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# Dynamic Relationship between Trade Balance and Macroeconomics Variables in India.

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***Abstract:***
After the industrial development since independence, India's foreign trade has undergone a complete change and is no longer confined to a few countries trading in few commodities. Export is one of the important elements that boost the India's GDP over the years. This study investigates the relationship of trade balance with other macroeconomics variables such as exchange rates, money supply and GDP i.e. domestic income of the country, with covering a time period of 18 years from 2000 to 2018. This paper examines the short run and long run relationship between the variables with the help of the Auto regressive Distributed lag (ARDL) model. The results stated that the Money supply and GDP that affect the trade balance significantly while exchange rate affects it by insignificantly. Further research can include other macroeconomics variables to explore the impact in the trade balance and give more clear results regarding this.

***Keywords****: Trade Balance, Autoregressive Distributed lag (ARDL), Macro Economics Variables*

## INTRODUCTION

### 1. MOTIVATION OF THE STUDY

The concept of globalization has recently been the subject of considerable attention in both academic and policy circles. This phenomenon broadly refers to the increasing integration of the world economy through financial and trade flows. As economies become more open to international trade, the transmission and propagation of economic fluctuations through trade links has assumed increased importance. An analysis of the cyclical dynamics of international trade therefore has implications in a number of different dimensions, including macroeconomic forecasting, short-run policymaking, and international policy coordination.
Developed countries have been trying to pursue developing countries to liberalize the trade and allow more flexibility in business policies to provide equal opportunities to multinational firms in their domestic market. International Monetary Fund (IMF) and World Bank helped them in this endeavor. Liberalization began to hold its foot on barren lands of developing countries like India by means of reduction in excise duties on electronic goods in a fixed time frame. Indian government did the same and liberalized the trade and investment due to the pressure from World Trade Organization. Import duties were cut down phase-wise to allow MNC's operate in India on equality basis. As a result globalization has brought to India new technologies, new products and also the economic opportunities. Despite bureaucracy, lack of infrastructure and an ambiguous policy framework that adversely impact MNCs operating in India, MNCs are looking at India in a big way, and are making huge investments to set up R & D centres in the country. India has made a lead over other growing economies for IT, business processing, and R & D investments. There have been both positive and negative impacts of globalization on social and cultural values in India. India currently accounts for 2.7% of world trade (as of 2015), up from 1.2% in 2006 according to the World Trade

*May-June 2020*
*ISSN: 0193-4120 Page No. 399 - 418*

Organization (WTO). Until the 1991 liberalization, India was largely and intentionally isolated from the world markets, to protect its fledgling economy and to achieve self-reliance. Foreign trade was subject to import tariffs, export taxes and quantitative restrictions, while foreign direct investment was restricted by upper-limit equity participation, restrictions on technology transfer, export bonds and government approvals; these approvals were needed for nearly 60% of new FD in the industrial sector. The restrictions ensured that FD averaged only around $ 200M annually between 1985 and 1991; a large percentage of the capital flows consist of foreign aid, commercial borrowing and deposits of non-resident Indians. India's exports were stagnant for the first 15 years after independence, due to the predominance of tea, jute and cotton manufactures, demand for which was generally inelastic. Imports in the same period predominantly consisted of machinery, equipment and raw materials, due to nascent industrialization. Since liberalization, the value of India's international trade has become more broad-based and has risen to Indian Rs. 63.0801 billion in 2003–04 from Indian Rs. 12.50 billion in 1950–51. India's trading partners are China, the US, the UAE, the UK, Japan and the EU. Exports during April 2007 were $ 12.31 billion up 16% and imports were $ 17.68 billion with an increase of 18.06% over the previous year. Trade and macroeconomic policies are well known tools for globalisation of any government or any developing countries, what their links is less well known are and how they interact. Trade officials like to think of trade policy as an instrument for protecting industries and also as a bargaining tool in international negotiations. In developing countries, which sectors often have a small tax base; government officials rely on tariff revenues to finance government expenditures. In contrast, central bank officials and officials from finance ministries are primarily concerned with inflation, government budgets and taxation policies, respectively. Central banks typically have domestic monetary targets or inflation as their policy objectives, while country's trade performance is only a matter of concern in terms of foreign reserve position and / or the emergence of unsustainable current account deficits. Important linkages exist between trade and macroeconomic performance and between trade and macroeconomic policies. Governments should seek to reduce current account deficits with the help of trade policies rather than other policies. Historically, governments have always been tempted to use trade restrictions to restore governments of payments equilibrium. In additions of foreign capital facilitating of current account deficits, they may indirectly affect the scope and even the conduct of trade policies. Governments should create conditions to facilitate the inflow of foreign capital rather on domestic sources of financing. Trade and macroeconomic variables do not operate in a vacuum. They are strongly inter-related and interdependent. Before formally explaining the linkages, it may be useful to provide a few intuitive explanations of those linkages. Broadly speaking, the linkages are of two kinds. First, macroeconomic variables, such as national income, employment, price level, aggregate investment and consumption (and hence savings), are affected by trade. Trade affects macroeconomic performance in terms of the dynamics of the economy's growth, its stability and distribution. Imports may be used as inputs in production and, therefore, directly affect the level of output and, indirectly, demand for labour and thus employment. Imports of consumer goods reflect choices of consumers and, hence, their decisions to spend their incomes or to save. In addition, imports compete with domestic production and may displace domestic firms from the market. As a result, domestically produced output will be affected and so will income and employment - adversely, if domestic firms are unable to compete, or positively, if they become more competitive. Exports, which constitute a component of aggregate demand, stimulate growth of domestic output and hence income and employment. By expanding markets for domestic firms, exports create conditions for production costs to fall as firms benefit from economies of scale. As a result, firms' productivity

*May-June 2020*
*ISSN: 0193-4120 Page No. 399 - 418*

will increase. Many countries have relied on exports as an "engine" of economic growth. Second, the reverse causality - from macroeconomic variables to trade - also holds true. Domestic growth will increase demand for imports and divert resources away from production of exportable to production for domestic markets. Other things being equal, the trade balance will tend to deteriorate. By the same token, stagnating domestic demand will "push" producers to look for markets abroad. Consequently, exports will tend to grow and the trade balance will improve. Changes in the domestic price level also have "spill over" effects on trade. Inflation lowers the competitiveness of domestic firms' vs. foreign imports and foreign firms in foreign markets. Once again, imports will tend to rise, and exports fall. Consequently, the trade balance will deteriorate. Changes in foreign prices are also important for the trade and macroeconomic performance of countries - especially those of smaller countries which are inherently more dependent on international trade. Rising world prices relative to domestic prices will encourage exports and discourage imports. In addition, rising import prices will increase costs of imported inputs and may generate inflationary pressures. Rising export prices will increase the profitability of export transactions, increase cash flows of exporting firms and, therefore, provide additional incentives to shift resources to the production of tradable goods. Changes in relative foreign prices affect a country's country of trade and, thus, its balance of payments situation. Trade is also sensitive to changes in macroeconomic policies. For example, an expansion in monetary or fiscal policy would increase aggregate spending, which includes spending on imports, and influence the allocation of resources between tradable and non-tradable. Macroeconomic policies also affect the conditions in financial markets and thus the incentives for capital flows to move in and out of the country. This, in turn, is a determining factor of the amount of external resources available for financing current account deficits. Trade can be determined by changes in macroeconomic variables such as consumer spending or investment. If, for example, the US monetary authorities lower interest rates, domestic spending on domestically produced goods and imports will rise. Like, resources used in the production of exportable may be shifted to production for the home market. On the other hand, trade can also be affected by the performance of sectors or individual firms. By way of another example, US exports may expand because of new contracts signed by, say, Boeing to sell aircraft to European countries. In the latter case, the expansion takes place as a result of the success of Boeing rather than changes in macroeconomic variables or policies

### 1.2. Research Questions

The purpose of this thesis is to investigate the relationship between certain macroeconomic indicators and the trade balance of India in short- and the long-run. We achieve the purpose by investigating the short-run and long-run impact of the given indicators using the Autoregressive Distributed Lags model (ARDL) as it has several advantages in relation to other methods. The thesis focuses on the following Research Questions (RQ) in order to fulfil the purpose::

1.0 How can the set of macroeconomic indicators be used to describe the trade balance?

This research question can be divided into the following sub-questions:

1.1 What is the short and long-run relationship between our chosen set of macroeconomic indicators and the Trade Balance of the India?

