economic growth. Mercantilists however are of the view that it is exports that are more important for the growth of an economy. There has accordingly gathered a large body of literature on the subject of trade and economic growth. Economic theory is largely in support of the positive impact of Exports on economic growth. But, role of International trade in the situation of developing countries is viewed by some economists like Prebrish, Singer and Mydral in a skeptical way. These argue that international trade leads to worsening terms-of-trade for developing countries. Though the majority opinion has been that trade plays a significant role in the development of a country - as has been the experience of economies like that of Asian Tigers. This has overtime been recognized as 'Export Led Growth' phenomenon. Hence increased international trade has been recommended as a main policy recommendation by economists and international institutions like IMF, WTO and World Bank. This export led growth phenomenon got renewed attention in the wake of breakdown of Soviet-union in 1990's. The study in this regard tries to assess the relation between Export performance and GDP growth in the case of India. This is to see if there a significant cause and effect relation between export performance and GDP growth.

One of the important issues that have influenced/dominated the debate in the international growth literature is the role of exports in economic growth. According to Kindleberger, "economic growth means more output and according to Schumpeter, "growth is a gradual and steady change in the long run, which comes about by gradual increase in the rate of saving and population. Thus, economic growth is related to a quantitative sustained increase in the country's per capital and volume of trade.

Economic development is the main target of every society in the globe, including India economic growth is elementary to economic development. Many economist have proclaimed that

more rapid growth of export can lead to higher economic growth. According to classical economist (Adam Smith & David Ricardo) international trade plays a crucial role in economic growth. It was acknowledges that export come up with foreign exchange which is must for imports that cannot bring out domestically. Trade is central to ending global poverty. Countries that are open to international trade tend to grow faster as compared to those that are closed.

Economists have described exports as an 'engine of growth'. India , a developing country, and previously known as a fairly inward oriented and or regulated economy has responded to globalization in an exemplary way by opening the economy to a great extent. Export and export policies in particular are regarded as crucial growth stimulation. In India, export is an important means of introducing technology, while for other countries as well, exports are a channel of learning and technological advancement. Moreover, the growth of export play an important role in the growth process by stimulating the demand, and encouraging saving and capital accumulation.

The export promoting strategy was successful in many countries like Japan and East Asian economies (Singapore, Korea, and Hong Kong) during 1970's and 1980's and failed in Latin America and Africa. This study is to analyse, either the hypothesis which states that increased in export leads to economic growth, is applicable for India. Although, in China, Japan, and East Asian countries, export led growth strategy was successful, according to past studies in these countries.

The main intension of this study is to analyse the export led growth hypothesis (**ELGH**), for the case of India. The export led growth expansion put forwards that export expansion is one of the main factor of growth .The growth of countries results not only from increasing the amount of capital and labour but also by enlarging exports. In this way, greater exports lead to a more competitive, technologically, productive, and rapidly growing economy. The analysis is bases on the endogenous growth theories. This study re-examines the dynamics relationship among GDP, import, export, capital.

## Literature Review

To analyze the objective sanity of the Export led Growth Hypothesis (ELGH) , we examine the bearing of causality between export and output . The question regarding the role of exports as one of the principle unavoidable elements of economic growth, returns us to the traditional/ classical economic theories by Adam smith and David Ricardo , who contended that worldwide exchange (trade) assumes a significant part in economic growth and there is definite monetary increase (economic gains) from specialization.

The contention of the neo old (classical) economist is that the culmination in worldwide market empowers through economies of scale and builds viability by centering assets in areas in which the nation enjoys a similar (comparative) benefit. These positive externalities empower monetary development.

To research the experimental (empirical) maintainability of the ELGH for India , we examine the bearing of effectiveness among export and output. Thus, it is important to consider the potential outcomes concerning the bearing of adequacy between exports and output for their growth rates.

As cited in the presentation, the ELGH contends that higher export lead to higher economic growth since they advance more consumption, quicker mechanical advancement and economies of scale and so on. A few economist have additionally suggested that causality have run from economic growth to export in economies where variables like mechanical advancement cause growth. Expanded growth assists economies with expanding output and export.

