EXCHANGE RATE REGIMES, INFLATION AND GROWTH: A STUDY OF BRICS COUNTRIES

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ECONOMICS

By

BABU RAO G

(Reg. No. 11SEPH12)

School of Economics,

University of Hyderabad,

(P.O) Central University, Gachibowli

Hyderabad-500046, India

June 2016

School of Economics
University of Hyderabad
Hyderabad-500046

DECLERATAION

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Prof. DEBASHIS ACHARYA
School of Economics
University of Hyderabad

School of Economics
University of Hyderabad
Hyderabad-500046

Date:

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Research Supervisor

//Countersigned//

(Prof. B.KAMAIAH)
Dean
School of Economics

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Abbreviations

AREAER:	Annual Report on Exchange rate Arrangements and Exchange rate Restrictions
BRICS:	Brazil, Russia, India, China, South Africa
CBC:	Central Bank of Brazil
EME:	Emerging Market Economies
EUR:	The Euro
FE :	Fixed Effects
GC :	Government Consumption
GDP :	Gross Domestic Product
IFS :	International Financial Statistics
IMF :	International Monetary Fund
INF :	Inflation
INR :	Indian National Rupee
JPY:	Japanese yen
MS :	Money Supply
NDB:	New Development Bank
NON-PEGGED:	Non-Pegged Exchange rate Regime
OCA:	Optimum Currency Area
PBC:	The People's Bank of China
PEGGED:	Pegged Exchange rate Regime
POP :	Population
RBI :	Reserve Bank of India
RE :	Random Effects
SARB:	South African Reserve Bank
TI :	Terms of Trade
TOP :	Trade Openness
USD :	United States Dollar
USD:	The US dollar
WDI :	World Development Indicators
WTO :	World Trade Organisation

Chapter 1

Introduction and Objectives of the Study

1.1. Introduction

Emerging market economies (EMEs) are considered as important drivers of the global economic growth considering their substantial share increase in the global output in the recent decades. However, exchange rate management has been a major challenge for these countries since it has an adverse effect on their economies. Choosing a suitable exchange rate regime matters much in a country's economic development and in achieving a high growth rate keeping the inflation at a stable level. The previous experience reveals that the developing countries had witnessed high inflation rates and low or negative growth due to exchange rate mismanagement. Few examples of such incidence are namely the Brazilian currency crisis (January 1999), Mexican economic crisis (1982 and 1995), East Asian crisis (1997), Argentina's Great Depression (1998-2002), and Turkey's financial crisis (2001).

During the 1990s, many developing nations accepted fixed exchange rate regimes to sustain price stability. By pegging their currencies to an anchor currency (i.e., US dollar), developing countries could bring credibility and confidence into their economies. Adopting a fixed regime eliminated uncertainty in exchange rates and prices. Therefore, monetary authorities could gain the confidence of the public, financial institutions, and businesses. The credibility effects of fixed regimes could also influence expected inflation and lowered inflation rates. According to Cobb and Field (2008), fixed exchange rates provide the discipline needed in economic policy to prevent high inflation rates. Similarly, Yeyati and Sturzenegger (2001) indicated that a system of fixed exchange rate could bring about price stability and also lower the inflation rate. For instance, in the early 1990s, Argentina adopted a fixed regime to fight against its high inflation rate. Three years after adopting of the regime, Argentina reduced its inflation from 800% to 5%.

Fixed regimes were also used in developing countries during the 1990s to increase their rates of economic growth. It was understood that fixed regime

promoted openness to trade and led to higher economic growth. This view was corroborated by Calvo and Mishkin (2003) who posited that countries looking for expanding their trade place a greater value on some form of a fixed regime with a trading partner and have experienced higher growth rates. Most of the East Asian countries, such as Thailand and South Korea, opted for the fixed exchange rate regime so that they could be competitive in international trade markets and increase their economic growth. In the early years of the arrangement, countries showed high growth rates through a fixed regime's trade channel.