1.2 Which and when are the macroeconomic indicators most important for describing the Trade balance?

## 2. CONCEPTUAL FRAME WORK

### 2.1 Balance of Trade

The balance of trade is also known as commercial balance or net exports and symbolized as NX. It is the difference between the monetary value of a country's exports and imports for a particular span of time. The difference can be made between for goods

*May-June 2020*
*ISSN: 0193-4120 Page No. 399 - 418*

and services of balance of trade. The measurement among the flow of exports and imports for a given period of time of a nation can also be termed as balance of trade. The concept of trade balance does not imply that exports and imports are "in balance" with each other. In case of a greater value of exports as compared to imports of a nation, that shows the trade surplus or positive balance of trade, at the same time where there is a greater value of imports as compared to the exports, that indicates the shortage of trade or negative balance of trade of that particular country. As per a report of 2016, out of 200 countries, it's around 60 countries are having a positive balance of trade. In a two-sided trading, the negative balance of trade leaves a bad impression after which it tremendously gets rejected by trade experts and economists. The trade balance is a part of the current account, which adds some other transactions like the net income from the international investment, international support, international assist, etc. The growth of net international asset position is directly proportional to the current account i.e. if the current account is in surplus or positive, then there is simultaneously increase in the international asset position and vice versa. The issues with the collection and recording of data may lead to the problem in the calculation of the trade balance. One conclusion can be drawn from this dilemma i.e. while adding the official data of all the countries in the world, if the result shows that the exports are 1% more than the imports then that indicates the world is successively growing with the positive balance of trade. But in practical, this is not possible because all the transactions are having equal amount of debit and credit in both the sides of the balance sheet which is the nature of the accounting system. The difference in the value of debit and credit will explain the nature of illegal transaction or popularly known as smuggling. These kinds of activities are mostly done in the developing countries, so the inconsistency in the respective countries leads to a suspension in the trading.

### 2.2 Macroeconomic

Macroeconomics is a branch of economics dealing with the performance, structure, behaviour, and decision-making of an economy as a whole. This includes regional, national, and global economies. Macroeconomics studies economy-wide phenomena such as inflation, price levels, rate of economic growth, national income, gross domestic product (GDP), and changes in unemployment.

Inflation and Deflation. The study of inflation and deflation is another important aspect of macroeconomics. The term inflation refers to an increase in the prices of goods and services across the country. And the term deflation refers to a decrease in the prices of goods and services. Economists measure inflation and deflation by studying price indexes. A price index is the weighted average of price for a class of products and services.

Price level. A price level is the average of current prices across the entire spectrum of goods and services produced in the economy. In more general terms, the price level refers to the price or cost of a good, service, or security in the economy.

### 2.3 Economic Growth

Economic growth refers to an increase in aggregate production in an economy. Macroeconomists try to understand the factors that either promote or retard economic growth in order to support economic policies that will support development, progress, and rising living standards.

Income and Output

One of the most important concepts of macroeconomics is income and output. The national output is the total amount of all goods and services produced in a country during a specific period. And when production units or organizations sell everything they produce, they generate an equal amount of income. As such, you can measure output by calculating the total income from the sale of all goods and services.

### 2.4. GDP (Gross Domestic Product)

In relation to macroeconomics, economists usually measure national income or output by gross domestic product or GDP. By measuring GDP, economists can understand the market swings and changes. They can identify what measures to take to improve the GDP of the country. With technological advances, capital increase, and the acquisition of state-of-the-art equipment, production units and organizations can increase national output and income. However, income and output can be affected by the recession and other market factors. Gross Domestic Product (GDP) is the broadest quantitative measure of a Nation's total economic activity. More specifically, GDP represents the monetary value of all goods and services produced within a nation's geographic borders over a specified period of time.

The equation used to calculate GDP is as follows:

**GDP = Consumption + Government Expenditures + Investment + Exports – Imports.**

Unemployment

Another important component of macroeconomics is unemployment. Economists measure the unemployment rate in an economy by calculating the percentage of individuals without jobs. Unemployment categories include classic unemployment, frictional unemployment, and structural unemployment. Classical unemployment is when wages are too high for employers to consider hiring more workers. Frictional unemployment occurs when the time taken to search for an appropriate employee is too long. An unemployment structure occurs when there is a mismatch between a worker's skills and the actual skill required for a job. Another important category of unemployment is cyclical unemployment that occurs when an economy's growth is stagnant.

### 2.5 Macroeconomic equilibrium in an open economy

Trade and macroeconomic elements are inter-related through a set of formal economic links. These relationships form a macroeconomic system of an open economy that identifies a set of conditions necessary to maintain the economy in equilibrium. The link between trade and macroeconomic elements stems from the so-called fundamental macroeconomic identity which, in turn, forms the basis for a theory known as the "absorption model". The absorption model is often combined with another theoretical framework known as the “monetary model” that provides a foundation for the monetary approach to the balance of payments. The absorption model links macroeconomic variables such as consumption, savings, investment and income with external balances (typically the current account). These relations describe the "real" side of the economy. The monetary model then links the domestic real variables with the monetary variables. Some aspects of these models are controversial, but they are grounded in strong theory and continue to be fundamental in the provision of policy advice, especially in the context of IMF conditionality.

Macroeconomic equilibrium in a closed economy is defined as the situation when planned (ex ante) aggregate spending (or absorption) equals actual income. In an open economy, this requires that planned or ex ante investment equals the sum of private sector savings, the public sector and the amount of foreign savings made available to domestic residents or the government. Thus, in an open economy, macroeconomic equilibrium has two components: the first is internal balance, related to domestic goods, financial and labour markets. Equilibrium is typically defined as output at full or near full employment. The second component is external balance which is defined in terms of a current account balance and it’s financing. In real world situations, this implies a judgment about external sources of financing and the sustainability of the country's external debt. Combining both elements in addressing the issue of current account balances, it follows that:

- The level of current account imbalance directly reflects the difference between national income and national spending. An excess of national spending over national income is only possible in the presence of the

*May-June 2020*
*ISSN: 0193-4120 Page No. 399 - 418*

corresponding deficit on the current account. Conversely, an excess of national income over national spending leads to domestic "savings" which are channelled into an excess of exports over imports (a current account surplus).

- In the absence of capital flows, a current account deficit is only possible by running down foreign reserves or foreign borrowing by the banking system. In the absence of reserves or foreign borrowing, the balance in the current account can only be achieved through adjustments of domestic macroeconomic variables.

**2.6 The monetary model of balance of payments**

The role of restoring and preserving external balance in monetary and fiscal policy can be better understood based on theoretical models or consistent with the "absorption approach" to balance payments. The latter, in turn, is based on the fundamental macroeconomic identity elaborated further below. One of these models - arguably the best known - is the monetary model.