These hypothetical contentions which are written above, concerning trades (exports – monetary development (economic growth) nexus (sequence) have been exactly affirmed by economist and researchers at various occasions. A number of studies such as Jung and Marshall (1985), Chow(1987), Darrat (1987), Kugler (1991), Dodaro (1993), Hsiao(1987) , Van lair Berg and Schmidt (1994). Greenaway and Sapsford (1994) and Islam (1998), have additionally done, time series examination for researching the cordial association between export growth and output growth. Standard Granger or Sim tests are just sensible if the original time series are not co incorporated (cointegrated). None of these examinations checked the co-mix properties (cointegration) of the time series variable included.

Moreover, every one of the investigations above used growth of Gross Domestic Product (GDP) and that of fares (exports) which are first differencing and error correction models that have been suggested to consolidate the short term in addition to long run data.

Bahmani-Oskooee and Alse (1993) considered this load of issues and utilized quarterly rather than yearly information for the nine nations examined. The investigation discovered solid empirical support for two-way causality between exports growth and GDP growth in eight out of the nine nations.

Darat(1986) dealt with four asian nations (Hong Kong, Singapore, South Korea, Taiwan) and discovered no proof of unidirectional causality from exports to economic growth in each one of the four economies. On account of Taiwan, nonetheless, the investigation identified unidirectional causality from economic growth to export growth.

Vohra(2001) examined the connection between the exports and economic growth in India , Pakistan, Malaysia, Philippines and Thailand for the period 1973-1993. The experimental (empirical) outcomes showed that when a nation has accomplished some degree of economic development, then the export altogether affects economic growth. The investigation likewise showed the significance of liberal market approaches by seeking exports expansion strategies and by attracting foreign investments.

Subasat(2002) inspected the observational (empirical) linkages between export and economic growth (monetary development). The examination (study) further showed that advancements (export promotion) doesn't essentially affect economic growth for lower and higher income nations.

Thurayia(2004) studied the connection between export and economic growth in Saudi Arabia and Sudan . Results showed that the growth rate in trades (export) in Saudia Arabia played a functioning part in accomplishing economic growth there, while it has a negligible impact in Sudan. The after-effect of co-integration and error correction models showed a beneficial outcome of exports on GDP in short run and long run, which confirms the legitimacy of the theory of export led growth in Saudia Arabia and Sudan.

Mah (2005) contemplated the long run causality between exports and economic growth for china with the assistance of the meaning of error correction term ,  $EC(t-1)$ . This study shows that trades (exports) extension is inadequate , in order to clarify the examples of genuine economic growth.

Ullah et al (2009) go into the export led growth speculation utilizing time series econometric strategies over the time of 1970-2008 for Pakistan. The outcomes clarify that exports extension prompts economic growth. In the event of India , Chandra (2000;2002) discovered bilateral causal connection between growth of export and GDP growth which is a short-run causal connection, as co-mix between development of fares and GDP development was not found.

Sharma and Panagiotidis(2004) test the fare drove development speculation with regards to india and the outcome harden the contentions against the fare drove development (export led growth) theory, if there should be an occurrence in India. Raju and Kurien(2005) analysis the connection among trades (export) and financial development(economic growth) in India and discovered solid help for unidirectional causality from send out(export) and monetary development (economic growth).

Dash (2009 ) inspect the causal connection between growth of export and financial development (economic growth) in India for the post advancement time frame 1992-2007 and the outcome shows that there exist a drawn out connection between export and output. It is consequently obvious from the above literature review, that the evaluation with respect to exports- economic growth relationship is fairly vague and blended (mixed). Many examinations support the export led growth while many others don't. Moreover, research focussed on these issues in states of India gave mixed evidence. This examination will give the valuable data for the strategy creators (policy maker). It can fill in as a kind of perspective to subsequent (later) research work as issues throws light economic growth nexus (relationship) with regards to India. We utilize co-integration and error correction model (ECM) in the investigation to keep away from spurious (false) relapse (regression) and apply it to a more extended information period.