However, there are a few shortcomings in using a fixed regime. Countries adopting such a regime are more vulnerable to experience speculative attacks. For instance, Thailand, South Korea, and Indonesia faced speculative attacks after they adopted fixed regimes. Investors sold such countries' currencies and bought the U.S. dollar since the interest rates were higher in the United States. During such speculative attacks, these currencies lose their value against the U.S. dollar and countries enter into an economic recession. During the end of last recession, Thailand's GDP dropped by 11%, South Korea's 6%, and Indonesia's 13%. Another shortcoming of fixed regime is that the central banks lose control of domestic monetary policy since they follow changes in monetary policies of the anchor currency's country. Finally, it is expensive to keep a fixed regime since it requires sizeable international reserves.

The flexible exchange rate regime is another common exchange rate arrangement in developing countries. It is believed that this act as a shock absorber. In the occurrence of external shocks, central banks, with flexible regimes, can use monetary policies independently for domestic considerations, unlike the central banks under fixed regimes. A study by Edwards (2011) indicates that a flexible regime facilitates price adjustments whenever external shocks reduce output volatility. However, one of the shortcomings of flexible regimes is that there might be high volatility in exchange rates due to an increase in unstable financial markets. The high volatility in exchange rates can bring uncertainty for public and financial institutions, which could lead to high inflation rates in developing countries. For example, in the year 2001, the

Turkish government was forced to allow its currency to float which led to huge devaluation in the Turkish lira. At the end of the year, one U.S. dollar was equal to 1, 5 00,000 Turkish liras. As a result, for a number of years, Turkey, struggled with high inflation and unemployment rates.

Recent episodes of financial turmoil have shown that changes in exchange rate regimes can impact inflation, growth, employment etc., in developing countries like BRICS. This study is different from the previous ones in following respect: First, it covers 20 years' data from 1993-2012, it also covers the effects of financial crisis. Secondly, it uses different exchange rate regimes like pegged and non-pegged classification, proposed by Jay C. Schaumburg (2004). Thirdly, it examines the effects of exchange rate regimes on inflation and growth in BRICS countries.

1.2. Research Gap

Different exchange rate regimes may be appropriate for different nations. Many developing countries have been struggling with high inflation rates. Therefore, their main macroeconomic goal is to sustain price stability. On the other hand, there are developing countries that are focusing only on economic growth. Thus, each developing nation needs a different type of exchange rate arrangement, based on its macroeconomic interests.

There is no consensus about which regime works best for BRICS countries. For decades, economists have investigated the impacts of optimal exchange rate regimes on macroeconomic performance. However, in current turbulent markets, the effects of exchange rate regimes become even more important. Hence, this study seeks to examine the effects of exchange rate regimes on inflation and growth in BRICS countries under the recent financial markets and external shocks.

1.3. Motivation, Aims and Scope of the Study

It would be interesting to study whether a specific exchange rate regime could improve the economic activity of an economy. Specifically, to identify a suitable exchange rate regime that can bring the inflation rate down and boost the economic growth of that country.

Major aims of this study are as follows: - to analyse the pegged exchange rate regimes of the BRICS countries, where an examination of the behaviour and development of several issues related to the Inflation and growth is required. In the context of the BRICS countries, a thorough investigation of the following variables will provide valuable insights into the appropriateness of the current exchange rate regimes, besides a much-needed understanding of the issues related to the exchange rate regimes.

While the pegged exchange rate regimes provide nominal exchange rate stability against the U.S dollar, it does not guarantee the stability of real exchange rates. Moreover, the pegged exchange rate has a fixed parity only against the US dollar, while moving against the other currencies of the rest of the trading partners. Therefore, it is important to monitor and assess the development and trends of exchange rates and classification of exchange rate regime. Often, fixed exchange rate procedures are used to stabilise native prices and inflation control. The degree and speed of exchange rate system are also important in the stability of domestic prices.

Another important part is the high levels of partial dollarization that also have implications in the choice of exchange rate regime. It can undermine the effectiveness of monetary and exchange rate policy of the respected country.