The IMF monetary model contains the following elements (among others):

dM = dR + dDC … (1)

Equation (1) states that the change in the money supply (dM) is by definition equal to the change in the foreign assets (i.e. net foreign assets) (dR) plus the change in the domestic credit of the banking system (dDC).

dR = X - IM -NF + dK … (2)

Equation (2) states that the change in foreign reserves (dR) is by definition equal to exports (X) minus imports (IM) of goods and services minus net factor payments and current transfers (NF) plus net foreign capital inflows of the non-bank sector (dK).

The link between monetary and fiscal policies with external accounts is established through the "fundamental macroeconomic identity". Defining first

Y = GDP-NF… (3)

GDP = C + + (X-IM) … (4)

A = C + … (5)

CAB = X-IM-NF … (6)

Where, Y - gross national disposable income,

A - Domestic absorption (consumption C and investment I),

CAB - current account balance of BOP,

And substituting (4), (5), (6) into (3) gives the following "fundamental macroeconomic Equation":

Y = C + + (X-IM) -NF ➞ Y = A + CAB and thus,

CAB = YA (7)

The current account balance (CAB) is a difference between country income (Y) and domestic absorption (A). Equation (7) also highlights that the current account shows a surplus if income is greater than domestic absorption and a deficit in the reverse case. Only the CAB deficit can be reduced by a decline in absorption (relative to income) or by an increase in income (relative to absorption).

Now, combining equations (7) and (2) we get

dR = YA + dK … (8)

Which shows that if the excess of domestic absorption over income is not entirely funded by inflows of foreign capital this will lead to a rundown of the net foreign assets of the banking system.

Equation (1) can be rearranged so that it relates the change in net foreign assets to the difference between change in money supply (dM) and the change in domestic credit (dDC):

dR = dM-dDC … (9)

Equation (9) shows that foreign reserves decline to the extent that change in total money stock is less than change in domestic credit. Combining equations (7), (8) and (9) gives:

Y-A + dK = dM-dDC … (10)

Thus, the excess in the change of domestic credit over the change in money stock will be equal to the current account deficit (assuming no net inflow of foreign capital).

Macroeconomic instability: shocks and unsustainable current account deficits

**3. REVIEW OF LITERATURE**

The main purpose of the literature review is to provide knowledge and a context regarding previous

*May-June 2020*
*ISSN: 0193-4120 Page No. 399 - 418*

research of macroeconomic indicators and their relationship to the trade balance. The literature review will also be conducted in order to explain and define the scope of the research questions that were defined in Section 1.2 and to clarify relevant topics that could form the basis for further research of our thesis. On the basis of the literature review we will design and determine relevant theoretical frameworks for our research area. In this section we describe the main literature, results and methods used in the area of the relationships between the trade balance and selected macroeconomic indicator for both short-run and long-run. Tsen and Mahmud (1988) conducted a study on "Terms of Trade, Oil Price and Bilateral Trade Balance of Singapore with Malaysia: Some Empirical Evidence" where they saw the impacts of terms of trade and oil price on the bilateral trade balance of Singapore with Malaysia. They found that an increase in terms of trade will lead to a decrease in bilateral trade balance. They suggested that trade diversification could reduce adverse impacts of the external trade balance. This could be achieved through providing more incentives for firms to participant in trade missions, trade fairs and trade in those emerging economies. Finally they concluded that terms of trade, domestic demand, foreign demand and oil price are important in the bilateral trade balance determination not only in the short run but also in the long run. Backus and Kehoe (1992) examined on "Dynamics of the trade balance and the terms of trade: The J-Curve revisited and gave a new interpretation of statistical relation between the trade balance and the terms of trade. The application of this model saw a negative relation with the simultaneous movements of terms of trade and a positive relation with the insulated movements in case of International Data, whereas there is a favourable in case of domestic i.e. domestic production increases, its relative price decreases and trade increases. They suggested that the increase in domestic productivity may lead to a more investment boom. Finally they concluded that this boom will lead to trade deficit, followed by future surplus. Prasad and Goel (1998) in their research study of "International Evidence on the Determinants of Trade Dynamics provided a number of different but complementary characterizations of the relationship between international trade and the business cycle in industrial economies. They found that there is little evidence that variations in the trade balance have contributed significantly to cyclical recoveries in industrial economies since the 1970s and a negative unconditional correlation between output and the trade balance in the data. They suggested future researchers to extend this study in a number of different directions, because they examined only the direct effects of international trade in generating business cycle recoveries. However, they concluded that more extension of this study would be very useful to examine the role of trade in the international propagation of business cycles. Baharumshah (2001) revealed on his research paper, "The Effect of Exchange Rate on Bilateral Trade Balance: New Evidence from Malaysia and Thailand" that due to devaluation, the real variables and economic structure can be affected under a particular situation by examining whether there is any effective impact of exchange rates on the bilateral trade balances of Malaysia and Thailand with the USA and from 1980 to 1996 i.e. 16 years. He suggested that the enhancement and improvement of trade balance of the nations can be done with the depreciation of real effective exchange rate. Further he added that the devaluation in Malaysian currency, i.e. Ringgit may get higher in competitiveness of its own domestic goods with foreign goods. However, he concluded that there is no evidence of J-curve phenomenon and both real domestic and foreign incomes are important variables for the trade balance. Boyd et al. (2001) through their research study "Real exchange rate effects on the balance trade : Co-intergartion and Marshall-Lerner Condition" investigated that how Real Exchange Rate effects on the Balance of Trade and in this case they used Quarterly data of 8 OECD country. With the help of structural co-integrating Vector Autoregressive Distributed Lag (VARDL) models, they examined the possessions of the

*May-June 2020*
*ISSN: 0193-4120 Page No. 399 - 418*

exchange rate on the balance of payments for domestic and foreign output. By using three econometric model: VAR, VARDL, ARDL, finally they suggested that devaluation can play a vital role to improve the trade balance of investigated countries. However they concluded that the trade of balance was getting affected not only with the real exchange rate but also other factors like domestic and foreign output, devaluation, etc. Wilson (2001) in his paper "Exchange rates and trade balance for dynamic Asian economics – Does the J-curve exist for Singapore, Malaysia and Korea?" observed to find if there is any connection between the real trade balance and the real exchange rate for bilateral trade in commodities between Singapore, Korea and Malaysia and the USA and Japan. He collected the data quarterly for his research from 1970 to 1996 i.e. 26 years. As a result, he found that there is no impact of the exchange rate on the trade balance apart from Korean trade with the USA. Later on, he come across that there is no application of J-curve. Winters (2002) in his research paper "International Trade and Macroeconomic Policy" examined the various policies which can be used to target external imbalances and their impact on trade. He suggested that governments should maintain a proper stand in the presence of an unsustainable balance of payments deficit, also seek to restore the external balance while maintaining or restoring the internal balance as well. However he concluded that the use of trade restrictions as an instrument for restoring external equilibrium is highly undesirable. The effects of trade restrictions are asymmetric and welfare-reducing. In addition, trade restrictions may only improve the balance of payments in the short run. A second main message is that open trade policies are not sufficient to benefit from greater integration into world markets. Open trade policies will fail if they are not accompanied by sensible macroeconomic policies. This shows the policies that support macroeconomic stability. Countries with open trade regimes tend to grow faster if they are also financially more stable. Moreover, what holds for macroeconomic policies will also hold for other policies. Liew et al. (2003) investigated on the study of "Exchange Rates and Trade Balance Relationship: The Experience of ASEAN Countries with Japan" from 1986 until 1999 i.e. 13 years and found the relationship between the exchange rate and trade balance has been overstated where it was predicted that the reason for the improvement of the trade balance would be fall in the ASEAN-5's currency to Japanese yen. He suggested to focus on the main factors which are affecting the real money which may helpful in enhancement of trade balance. The conclusion of his study saw that the outcome can't be achieved through a decline based policy and only the exchange rate cannot be applied to manage the external balance of the country. Onafowora (2003) found in his research paper "Exchange rate and trade balance in East Asia: is there a J-curve?" that the exchange rate, trade balance, domestic income and foreign income are having a strong relationship in terms of long-run. Through co-integration analysis, he has done his research to identify if there is any outcome of exchange rate on the trade balance in the two-pronged operation of three ASEAN countries with US and Japan for both long run and short run. Finally he concluded with the Marshall-Lerner condition that in the short run, with a different degree of J-effects, it is assumed in the long run that the gain of the trade balance occurs 3 or 4 periods later after a deflation. Parikh (2004) analyzed a research on "Relationship between Trade Liberalisation, Growth and Balance of Payments in Developing Countries: An Econometric Study" and stated that trade liberalization has significant relationship with economic growth and/or trade deficits in short to medium-run, but not in long run. He suggested that the developing countries can also be become equal with developed countries in their per capita income with the help of developed countries by way of capital financing. However, he concluded with the statement that trade liberalisation could constrain growth through adverse impact on balance of payments. Hatem and Irandoust (2005) in their study "Bilateral Trade Elasticity's: Sweden Versus Her Major Trading Partners" showed that