In their paper, Sinha (1996) analysed the demand for imports into India for the period 1960-92. They argued for the absence of any cointegrated relationship among the constituents of import demand function during that period. Asafu-Adjaye and Chakraborty (1999) consider three variables: exports, real output, and imports(for the period 1960–94). They do not find any evidence of the existence of a causal relationship between these variables for the case of India. Sharma and Panagiotidis (2005) examining the co-integrating relation among GDP Imports and Exports for the period 1971-2001, find evidence against the hypothesis that exports and GDP are co-integrated for the case of India.

### **Objective of the Study:**

- 1) To examine the causal relationship between export and economic growth.
- 2) To analyse the direction and significance of the impact of exports on economic growth in India.

### **Data:**

We have taken five variables in this study namely export of goods and services, import of goods and services, Gross domestic product (GDP), total reserves, and the relative prices. The first variable import of goods and services, which is measured in billion INR, is obtained from RBI database on Indian economy. The data has been collected for quarterly and annual frequencies; annual data ranges from year 1980 to 2017 and the quarterly from 1996Q1 to 2020Q4. The second variable export of goods and services is collected in the same manner as that of imports of goods and services. The third one is Gross Domestic Product (GDP) at market price which is measured in billion INR at 2011-12 base prices GDP and is used as a proxy for the level of domestic demand. The data on GDP has been obtained from the RBI database on Indian economy on annual and quarterly frequencies. The data the quarterly data spans from 1996Q1 to 2020Q4. The data has been obtained from RBI database on Indian economy and has been obtained for the quarterly frequencies.

As a first before we proceed for the empirical examination of variables, it is necessary to find an appropriate model that takes into account the objectives of the study as well as the characteristics of the data. In this context since we make use of the time-series data, it is therefore pertinent to check the stationarity of the data. The stationarity of the data is important for the fact that certain statistical tools are not applicable if the underlying data generation process possesses a unit root. In other words the series is said to be following a random walk process where the path



getssolely defined by the residual term. More specifically the common techniques and methods of using regression analysis for estimation may cause the coefficients to be biased and inconsistent when the sample variable are non-stationary. In this regard certain tests have been developed that are used to check for the presence or absence of unit root in the data. The prominent ones in the literature are the Augmented Dickey-Fuller test and Philips-Perron test.

## Methodology:

Unit Root test:

The Dickey–Fuller-test tests the null hypothesis that a unit root is present in an autoregressive model. It is named after the statisticians David Dickey and Wayne Fuller, who developed the test in 1979.

A simple Auto-regressive of first order (AR (1)) model is

$$y_t = \rho y_{t-1} + u_t$$

Where  $y_t$  the variable of interest is,  $t$  is the time index and  $\rho$  is the coefficient  $u_t$  is the error term. A unit root is present if  $\rho = 1$ , the model would be non-stationary in this case.

The regression model can be written as

$$\Delta \rho y_t = (\rho - 1)y_{t-1} + u_t = \delta y_t + u_t$$

where  $\delta$  is the first difference operator. This model can be estimated and testing for a unit root is equivalent to testing  $\delta = 0$  ( $\delta \equiv \rho - 1$ ) since the test is done over the residual term rather than raw data, it is not possible to use standard t-distribution to provide critical values. Therefore, this statistic  $r$  has a specific distribution simply known as the Dickey–Fuller table.

There are main three versions of test

1. Test for a unit root:

$$\Delta y_t = \Delta y_{t-1} + u_t$$

2. Test for a unit root with drift:

$$\Delta y_t = \alpha_0 + \delta y_{t-1} + u_t$$

Test for a unit root with drift and deterministic time trend:

$$\Delta y_t = \alpha_0 + \alpha_1 t + \delta y_{t-1} + u_t$$

## Cointegration Tests:

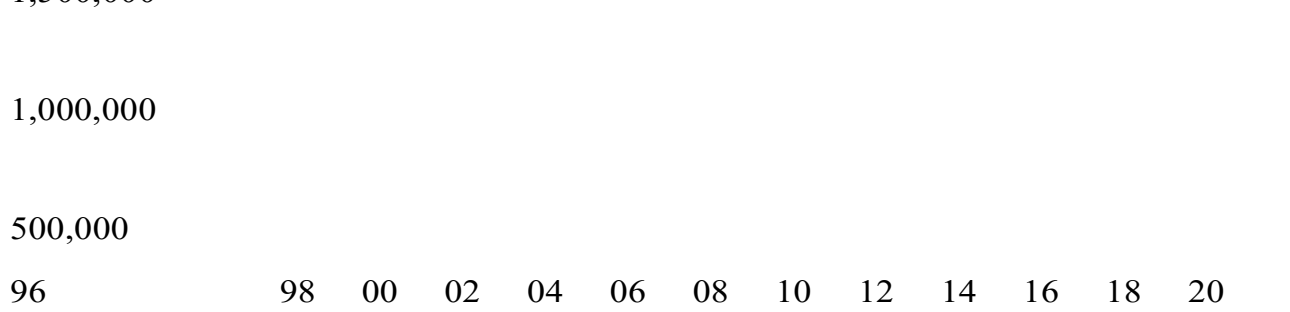
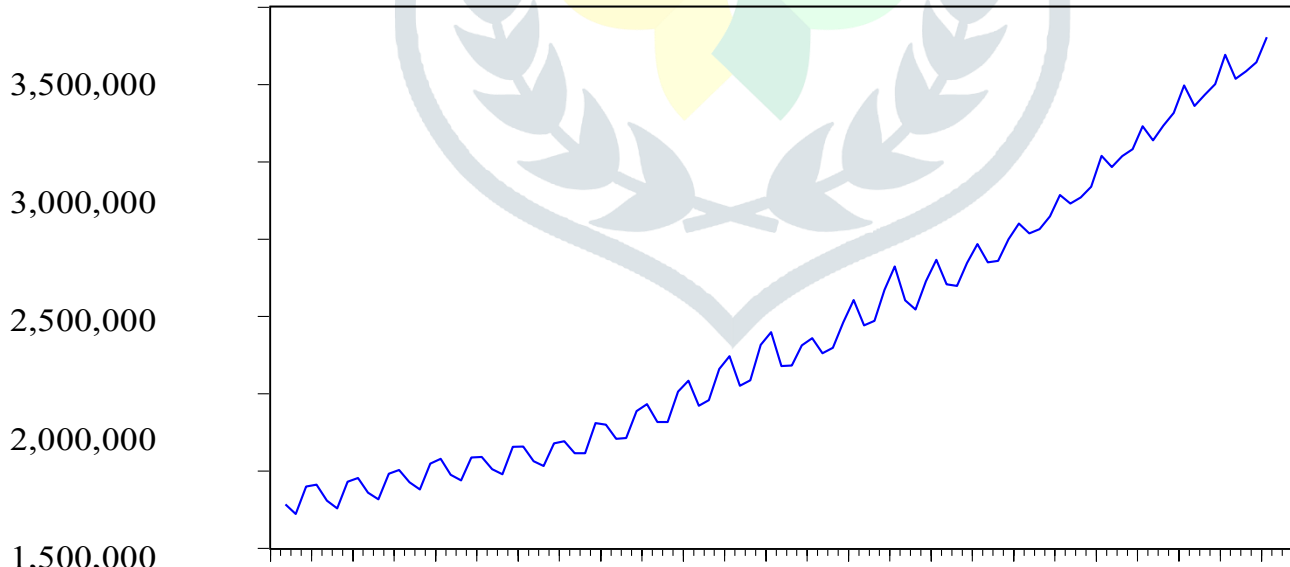
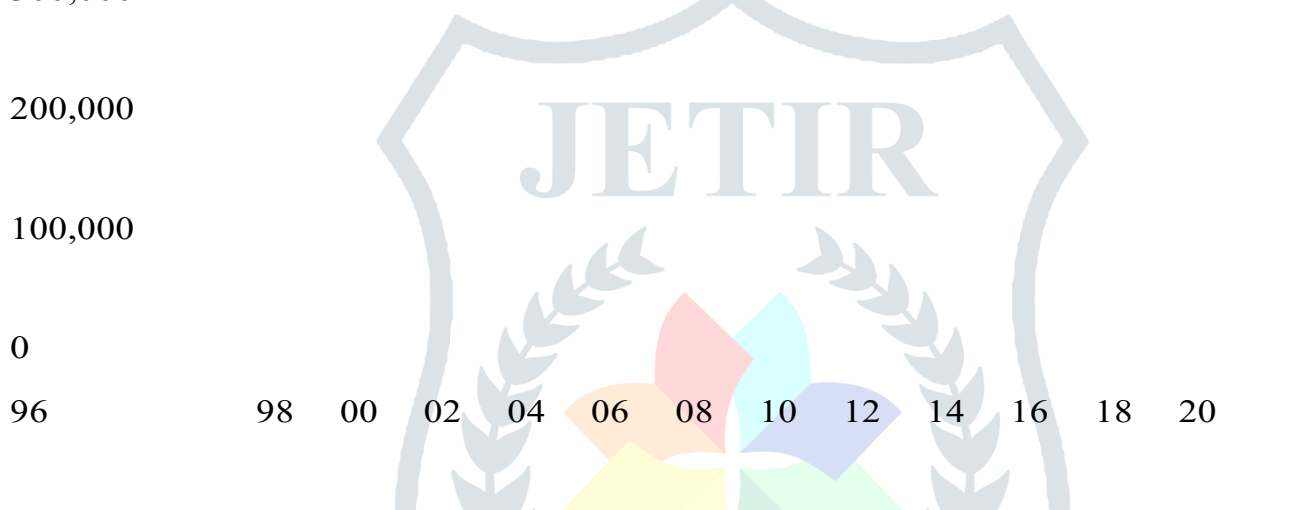
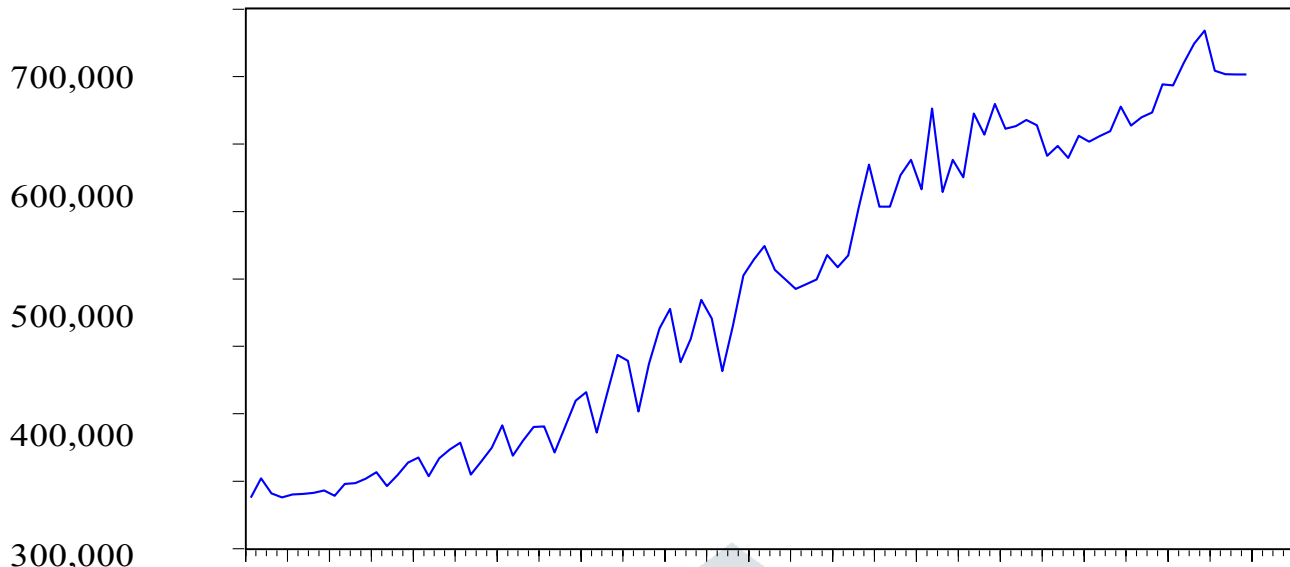
Once the stationarity test are conducted, if the variables turn out to be non-stationary at level and stationary at first difference, the appropriate methodology for data analysis will be co- integration test. If on the other hand the variables turn out to be stationary then co-integration analysis is not required as the usual time-series methods of data analysis can be applied. In case of non-stationary variables regression is allowed if there exists a linear combination of them which is stationary. If the linear combination exists then such integrated variables are thought to be co-integrated. It was Engle and Granger (1987), who introduced the co-integration test. Engle and Granger (1987) showed that although time series data may exhibit random walk behavior over time, a linear combination of such variables may still exist such that it converges to equilibrium. However co-integration test proposed by Stock and Watson (1988), and Johansen (1991) are widely used in multivariate context.