This research contributes to a better understanding of the behaviour of the exchange rate and exchange rate regimes in the BRICS countries and facilitates further research in the area. As stated previously, there are no academic or policy studies on the exchange rate regimes of the BRICS countries done prior to this study.

1.4. Objectives of the Study

Based on the above discussion, motivation from the previous studies and research gap, the present study examine three relevant aspects with respect to the effects of exchange rate regimes on inflation, Growth and Macroeconomic trend analysis in BRICS countries. The main objectives of the present study are:

1. To analyse the impact of exchange rate regimes on inflation of BRICS countries
2. To examine the impact of exchange rate regimes on Growth rates of BRICS countries

1.5. Nature and Sources of Data

The study has covered annual observations for BRICS countries from 1993-2012. The classification of Exchange rate regime is constructed on the de facto scheme for this period. The data for the Inflation, macroeconomic variables, economic growth models and other control variables were taken from International Financial Statistics (IFS), and World Development Indicators (WDI).

Table-1: Definitions of Variables and Sources

Variables	**Definitions and Sources**
%ΔGDP	Rate of growth of real GDP (WDI)
INF (π)	Annual percentage change in the Consumer Price Index (IFS)
GC	Government consumption to GDP ratio (WDI)
INVTGDP	Ratio of investment to real GDP (WDI)
%ΔMS	Rate of growth of Money Supply (IFS)
TOP	Openness ratio of the sum of the exports and imports to real GDP (WDI)
POP	Natural logarithm of population (IFS)
TOTI	Terms of Trade; the ratio of the price exports to price of imports (WDI)
PEGGED	A binary variable. Takes the value 1 if a country has a pegged regime; takes value 0 if the country has a non-pegged regime
INFPEGGED	An interaction variable that consists of inflation and pegged
INGDP	Natural logarithm of initial real GDP
π_{t-1}	One year lagged value of inflation rate.

1.6. Methodology

With the support of the existing literature in the exchange rate theories and regimes, this study adopts an empirical approach in order to analyze the above objectives. The study used Panel Unit root test statistics, namely, Levin-Lin-Chu Test (LLC), Im- Pesaran (IP) and Shin Test and Fisher-PP test for testing stationary properties of the data.

To examine the impact of exchange rate regimes on inflation the study used fixed and random effects methods. The fixed effects method captures the unobserved omitted variables and eliminates the omitted variable bias. Another side, with the time series data, ARDL model applied to see the individual country wise analysis on exchange rate regimes and its impact on inflation. The second objective i.e. to analyse the impact of exchange rate regimes on growth, is examined using a five year average panel growth model.

1.7. Organization of the Study

The rest of the thesis is organized into seven chapters, as under.

Chapter II discusses the theories on exchange rate, classifications of exchange rate regimes and its effects. This chapter identifies the various exchange rate regimes defined by different classification methods of exchange rate regimes and also explains the trends in exchange rate regimes.

Chapter III reviews literature on each objective. Chapter IV attempts to identify the macroeconomic Trends in BRICS countries. Chapter V deals with the data and methodological issues.

Chapter VI examines the impact of exchange rate regimes on inflation in BRICS countries. The theoretical, as well as empirical, approaches of measuring inflation, lagged values of inflation and several controlled variables discussed in this chapter. While it is more important to measure and see other classification methods running on inflation, data limitations constrained the use of different approaches for the BRICS countries.

Chapter VII examines the impact of exchange rate regimes on inflation in BRICS nations: Country wise evidence. The theoretical, as well as empirical methodology has been discussed in this chapter.

Chapter VIII examines the impact of exchange rate regimes on growth in BRICS - countries theoretically as well as empirically. This chapter uses econometric methods, like regression, fixed and random effects tests, to estimate the growth model for the BRICS countries. Chapter IX summarise the main findings of the research. Some policy implications for further research are also discussed in this chapter.

1. 8. Limitations of the Study

Since this study covers only a short period of 20 years, a detailed trend covering a lengthy period is not possible. Some of the proxies used in the study can be substituted by better proxies or measures.