*May-June 2020*
*ISSN: 0193-4120 Page No. 399 - 418*

Sweden did not satisfy Marshall-Lerner condition by using co-integration test. The reason behind this might be the balance of trade in Sweden is not quick to respond in exchange rate but it is very insightful in the changes of income of the nation as per IMF (2006; approved by Mark Allen) analysis on Exchange Rate and Trade Balance Adjustment in 46 Emerging Market Economics suggestions. They focused on the average impact of a nominal exchange rate change on the trade balance. A country's trade balance significantly depends on the elasticity of export demand or the nature of the differentiated export products with a negatively sloped demand curve. Export volume and pricing-to-market elasticity tend to be quantitatively small, so most of the response of trade balance comes from the behaviour of imports. The impact of an exchange rate change depends on the initial trade balance; given the price elasticity of import is greater the price elasticity of export. They suggested that the Marshall-Learner condition governing depreciation in nominal exchange rate will improve the trade balance in term of foreign currency. They concluded with the statement that if the countries have a larger trade surplus than a less likely or a smaller of an exchange rate, movement on trade balances is showing that the country export more than its import. Zafar (2007) in his research of the growing relationship between China and Sub-Saharan Africa: Macroeconomic, Trade, Investment, and Aid Links saw the economic dominance of China for continuously two decades. The total amount of trading between China and Africa went more than $50 billion because of importing oil from Angola and Sudan, timber from Central Africa, and Copper from Zambia, which was a great boom in the GDP rate of Africa. Except this Chinese aid and infrastructure were also bringing desperately need capital to the continent. At the same time, where there was a great benefit to African counties, there was also a threat to displace local production for African consumers. China created a good governance and macroeconomic management in Africa because of the potential Dutch disease implication of commodity booms. However he concluded that China presented both an opportunity to Africa to reduce its marginalization from the global economy and a challenge an effective connection to avail the resources to promote poverty reducing economic development at home. Yuen-Ling et al (2008) did an empirical study on Real Exchange Rate and Trade balance Relationship: An Empirical Study on Malaysia" where they examined that whether there is any connection between exchange rate and balance of trade in Malaysia from 1955 to 2006. They found on their study that the rear exchange rate and the domestic income has a positive relationship with the trade balance, but the foreign income (USA as foreign country) has a negative relation with trade balance, which is as the same theory developed in economics. Finally, they suggested that adopting import-substitution policy, which may work better than the devaluation-based policy in improving domestic income and trade balance. However they concluded that the trade balance of Malaysia is more dependent on the domestic income as compared to foreign income. Ardalan and College (2009) conducted study on the "Monetary approach to balance of payments: A review of the seminal short-run empirical research" where they have done an empirical research on monetary approach to get the balance of payment. They also used other approaches such as elasticity and absorption approaches and found that monetary approach was appropriate for demand and supply of money in the economy of the country. However, in the conclusion they stated that for the short run, money supply plays a vital role in the changes of exchange rates and to examine the trade balance, monetary policy is very significant. Khatoon and Rahman (2009) in their research paper "Assessing the Existence of the J-Curve Effect in Bangladesh" worked on the context of Bangladesh and twenty major trading partners of Bangladesh. They used the data from 1972 to 2006. They used co-integration techniques to estimate long run relationship and in short run estimation they used Vector Error correction model. Through Johansen Test for Co-

*May-June 2020*
*ISSN: 0193-4120 Page No. 399 - 418*

integration, they found that in the long run, there is a positive relationship of trade balance with devaluation of exchange rate and foreign income and negative relationship with domestic income. In short run there is a positive relation in between with trade balance and devaluation of currency in Bangladesh. They suggested that the trade balance of Bangladesh can be improved by the increase in domestic income. However they concluded that both long run and short run has to be taken care for a stable trade of balance in the economic growth of Bangladesh and hence the J-Curve effect exists in Bangladesh. Xu and Zhang (2009) investigated in their study "The Effects of Different Components of Exchange rate on Trade Balance: A Signal Extraction Approach" the relationship between exchange rate and trade balance in a single extraction framework and found that the real effective exchange rate had a significant impact on trade balance, the effects of public known component on trade balance of three type of enterprises are similar, but the effects of signal components are different, the effects of exchange rate on trade balance are variable and becoming very weak. Yusoff (2009) in his study "Bilateral Trade Balance, Exchange Rates, and Income: Evidence from Malaysia" examined the Malaysian sell overseas and exchange rates in Malaysia with United States, Japan and Singapore. He found that real exports and foreign income are correlated with each other by testing the real exports through the co-integration test. After the evaluation of long run equation, it shows that the trade balance is getting affected by real exchange rate exchange rates, foreign income and real imports are critical determinants that affect the trade balance. Finally he concluded that the depreciation or lower in Malaysia currency, Ringgit improves the competitive ability of the country exports. Diboolgu (2010) revealed in his research paper Aggregate supply, domestic absorption, and terms of trade: A structural decomposition of the U.S. Trade balance that U.S. trade balance was dependant on the macroeconomics elements like supply of goods, demand, and relative price. To identify a structural net gains or losses from trade caused by changes in price or volume of the goods, he selected the Vector Auto regression (VAR) model to reveal its relationship with other schemes. He suggested for further research on this by taking other macroeconomic elements which were partially affecting the trade balance. However he concluded over the performance of U.S. trade balance, the demand and supply play a vital role in the long run while price and demand are important in short run. Chowdhury et al. (2014) have done their research on "Relationship between the exchange rate and trade balance in Bangladesh from Year 1973 to 2011: An Econometric Analysis" and found that there is a significant relationship of trade balance with exchange rate, foreign income, foreign asset; where domestic income shows a negative relationship with trade balances. With this they added that real exchange rate is an important variable to the trade balance, and devaluation will improve the trade balance in the long run association ship. The coefficients are found to change smoothly like exchange rate, foreign asset and growth of domestic and foreign GDP has a significant impact on trade flows. They suggested that increase of exchange rate and foreign asset can keep highly substantial and feasible roles to make Bangladesh product competitive in world market. However, as Bangladesh has to import a great deal of capital goods for its key exporting industries, devaluation of currency can merely increase the exports demand (not exports supply) at the outset. As a consequence, the increased exports demand immediately increases the effective demand of imports for capital goods. This is why trade balance deteriorates immediately after devaluation. Alessandriay and Cho (2015) presented a paper on "The dynamics of the Trade Balance and the Real Exchange Rate: the J curve and Trade Costs" the dynamics of the trade balance are mostly explained by changes in trade costs. They developed a theoretical model with heterogeneous producers, a dynamic export participation decision, pricing to market, and declining trade costs to address these properties of the trade balance. However, they concluded that with these movements