Johansen's Methodology starts from the point in the vector Auto-regression (VAR) of order  $p$  given by

$$y_t = \mu + A_1 y_{t-1} + A_2 y_{t-2} \dots \dots + A_p y_{t-p} + \varepsilon_t(1)$$

Where  $y_t$  is an  $n \times 1$  vector of variables that are integrated of order one – commonly denoted  $I(1)$  – and  $\varepsilon_t$  is an  $n \times 1$  vector of innovations. This VAR can be re-written as

$$\Delta y_t = \mu + \pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + \varepsilon_t \quad (2)$$



**2.Granger Causality test:** is a statistical hypothesis test for resolving whether one time series is useful for predicting another, first proposed in 1969 or granger causality is a way to explore causal relationship between variables. Clive Granger argued that causality in economics could be tested for by measuring the ability to predict the future values of time series using prior value of another time series.

A time series X is said to Granger-cause Y if it can be shown, usually through a series of t- test and f-test on lagged values of X that those X values provides statically significant information about future values of Y.

Granger causality is a “bottom up” procedure, where the assumption is that the data- generating processes in any time series are independent variables; then the data sets are analyzed to see if they are correlated. The opposite is a “top down” method which assumes the processes are not independent; the data sets are then analyzed to see if they are generated independently from each other.

### Running the Test

The null hypothesis for the test is that lagged x-values do not explain the variation in y. In other words, it assumes that  $x(t)$  doesn't Granger-cause  $y(t)$ . Theoretically, you can run the Granger Test to find out if two variables are related at an instantaneous moment in time. However, that version of the test is seldom used because it's not very useful, so I have not included the steps here.

### Results and Discussion:

#### Results of Unit root test

The results of the Unit root test are presented below in in table 1.a.

Null Hypothesis: Exports has a unit root				
Exogenous: Constant, Linear Trend				
Lag Length: 4 (Automatic - based on SIC, maxlag=11)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-2.727980	0.2282
Test critical values:	1% level		-4.062040	
	5% level		-3.459950	

**Table 1.a.** Results of unit root test for Exports of India



Null Hypothesis: GDP has a unit root				
Exogenous: Constant, Linear Trend				
Lag Length: 4 (Automatic - based on SIC, maxlag=11)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-1.263519	0.8904
Test critical values:	1% level		-4.062040	
	5% level		-3.459950	
	10% level		-3.156109	

**Table 1.b.** Results of unit root test for GDP of India

Null Hypothesis: M3 has a unit root				
Exogenous: Constant, Linear Trend				
Lag Length: 4 (Automatic - based on SIC, maxlag=11)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			1.290860	1.0000
Test critical values:	1% level		-4.058619	
	5% level		-3.458326	
	10% level		-3.155161	

**Table: 1c.:** Results of Unit for M3 money supply

From the graph plot for Exports and GDP it can be seen that there is both the presence of intercept and trend in the data. Hence while conducting the Unit root test we include both trend and intercept term in the model

specification. The results from the unit root test indicate that there is presence of unit root in the data on exports and GDP as we fail to reject the Null hypothesis at 5% significance level. This is inferred from the fact that the p-value is greater than 0.05% significance level. Similarly the results of Augmented Dicky-Fuller test for M3 money supply indicate the presence of Unitroot. This is inferred from the fact that the p-value is greater than 0.05% significance level.