Chapter 2

Theories on Exchange Rate Regimes: An Overview

2.1. Introduction

The choice of an exchange rate regime has important implications for small and emerging economies. It has impact on a country's economic activities and trade. Therefore, it is important to periodically evaluate and examine the exchange rate policies and measures adopted by an economy. This will lead to a better exchange rate regime of a country facilitating a broader macroeconomic framework. As Frankel (1999) stated it is widely believed that the choice of a country's exchange rate regimes largely depends on certain country-specific characteristics and the changes in them over a period of time. Before discussing the issue analytically, it would be better to review the specific issues related to the exchange rate regimes in the BRICS countries and evaluate the current exchange rate regimes as per the existing theories. The present chapter starts with a review of the related types of exchange rate regimes, their advantages and disadvantages, and the macroeconomic performance of countries under different these exchange rate regimes. To examine and evaluate the appropriate exchange rate regimes, it is necessary to identify the theoretical determinants of exchange rate regimes that the BRICS countries have adopted.

This chapter is organised into different sections. It begins with the introduction on exchange rate regimes, definitions and choices. Section 2.2 briefly discusses the theoretical implications and relationship between Inflation and Growth. Section 2.3 presents the importance of exchange rate regimes in BRICS countries, while Section 2.4 will discusses the De jure and De facto exchange rate regimes. Further, Section 2.5 reviews the related literature on BRICS and the impact that these countries exert on the global financial markets. While Section 2.6 examines the theoretical

determinants of exchange rate regimes in developing countries, Section 2.7 analyses the advantages and disadvantages of pegged and non-pegged exchange rate regimes, Section 2.8 discusses the exchange rate regime classification used in this study. Finally, Section 2.9 concludes the chapter.

2.2. Theoretical Implications and Relationship between Inflation and Growth

There are a number of theories on inflation. Of these, the two most prominent ones are: demand-pull and cost-push theories. It is worth nothing that the causes of inflation are not the causes of inflation are not always similar and it is difficult to exactly locate the actual reason behind inflation. Different approaches regarding the various causes of inflation have been discussed in the literature. The two main schools, Keynesian, and Monetarist, are the basis for the debates on inflation. In recent times, the structuralist view, is being increasingly used for explaining inflation in developing countries.

In short, demand-full inflation is caused by 'too much money chasing for too few goods'. This triggers an increase in demand for goods and services in the economy, which in turn leads to increase in prices. On the other hand, cost-push inflation refers to a general increase in price level. Such an inflation is associated with a reducing in aggregate supply. A contraction in aggregate supply might be due to increase in the cost of inputs of production. For instance, a rise in the cost of inputs may force the firm to raise its prices to offset the higher costs and maintain its real value of profit. In such a situation, workers may demand higher nominal wages. In this way, the cost of production and the general price level in the economy can increase (Ball, 2007). Some of the other factors that could reason cost-push inflation are:

- A rise in prices of non-labour inputs, like oil.
- Increase in interest rate

- Increase in the price of imported raw materials due to change in exchange rate, international commodity prices or external shocks.

Different schools of thought have come up with their own theories to explain the various causes of inflation. Theory of Purchasing Power Parity (PPP) is the simplest approach to explaining the reasons for inflation in the emerging economies like BRICS. According to the PPP theory, inflation is one country must equal the inflation of another country, when expressed in a common currency. This can be explained as follows:

$$P = E_t + p_t^f \qquad (1)$$

Where, P is the domestic price level, E_t, is the Nominal Exchange rate and p_t^f, is the foreign price level. According to Equation (1) under fixed exchange rate regime, domestic prices will adjust themselves to come as close as possible to the foreign prices. On the other hand, when the exchange rate regime is flexible, changes are made in the exchange rate to equalise the PPP. However according to Isard (1995), PPP might not hold true in the short run or sometimes even in the long run. The above equation can be seen as representation of imported inflation. Imported inflation can be termed as an increase in domestic prices due to an increase in the prices of imports, i.e., when the prices of imports are influenced by changes in exchange rate rates and foreign prices. Therefore, when the economy is heavily dependent on imports, inflation in a country may be determined by its exchange rates and foreign prices.