*May-June 2020*
*ISSN: 0193-4120 Page No. 399 - 418*

in the trade balance, business cycles are substantially more synchronized and there is much less consumption risk sharing. Gbatu et al. (2017) in their research paper Causal Effects and Dynamic Relationship between Exchange Rate Volatility and Economic Development in Liberia discussed on major policy issues, which are overriding for Liberia's economic recovery by analyzing the dynamic associations between exchange rate volatility (ERV) and Liberia's real gross domestic product (RGDP). From the empirical study they found that there is no significant relationship between ERV and Liberia's RGDP in the short-run, but variance decomposition analysis reveals that innovations to Liberia's RGDP lead to fluctuations in ERV in the long-run. Further, they suggested the Liberia's policymakers to exert stronger monetary policy control to ensure the existence of single currency regime in the long-run. However, in the conclusion part they stated that technological innovation is required to boost domestic production in order to offset the negative effect of ERV on trade. Yiheyis and Musila (2018) examined in their study The dynamics of inflation, exchange rates and the trade balance in small economy that a real depreciation lead to an increase in inflation in the long run and there is no significant effect of real depreciation and inflation on trade balance. But in the short run there is an unusual relationship between the trade balance and real exchange rate and also between the real exchange rate and the inflation. Hence both long run and short run are responsible for the development of trade balance in the foreign sector in small developing countries. They suggested that an improvement in the trade balance requires more than an appropriate exchange rate policy and underscores the importance of other policies in strengthening the external sector of the economy. However, they concluded that In Uganda, there is persisting the trade deficit, rising inflation, significant exchange rate realignments and other liberalisation measures the economic development of the country. Manual and San (2019) in their research of "Dynamic Relationship between Trade Balance and Macroeconomic Elements: empirical Evidence from Emerging Economies in Malaysia"reviewed the dependency of Malaysia on International trading where export is one of the most important factor which affecting the GDP rate. In their 15 years of research from 2000 to 2015, they made an investigation on the relationship between balance of trade and macroeconomics by taking some major elements like domestic income, exchange rates, inflation rates and money supply, etc. and found that domestic income, exchange rates, inflation rates are playing a significant role, where money supply is insignificant that affect the balance of trade. Their suggestion for future researchers was to use the other elements like foreign income, government expenditure, and household consumption to determine the balance of trade in a broader and more refined manner. Since money supply is insignificant to the trade balance, Malaysia should not focus on this, rather than it should look for the increase in inflation rate which is affecting the trade balance in both long term and short term to get the progress in trade deficit.

## 4. RESEARCH OBJECTIVES

The paper was covered with the objective to check whether the macroeconomics variables are actually having any effect on the trade balance of India or not. Thus, the objectives are:

- To study the impact of various macroeconomics variables on the functioning of India trade balance.
- To evaluate the Indian economic growth in a developing country.
- To give a suggestion by evaluating the current economic policies of the country for improving the status of the country

### 4.1 Scope of the Study

This paper is focused about relationship between the trade balance and macroeconomics indicators of India. The paper is limited to three macroeconomics variables i.e. GDP, Money Supply (M3) and Exchange Rate. The current study analyses and focused the impact and effect of the

*May-June 2020*
*ISSN: 0193-4120 Page No. 399 - 418*

macroeconomics variables in trade balance of a developing country like India. Further the paper aimed to analyzed the effect of other macroeconomics variables' to trade balance as compared to other countries.

**4.2 Research Hypothesis**

The paper has been taken up the following hypotheses to find the relevant conclusion for the better decision making process.

Null Hypotheses 1-There is Unit Root present in the Model.

Null Hypotheses 2- There is No Serial Correlation at up to 2lags.

Null Hypotheses 3- There is no long run relationship between Trade Balance and other Independent Variables i.e. the macroeconomics variables

**4.3 Data collection**

This paper is based on secondary data. The data have collected from the various sources i.e. World Investment Reports, Asian Development Bank's Reports, various Bulletins of Reserve Bank of India, publications from Ministry of Commerce, Govt. of India, Economic and Social Survey of Asia and the Pacific, United Nations, Asian Development Outlook, Country Reports on Economic Policy and Trade Practice Bureau of Economic and Business Affairs, U.S. Department of State and from websites of World Bank, IMF, WTO, RBI, UNCTAD, EXIM Bank etc. It was the time series data and the required data has been collected for the period of 2000 to 2018 in quarterly manner

**4.4. Research Gap**

The above discussed review of literature reveals that most of the studies on balance of trade and macroeconomics elements which have a positive and significant impact on liberalization, both domestic and international trading, exchange rate, CP and GDP, domestic and foreign output, government policies, economic welfare, balance of payment, per capita income, capital financing, domestic and foreign income, demand and supply of money and commodity, economic growth both in long run and short run, foreign assets, etc. But there is no or very less information regarding incentives for participants, bilateral trade of the developing countries like India (most of the studies have discussed on the developed countries like USA and Singapore, etc), inflation and deflation in currencies, the quality and quantity of goods and services, employment, National debt, Interest rates, the role of public policies, etc. In addition to these above mentioned factors, there are not all, but very few selected macroeconomic elements have taken to the study and researches have done their research study for a certain period of time as per their convenience or availability of data. Taking into account the above stated research gap, accordingly the research work has been carried out as a contribute to the welfare of the society as well as Nation.

**5. INFERENTIAL STATISTICS**

**5.1 Stationary and Non-Stationary Series Concept**

A non-stationary time series is a stochastic process with unit roots or structural breaks. However, unit roots are major sources of non-stationary. The presence of a unit root implies that a time series under consideration is non-stationary while the absence of it entails that a time series is stationary. This depicts that unit root is one of the sources of non-stationary. A non-stationary stochastic process could be Trend Stationary (deterministic) Process (TSP) or Difference Stationary Process (DSP). A time series is said to be trend stationary process if the trend is completely predictable and not variable, whereas if it is not predictable, we call it difference or integrated stochastic trend or difference stationary process. In the case of deterministic trend, the divergence from the initial value (represents non-stationary mean) is purely random and they die out quickly. They do not contribute or affect the long run development of the time series. However, in the case of integrated stochastic trend, the random component (Ut) or divergence affects the long run development of the series. Utilizing time series with these features in any meaningful empirical analysis,