The presence of Unitroot in the variables of the data suggest that the appropriate model for analysis of data is Cointegration technique. According

Results of Granger Causality Test:

Pairwise Granger Causality Tests			
Sample: 1996Q1 2020Q4			
Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Prob.
GDPMP does not Granger Cause EX	93	0.63113	0.5344
EX does not Granger Cause GDPMP		8.48021	0.0004

**Table 2:** Results of the Granger causality test.

The results from granger causality reveal that there is a cause and effect relationship between exports and GDP. The direction of causality runs from Exports to GDP. This therefore vindicates the hypothesis that export led growth strategy is a desirable policy to pursue for India. This result is inferred from the fact that Null hypothesis of exports doesn't Granger cause GDP is rejected (as p-value is less than 0.05 and 0.01%). Hence the alternative hypothesis that Exports do Granger cause GDP is accepted.

**results from Cointegration test:**

Sample (adjusted): 1997Q1 2019Q4			Trend assumption: Linear deterministic trend	
Included observations: 92 after adjustments			Series: GDPMP EX M3 OUTPUTGAP	
Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.546782	119.8139	47.85613	0.0000
At most 1 *	0.326729	47.00669	29.79707	0.0002
At most 2	0.097243	10.61086	15.49471	0.2366
Trace test indicates 2 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.546782	72.80722	27.58434	0.0000
At most 1 *	0.326729	36.39583	21.13162	0.0002
At most 2	0.097243	9.411813	14.26460	0.2535
Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				

Cointegration association has been analysed by using Johansen technique of cointegration. The results of the Johansen cointegration method of maximum likelihood method are reported in above table. The Null hypothesis of no cointegration vector is rejected against the alternative hypothesis both by trace statistics and maximum eigen value statistics at 5 percent significance level. The null hypothesis of at least 1 cointegrating vector can't be rejected in favour of alternative hypothesis of 2 cointegrating vector both by trace statistics and maximum eigen value

statistics suggest at least one cointegrating vector between GDP and Exports, Output gap and money supply at 95% confidence level.

## 7.4: Normalised Cointegrating equation

GDP	=	EX M3 OUTPUTGAP
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1.000000	26.47644	0.023225	245330.7
	(4.09770)	(0.16776)	(151797.)
As required signs have been reversed after shifting independent variables across the equality sign.			
Adjustment coefficients (standard error in parentheses)			
D(GDPMP)	-0.005020		
	(0.00241)		
D(EX)	0.002646		
	(0.00160)		
D(M3)	-0.040735		
	(0.00451)		
D(OUTPUTGAP)	9.64E-08		
	(1.5E-07)		

Given the results from Trace statistics and Maximum Eigen Value statistics we therefore proceed to interpret the results of cointegration analysis. The results from cointegration analysis show the longrun relationship between the study variable from the results it can be seen that there is a positive and significant relationship between GDP and Exports. This results vindicates the thesis of export led growth strategy for India. The results from the study clearly support the idea that India should focus on promoting export led growth strategy aggressively

### Conclusion:

Economic theory is largely in support of the positive impact of Exports on economic growth. However, role of International trade in the context of developing countries is viewed by some economists like Prebrish, Singer and Myrdal in a skeptical way. These argue that international trade leads to worsening terms-of-trade for developing countries. Though the majority opinion has been that trade plays a significant role in the development of a country - as has been the experience of economies like that of Asian Tigers. This has overtime been recognized as 'Export Led Growth' phenomenon. Hence increased international trade has been recommended as a main policy recommendation by economists and international institutions like IMF, WTO and World Bank. This export led growth phenomenon got renewed attention in the wake of breakdown of Soviet-union in 1990's. The study in this regard tries to assess the relation between Export performance and GDP growth in the case of India. This is to see if there a significant cause and effect relation between export performance and GDP growth.

The results from granger causality reveal that there is a cause and effect relationship between exports and GDP. The direction of causality runs from Exports to GDP. This therefore vindicates the hypothesis that export led growth strategy is a desirable policy to pursue for India. This result is inferred from the fact that Null hypothesis of exports doesn't Granger cause GDP is rejected (as p-value is less than 0.05 and 0.01%). Hence the alternative hypothesis that Exports do Granger cause GDP is accepted. Given the results from Trace statistics and Maximum Eigen Value statistics we therefore proceed to interpret the results of cointegration analysis. The results from cointegration analysis show the longrun relationship between the study variable from the results it can be seen that there is a positive and significant relationship between GDP and Exports. This results vindicates the thesis of export led growth strategy for India. The results from the study clearly support the

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