Classical economists, such as David Hume, Adam Smith, David Ricardo and J S Mill, and neo-classical economists, like Leon Walras, Alfred Marshal, and Arthur C Pigou, were of the opinion that inflation is caused by changes in money supply based on the quantity theory of money (Mulvey and Trevithick, 1975). This line of thinking was later reviewed by the monetarists and the most prominent monetarist of the recent times, Milton Friedman, propounded “Inflation is always and everywhere a monetary phenomenon.” He posited that there is a positive and stable

relationship between inflation and money supply (Friedman, 1963). According to monetarists, inflation is caused by excess aggregate demand in the economy arising from the excess supply of money. This phenomenon is explained in the quantity theory of money, which was initially explained by Fisher's equation of exchange:

$$MV = PT \qquad (2)$$

where, *M* is money supply, *V* the velocity of money, *P* the price level and *T* is transactions in the economy. Since it is not always possible to precisely measure *T* it is normally proxied by aggregate income *Y*. Therefore, and the equation can be re-framed as:

$$MV = PY \qquad (3)$$

Equation (3) is an accounting identity, which shows that the nominal expenditure on all goods and services in the economy should equal the value of output in the economy. The equation assumes that the velocity is fixed in the short run. The equation stands on the assumption that the economy is in equilibrium and at full employment giving a constant output. Hence, the price level P can increase only when there is an increase in money supply M. Therefore, inflation can be controlled by limiting the money supply. Thus, monetary policy can be the most effective tool in controlling inflation. One limitation is that velocity may vary in the short run. This has led to some industrialists to concede that when inflation is caused by money growth, it might not always be applicable in the short term (Ball, 2007).

The Keynesian approach suggests that inflation is the outcome of excess demand in the economy. The distinction between Keynesians and monetarists is not that distinct as it is considered. Keynesians also believe that growth of money supply is responsible for inflation. Similarly, the structuralist theory of inflation suggests that excess demand in the economy will create an inflation gap, which is the difference between aggregate demand and the potential level of output at full employment.

Any of these factors which impact the aggregate demand in the economy can create demand. These components are shown in the following equation:

$$AD = C + I + G + (X - M) \qquad (4)$$

where *AD* is aggregate demand, *C*, is the consumer expenditure, *I* is the investment, *G* is the government expenditure, *X* is the exports, and *M* is the imports. According to Equation (4) a rise in consumption due to lower inflation, tax cut, or increased consumer confidence, could trigger a rise in aggregate demand. At the same time, the higher government expenditure, or increased investments by the private sector, or an improvement in exports of the country, could lead to increase in aggregate demand, leading to a higher equilibrium price level and output level.

Another important concept is the linkage between inflation and unemployment. It was used to explain wage and price relationship. Based on the empirical study undertaken by Phillips in 1958, an inverse relationship was found between inflation and unemployment, which later came to be known as the Phillips curve. The model proposed by Phillips was empirical in nature, and Richard Lipsey later tried to provide some theoretical foundations to it. For this purpose, he examined the behaviour of wages in a micro-labour market situation. Further in the early 1960s, the model was further developed by Paul Samuelson and Robert Solow (Mankiw, 2009).

The Phillips curve describes a trade-off between wage, inflation and unemployment. This is significant for both the theory of inflation and economic policy making. The relationship between inflation and unemployment can be expressed as follows:

$$\pi_t = (\mu + z) - \alpha u_t \qquad (5)$$

where, π_t is the rate of inflation, u_t is the unemployment rate, z represents all the other factors that would influence wage setting, μ is the

mark-up, and α is the parameter that capture the trade-off between inflation and unemployment (Blanchand, 2003).