*May-June 2020*
*ISSN: 0193-4120 Page No. 399 - 418*

the series must be purged of this trend. This is referred to as detrending of the series. This could be carried out in two ways, depending on whether the series is a difference stationary process or deterministic stationary process. If a series is DSP, it means it has a unit root; hence, the differencing of such series is stationary. Therefore, the solution to the non-stationary series is to difference the series. Also, if a series is TSP, it means it exhibits a deterministic trend, while a trend stationary variable with non-constant mean may be I(0) after removal of a deterministic trend. That is, regressing such series on time(t) and the residuals from this regression will be stationary($Yt = \beta t + Ut$). Hence, cointegration cannot be seen as a means to an end but restricted. It should be made clear that if a time series is TSP, but treated as DSP, this is called over-differencing. On the other hand, if a time series is DSP, but treated as TSP; this is referred to as under-differencing. The implications of these types of specification error can be serious, depending on how the serial correlation properties of the resulting error terms are handled. However, it has been observed that most time series are DSP rather than TSP. Therefore, when such non-stationary time series (DSP) are used in estimation of an econometric model, the Ordinary Least Square (OLS) traditional diagnostic statistics for evaluation of the validity of the model estimates such as, coefficient of determination (R2), Fisher's Ratio(F Statistic), Durbin-Watson(DW-Stat), t-statistic etc. become highly misleading and unreliable in terms of forecast and policy. In such series, the mean, variance, covariance and autocorrelation functions change overtime and affect the long run development of the series. The presence of unit root in these series leads to the violation of assumptions of constant means and variances of OLS. However, this review dwells on Difference Stationary Process rather than Trend Stationary Process since most time series are Difference Stationary Process. As demonstrated above, many time series variables are stationary only after differencing. Hence, using differenced variables for regressions imply loss of relevant long run properties or information of the equilibrium relationship between the variables under consideration. This means that we have to devise a way of retaining the relevant long run information of the variables. Cointegration makes it possible to retrieve the relevant long run information of the relationship between the considered variables that had been lost on differencing. That is, it integrates short run dynamics with long run equilibrium. This is the basis for obtaining realistic estimates of a model, which is the driver of a meaningful forecast and policy implementation. Cointegration is a preferred step for modeling empirically meaningful relationships of DSP. Cointegration is concerned with the analysis of long run relations between integrated variables and reparameterizing the relationship between the considered variables into an Error Correction Model (ECM). Under the conventional Granger (1981) and, Engle and Granger (1987) cointegration analysis is not applicable in cases of variables that are integrated of different orders (i.e, series-A is I(1) and series-B is I(0)) while in Johansen and Juselius(1990), and ARDL cointegration procedure it is applicable. The ARDL cointegration technique is used in determining the long run relationship between series with different order of integration (Pesaran and Shin, 1999, and Pesaran et al. 2001). The reparameterized result gives the short-run dynamics and long run relationship of the considered variables. Although ARDL cointegration technique does not require pre-testing for unit roots, to avoid ARDL model crash in the presence of integrated stochastic trend of I(2), we are of the view the unit root test should be carried out to know the number of unit roots in the series under consideration. This is presented in the next section

**5.2 Unit Root Stochastic Process**

Given a Random Walk Model (RWM);

$$Yt = \rho Yt\text{-}1 + Ut$$

$-1 \leq \rho \leq 1$ In the above RWM without drift, If $\rho = 1$, we are faced with unit root problem, that is, a situation of non-stationarity. In this case the variance of Yt is not stationary. However, If $/\rho/ \leq 1$, that is if

*May-June 2020*
*ISSN: 0193-4120 Page No. 399 - 418*

the absolute value of ρ is less than one, then the series, Yt is said to be stationary. Given this, Ut is said to be white noise and distributed normally with zero mean and unit variance. Hence, it follows that

E(Yt) = 0 and Var(Yt) = 1/(1- ρ2).

A stochastic process Yt is assumed to have a unit root problem if its first difference, (Yt-Yt-1) is stationary. In practice, the presence of unit root shows that the time series under consideration is non-stationary unless the reverse is the case. On the other hand, a series with unit root have no tendency to return to long-run deterministic path and the variance of the series is time dependent. A series with unit root suffers permanent effects from random shocks, thus, follow a random walk. That is, using (dependent and independent) time series that contain unit root in regression analysis, the classical results of the regression may be misleading. However, I(1) variables that exhibit a random walk without drift may have a mean that is constant over time, expected value of zero and, with trending variance; hence making the series with unit root to have the tendency to return to long-run path after removing deterministic trend. This reemphasized that; cointegration cannot be seen as a means to an end, but restricted. However, this paper focuses on series with unit root, I(1) (no constant mean and variance) that have no tendency of returning to the long-run path. There are various methods of testing unit roots. They include; Durbin-Watson (DW) test, Dickey-Fuller test(1979)(DF), Augmented Dickey-Fuller(1981)(ADF) test, Philip-Perron(1988) (PP) test, among others. It is of the view that before pursuing formal tests to plot the time series under consideration, to determine the likely features of the series and; run the classical regression. If the series is trending upwards it shows that the mean of the series has been changing with time. In the case of the classical regression, if Durbin– Watson statistics is very low and a high R2 (Granger–Newbold, 1974), this perhaps reveals that the series is not stationary. This is the initial step for a more formal test of stationarity. The most popular strategy for testing the stationarity property of a single time series involves using the Dickey Fuller or Augmented Dickey Fuller test respectively. The choice of the right tests depends on the set up of the problem which is of interest to the practitioner. It is difficult to follow the latest advances or to understand the problems between employing various tests. This should not be understood as a motive for not performing other types of unit root tests. Comparing different results from different test methods is a good way of testing the sensitivity of your conclusions. Once you understand how these tests work, and their limitations, you will understand when to use any test. The advantage is that it enables us to understand the meaning and purpose of any test. However, when a test result is inconclusive, the usual way is to continue the analysis with a warning note, or simply assume one of the alternatives. Thus, the unit roots test is basically required to ascertain the number of times a variable/series has to be differenced to achieve stationarity. From this comes the definition of integration: A variable Y, is said to be integrated of order d, I(d)] if it attained stationarity after differencing d times(Engle and Granger, 1987).

**5.3 The Augmented Dickey-Fuller (ADF) (1981) Tests for Unit Root**

In order to validate this characteristic in our time series data, we utilize two different unit root tests, the

Augmented Dickey-Fuller Test (ADF) and the Phillip-Perron Test (PP). In general, the ADF and PP tests are consistent with each other; however we include both as to ensure accuracy regarding the unit root conclusion. Our study will test each time series individually to ensure non-stationary at the levels of the data, and also run the unit root tests on the first differences to ensure I(1).

The PP test is very similar to the ADF test. The main reason we also conduct a PP test is because the ADF test loses power for sufficiently large values of p, the number of lags (Ghosh et al, 1999). It includes an automatic correction to the Dickey-Fuller process for auto-correlated residuals (Brooks 2008). The PP test is a more comprehensive theory of unit root non-stationary.

*May-June 2020*
*ISSN: 0193-4120 Page No. 399 - 418*

### 5.4 Cointegration Test

Modelling time series in order to keep their long-run information intact can be done through cointegration. Granger (1981) and, Engle and Granger(1987) were the first to formalize the idea of cointegration, providing tests and estimation procedure to evaluate the existence of long-run relationship between set of variables within a dynamic specification framework. Cointegration test examines how time series, which though may be individually non-stationary and drift extensively away from equilibrium can be paired such that the workings of equilibrium forces will ensure they do not drift too far apart. That is, cointegration involves a certain stationary linear combination of variables which are individually non-stationary but integrated to an order, I(d). Cointegration is an econometric concept that mimics the existence of a long-run equilibrium among underlying economic time series that converges over time. Thus, cointegration establishes a stronger statistical and economic basis for empirical error correction model, which brings together short and long-run information in modeling variables. Testing for cointegration is a necessary step to establish if a model empirically exhibits meaningful long run relationships. If it failed to establish the cointegration among underlying variables, it becomes imperative to continue to work with variables in differences instead. However, the long run information will be missing. There are several tests of cointegration, other than Engle and Granger(1987) procedure, among them is; Autoregressive Distributed Lag cointegration technique or bound cointegration testing technique. This becomes the focal point of this paper

### 5.5 Autoregressive Distributed Lag Model (ARDL) Approach to Cointegration Testing Or Bound Cointegration Testing Approach

When one cointegrating vector exists, Johansen and Juselius(1990) cointegration procedure cannot be applied. Hence, it become imperative to explore Pesaran and Shin (1995) and Pesaran et al (1996b) proposed Autoregressive Distributed Lag (ARDL) approach to cointegration or bound procedure for a longrun relationship, irrespective of whether the underlying variables are I(0), I(1) or a combination of both. In such situation, the application of ARDL approach to cointegration will give realistic and efficient estimates. Unlike the Johansen and Juselius(1990) cointegration procedure, Autoregressive Distributed Lag (ARDL) approach to cointegration helps in identifying the cointegrating vector(s).