The empirical analysis of the Phillips curve points to a short-run trade-off between wages and unemployment. However, no conclusive evidence was found regarding the long-run trade-off between the two factors (Mulvey and Trevithick, 2007). Friedman and Edmund Phelps contested the validity of the Phillip's curve and proposed an 'expected-augmented Phillip's curve,' which incorporates future expectations of inflation. This can be expressed as follows:

$$\pi_t = \theta\pi^e + (\mu + z) - \alpha u_t \qquad (6)$$

Where π^e is the expected inflation and θ is the expectations adjustment parameter. It is posited that workers base their expectation of future inflation on the past inflation. When an inflation is persistent and high in the economy, workers should be consulted while fixing their wages. Expectations based on past behaviour are called adaptive expectations (Salvatore, 2001).

Another dominant school of thought, the structuralists also tried to explain inflation, especially in emerging countries like BRICS. According to the structuralists, in developing countries inflation is caused by non-monetary factors, unlike in developed countries where such type of price pressures mainly arise from the real sector bottlenecks in the economy (Bernanke, 2005). Structuralists believe that inflation is based on three assumptions: (a) the relative prices changes when economic structure changes; (b) downward inflexibility of monetary prices exists; and (c) a passive money supply closes the deflationary gap caused by price increases (Canavese, 1982). The structuralists identified three major factors that can cause inflation in developing countries.

The first is the rigidity of food supply in the developing countries due to bottlenecks in the agriculture sector. As countries become more industrialised, workers shift from the agriculture sector to industrial sector.

This leads to reduction in supply of labour in the agriculture sector and an increase in the demand for good as the population becomes more and more wealthy. The rigidity of the food supply and the inability to import food to fulfil the market demand results in an increase in food prices. On the other hand the prices in the industrial sector are downwardly rigid, and the rise in food prices on the other, drive up the general price level in the country (Fischer and Mayer, 1981).

The second factor is the foreign exchange bottleneck, which may occur when foreign exchange receipts in the country are unable to fully finance the high demand for imports. Increased demand for imports may come from both the private and the government sectors. Demand driven from greater industrialisation and increasing population of the country can adversely impact the development of the country.

The third factor that causes inflation could be the financial stringency that developing countries face. In the process of urbanisation and industrialisation, developing countries face an increased demand for both physical and social infrastructure facilities, which the government is unable to finance from its own resources. Due to the inefficient and underdeveloped structure of revenue and tax systems in most of these countries, the concerned Governments fail to access enhanced revenue from the increased wealth resources that have resulted from the growth and development in these countries. Governments, faced with such budget constraints, may resort to deficit financing, increasing the money supply and creating inflationary pressures in the economy (Kirkpatrick and Nixon, 1976).

Apart from the above factors, there are several other causes for inflation, especially in developing countries. Fiscal imbalances can be a major source of domestic inflation in developing countries. This is because fiscal deficits can lead to high money growth and exchange rate depreciation (Montiel, 1989). Further, according to another model known as adaptive expectations, people base their inflation expectations on the

past behaviour of inflation. This phenomenon can be termed as inflation inertia. It is considered as an important determinant of inflation in developing countries, especially when there is wage indexation and a history of high inflation in the country (Loungani and Swagel, 2001).

2.2.1. Theoretical Implications of Inflation and Growth Relationship

Economic theories have arrived at a variety of conclusions on the relationship between inflation and output growth. The Aggregate Supply-Aggregate Demand (AS-AD) framework postulates a positive relationship between inflation and growth, i.e., as growth increases, inflation increases. Few theories that discusses the relationship and their impact on the economy are discussed here:

2.2.1.1. Classical Theory of Growth

Classical theorists set the bedrock for a number of growth theories. The foundation for classical growth model was laid down by Adam Smith, who proposed a supply-side model of growth. His production function is as follows:

$$Y = f(L, K, T) \qquad (7)$$

where *Y* is output, *L* the labour, *K* the capital, and *T* is the land. In Equation (7), output is related to labour, capital and land outputs. Accordingly, output growth (g_y) is driven by population growth (g_t), investment growth (g_k), and land growth (g_r), and increases in overall productivity (g_f). Therefore: $g_y = \emptyset\ (g_f, g_k, g_l, g_r)$.