## 6. ANANLYSIS & DATA INTERPRETATION

In this section we present the results from the ADF-test and ARDL model. First the ADF results for time periods are presented and then the ARDL model is utilized on of the given time periods.

### 6.1 Key Findings – Descriptive Statistics (India and All Stock Indices)

**Table 6.1 Descriptive Statistics of Level Data**

| Statistics | Trade Balance | Exchange Rate | Money Supply | GDP |
|---|---|---|---|---|
| **Mean** | -7.5713 | 51.8675 | 14.4504 | 7.2315 |
| **Med** | -8.0000 | 47.8500 | 14.5166 | 7.3500 |
| **Max** | -0.1400 | 71.8333 | 23.6666 | 13.300 |
| **Min** | -18.1867 | 39.4333 | 3.5333 | 0.2000 |
| **SD** | 5.3848 | 9.0351 | 4.2726 | 2.4333 |
| **Skew.** | -0.1124 | 0.7119 | -0.0127 | -0.5066 |
| **Kurt.** | 1.7336 | 2.0270 | 2.6873 | 3.5628 |
| **JB.** | 5.2384 | 9.4175 | 0.3115 | 4.2543 |
| **Prob.** | 0.0729 | 0.0090 | 0.8557 | 0.1191 |

**Source:- Compiled from E-Views output**

May-June 2020
ISSN: 0193-4120 Page No. 399 - 418

The skewness statistics of daily data whether found to be positive or negative, but are less than 1 for all the indices indicating that the level data distribution is almost symmetric. In the same line, Kurtosis is less than three for all the indices during the period suggests that the underlying data is platykurtic i.e. squat with short tails about the mean, which indicates that the data is not normally distributed. Additionally the application of Jarque-Bera (JB) statistics calculated to test the null hypothesis of normality in the data rejects the normality assumption at 1% level of significance.

### 6.2 Unit Root Testing

From the above table, it has been revealed that observe variables such that trade balance, exchange rate, money supply and GDP of time series

data having strongly influence its behaviour which has been proved by using unit root tests. This test is based on in order to prove the data are stationary, the Augmented Dickey-Fuller (ADF) Test for unit root is conducted and to verify the results of ADF test, the Phillips Person test of stationary has been conducted to check whether or not unit root present in autoregressive model. The both test are has three models i.e. Intercept, Trend and Intercept and None (there is no Intercept and no Constant) and minimum two must satisfy to take any decision. The decision criteria for Unit root test is, If the P-value is more than the 0.05 then we can't reject the Null Hypothesis rather than accept the Null Hypothesis and Vice-Versa for both the level as well as the first difference form. From the above test we can concluded that all the selected variables are reached stationary at first difference I (1) , so there is so need of further testing at second difference form. Apart from that all the variables become stationary at first difference form except GDP, because the GDP become stationary at level form. Based on the above results we can seen that there are a mixture of I (0) and I (1) data.

**Table 6.2 Unit Root Test at Level Form**

| Variables | ADF Test | | PP Test | |
|---|---|---|---|---|
| | Intercept | Intercept &Trend | Intercept | Intercept &Trend |
| **Trade Balance** | 0.5968 | 0.4789 | 0.5375 | 0.5321 |
| **Exchange Rate** | 0.4876 | 0.3923 | 0.3984 | 0.3103 |
| **Money Supply** | 0.0002 | 0.0001 | 0.2715 | 0.1747 |
| **GDP** | 0.7654 | 0.5098 | 0.6646 | 0.4122 |
| *Note:- Null Hypothesis: There is Unit Root Alternative Hypothesis: There is no Unit Root | | | | |
| **Source:- compiled from E-Views output** | | | | |

**Table 6.3 Unit Root Test at First Difference**

| Variables | ADF Test | | PP Test | |
|---|---|---|---|---|
| | **Intercept** | **Intercept &Trend** | **Intercept** | **Intercept &Trend** |
| **Trade Balance** | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| **Exchange Rate** | 0.0001 | 0.0010 | 0.0000 | 0.0000 |
| **Money Supply** | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| **GDP** | 0.0000 | 0.0000 | 0.0001 | 0.0000 |
| *Note:- Null Hypothesis: There is Unit Root Alternative Hypothesis: There is no Unit Root | | | | |
| **Source:- compiled from E-Views output** | | | | |

### 6.3 Estimating ARDL Models

After performing the stationary test, there are three (3) likely outcomes from test i.e.

I. Series are integrated of order 0. That is, stationary in level form.
II. Series are integrated of order 1. That is, stationary after first difference form.

*May-June 2020*
*ISSN: 0193-4120 Page No. 399 - 418*

III. Series are integrated of different orders. That is, having a combination of I (0) and I (1) series.

From our stationary test it clearly indicates that the outcomes having a combination of both level and first- difference stationary. For this kind of situation we have to perform a co-integration test is to necessary to establish whether a long run relationship between the variables exists or not. But, in this case we can't use of Johansen co-integration test here we can only used the Bounds Test which is appropriate co-integration test for this situation, proposed by Pearsan, Shin and Smith (2001).

The hypothesis for Bounds Co-integration test is stated as:

H0: There is no Co-integration equation between the variables.

H1: There is Co-integration equation between the variables.

**Table 6.4 Results from the Bounds Co-integration Test**

| Dependent Variables | F-statistic | Whether Co-integrated or not | What Next |
|---|---|---|---|
| **Trade Balance** | 0.9617 | No | Estimate ARDL (Short-Run) |
| **Exchange Rate** | 6.4455 | Yes | Estimate ECM (Error Correlation Model) |
| **Money Supply** | 3.0987 | No | Estimate ARDL (Short-Run) |
| **GDP** | 3.9907 | No | Estimate ARDL (Short-Run) |

**Source: Compiled from the E-views output**

**6.4 Decision Criteria for Bounds Test**

**I.** The above Bounds Co-integration test should be performed on the level form of the variables and not on their first difference. It is okay to also use the log-transformation of the raw variables.

II. We can reject the Null hypothesis of no co-integration either at 10%, 5% and 1% significance level. In this test we are reject Null hypothesis at % significance level.

III. If the calculated F-Statistic is greater than the critical value for the upper bound I (1), then we can concluded that there is co-integration in others words we reject the null hypothesis. It means, there is a long-run relationship between the variables. Now we can estimate the long run model which is error correlation model (ECM).

IV.If the calculated F-Statistic is lower than the critical value for the lower bound I (0), then we can concluded that there is no co-integration in others words we do not reject the null hypothesis. It means, there is no long-run relationship between the variables. Now we can estimate the short run model which is the autoregressive distributed lag (ARDL) model.

V. If the F-Statistic fall between the lower bound I (0) and the upper bound I (1) then the test considered as inconclusive,

VI. The Narayan (2005) provides a set of critical values for small sample sizes, ranging from 30 to 80 observations. The critical values are 4.068 to 5.250 for 1% significance level.

The results in the Table 6.4 show the estimate of Bounds Co-integration test describing that, the F-Statistic value of Exchange rate i.e. 6.4455 is greater

*May-June 2020*
*ISSN: 0193-4120 Page No. 399 - 418*

than the critical value for the upper bound i.e. 5.250 at 1% significance level. Hence, there is we can accept the null hypothesis that means, exchange rate is co-integrated with others variables. Now we can estimate the long run model which is error correlation model (ECM). The others three variables are not co-integrated with other variable as there calculated F-Statistic value is lower than the I (0) value i.e. 4.068. Hence there is a short-run relationship between the variables, so we can estimate the short run model i.e. autoregressive distributed lag (ARDL) model.

**6.5 Selection of Lags**

In order to test the short run and long run models for the variables, we can determine the appropriate lag length for the model. We have to choose the individual leg length for each of the variables. For determination of leg length of each variable we can take that particular variable as the dependent variable or as the Endogenous variables and other there variables as the Exogenous Variables. For example, if we take trade balance as the endogenous variables and other three variables like exchange rate, money supply and GDP along with the constant term as the exogenous variables. After that we calculate the appropriate leg length criteria and the software by itself calculates the appropriate leg length for the model by consider the different the criteria. Hence, foe our model the lag 1 is chosen as the best model for all the variables.

**6.6 Estimating Short-Run Model**

After the lag length selection now we can go ahead for estimate the short run model for Trade balance, Money supply and GDP respectively.

The equations for short run model specifications are:

- Trade Balance- d(trade balance) c d(trade balance(-1)) d(money supply(-1)) d(exchange rate(-1)) d(GDP(-1))
- Money Supply- d(money supply) c d(trade balance(-1)) d(money supply(-1)) d(exchange rate(-1)) d(GDP(-1))
- GDP- d(GDP) c d(GDP (-1)) d(money supply(-1)) d(exchange rate(-1)) d(trade balance(-1))

Here c donates to the Constant, (-1) donates for the first lag for the variables and the d is implies that these are the short run equations. The methods which is used for the estimating the short run is Ordinary Least Square Method (OLS).

The equations for Long-run model specification

- Exchange Rate- (exchange rate) c (trade balance (-1)) (money supply (-1)) (exchange rate(-1)) (GDP(-1))

Error Correction model specification

- Exchange Rate-- d(exchange rate) c d(exchange rate(-1)) d(trade balance(-1)) d(money supply(-1)) d(GDP(-1)) ecm(-1)

After estimating the model now we can check the Serial correlation and the stability check for the model. The Serial correlation is error term which transfer from one time period to another time period. It means, the error term for a specific time period is correlated with the error of another time period.

**Table 6.5 Serial Correlation LM Test**

| **Dependent Variables** | **Probability** |
|---|---|
| **Trade Balance** | **0.1401** |
| **Money Supply** | **0.9774** |
| **Exchange Rate** | **0.8724** |
| **GDP** | **0.2957** |
| *Note:- Null Hypothesis: There is No Serial Correlation at up to 1lag<br>Alternative Hypothesis: There is Serial Correlation at up to 1lag | |
| **Source:- Compiled from E-Views output** | |

The above table indicates the Serial Correlation LM Test value for all the variables, Here the null hypothesis stated that there is no serial correlation up to 1 lag. From the table it clearly indicates that, P-value of all of the variables is greater than the 0.05, which is more than the significant level at 5%. Hence, we can't reject the null hypothesis. So all the variables are free from serial correlation up to 1 lag.

After the Serial correlation test now we can check the stability check for the models. For the stability

May-June 2020
ISSN: 0193-4120 Page No. 399 - 418

check we can go for the CUSUM test. This test based on the cumulative residuals. This test plots the average sum together with 5% critical lines. The test finds parameter instability if the average sum goes outside the area between the two critical lines.

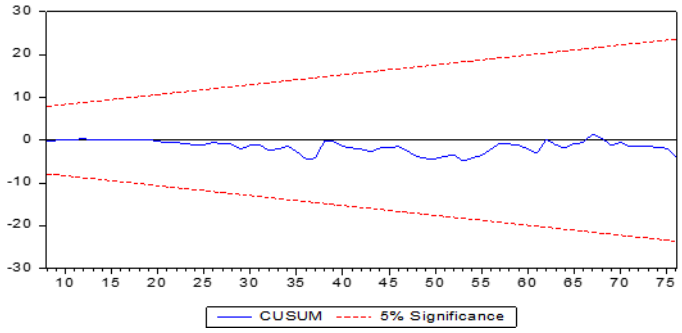


**Figure 1: CUSUM Test for Trade Balance**

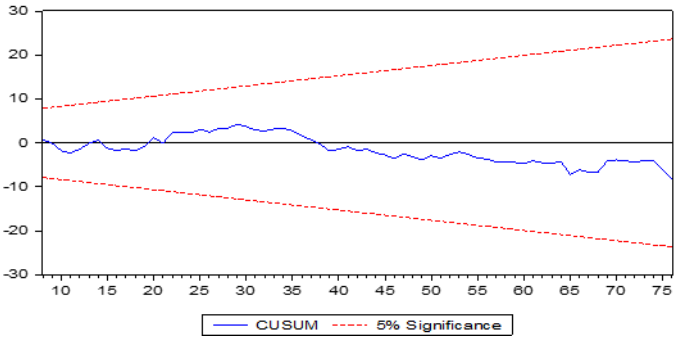


**Figure 2: CUSUM Test for Money Supply**

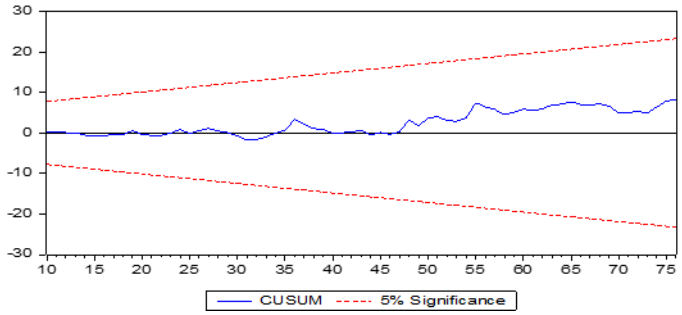


**Figure 3: CUSUM Test for Exchange Rate**

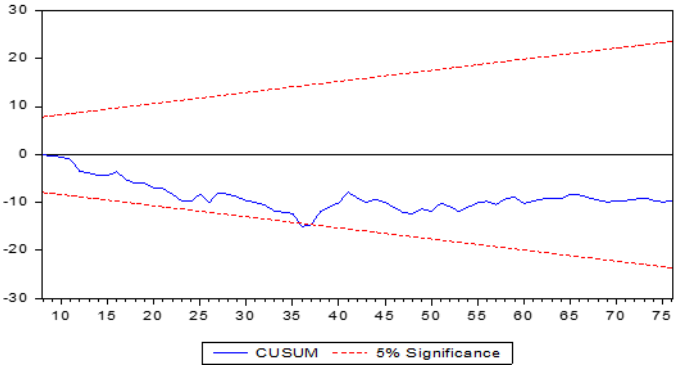


**Figure 4: CUSUM Test for GDP**

The CUSUM test signifies that the equation is stable at 5% significance level apart from the GDP's equation. The test clearly indicates that GDP's equation was instability during the chosen sample period. Hence, we can conclude that the model has no autocorrelation problem and all the equations are stable except the GDP. Now, the error correction model is estimated for finding the long run relationship between the variables.

## 7. CONCLUSION AND SUGGESTION

In the final section of this study a summarized conclusion s given on the basis of the results and the corresponding analysis. In this thesis we investigate the relationship between macroeconomic indicators such as Money supply, GDP and Exchange Rate with trade balance of India. Macroeconomic indicators are important as they provide a tool for analyzing the current and future state of the economy. The results from the F-bounds test show evidence that there is no long-run relationship between the variables. They are not move together n the long-run. For the time periods the results are non-biased according to the aforementioned diagnostic tests. If this relationships, due to monetary policy or simply the market dynamics remain unknown and can be a topic for further research. The government should introduce of aggressive monetary policy and terms of QE and low interest rates.

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*May-June 2020*
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