Smith suggested that the growth is self-reinforcing since it exhibited increasing returns to scale. He stated savings as a creator of investment and hence, the growth. Therefore, he considered income distribution as one of the important determinants of the rate of growth of the nation. The link between the changes in price levels (inflation), its tax effects on profit levels and output were not especially mentioned in the classical growth theories.

2.2.1.2. Theory of Keynesian

The traditional Keynesian model consists of the Aggregate Demand (AD) and Aggregate Supply (AS) curves that precisely illustrates the inflation-growth relationship. According to this model, in the short-run, the AS curve slops upward, rather than vertical, which is its critical feature. If AS curve is vertical, changes on the demand side of the economy affect only the prices. On the other hand, if it is upward sloping, changes in AD affect both prices and output (Dornbusch et al., 1996). This upholds the fact that many factors drive the inflation rate and the level of output in the short-run. These changes include expectations, labour force, prices of other factors of production, monetary and/fiscal policy.

2.2.1.3. Money and Monetarism

Monetarism has several essential features. It mainly focuses on the long-run supply-side properties of the economy, as opposed to short-run dynamics (Dornbusch et al., 1996). Milton Friedman, coined the term 'monetarism', emphasising several key properties of the long-run economy. These include the quantity theory of money and neutrality of money. The quantity theory of money links inflation and economic growth by simply equating the total amount of spending in the economy to the total amount of money in existence. Friedman stated that inflation is the product of an increase in the supply or velocity of money at a rate greater than the rate of growth in the economy. He challenged the concept of the Phillips Curve. He assumed an economy where the cost of everything double. Individuals anticipate the rate of future inflation and integrate its effects into their present behaviour. Since, employment and output are not affected, economists called this concept as the neutrality of money.

In the long-run, the principle neutrality holds, if the equilibrium values of real variables, including the level of GDP are independent of the level of money supply. On the other hand, super-neutrality holds when real variables, including the rate of growth of GDP are independent of the rate

of growth in the money supply in the long-run. Inflation seems harmless if it operates in this manner. In reality, however, inflation does impact other macroeconomic variables. Inflation can adversely affect a country's growth rate due to its impact on capital accumulation, investment and exports.

2.3. Importance of Exchange Rate Regimes in BRICs Countries

One important macroeconomic issue taken up in literature on emerging economies, like BRICS nations is when the exchange rate regime is more appropriate for a stable economy. On the one hand, according to the 'bipolar' view intermediary regimes that involve all sorts of intermediary exchange rate regimes between free-floating and fixed exchange rate regimes, are less appropriate for economies with substantial involvement in international capital markets. The main dispute being that such types of exchange rate regimes make the countries more vulnerable to speculative attacks (Fisher, 2001). On the other hand, 'fear of floating' calls for adoption and practice of flexible exchange rate regime in many emerging countries so as to limit the exchange rate movements. Such resistance to floating arises from their low policy and institutional credibility and a high degree of pass-through of exchange rate changes into domestic prices, among other factors (Calvo and Reinhart, 2002). Other causes that include why monetary authorities avoid exchange rate movements that are related to the effects of excessive exchange rate volatility on the outstanding foreign currency debts of banks and the corporate sectors with unhedged foreign currency are also raised. In addition, exchange rate fluctuations also generate uncertainties that could impede trade. For instance, prolonged real appreciation associated with large capital inflows can adversely affect export competitiveness and investment in the external sector.

Fixed exchange regime has the advantage of eliminating the exchange rate risk that influences the decisions of exporters, importers and domestic borrowers in international financial markets and also in covering

the domestic inflation to external inflation. However, such regimes also pose high risks for bigger emerging countries, as they result in the loss of economic policy flexibility in facing external shocks, mainly because of economic authorities who do not have enough exchange reserves to intervene in the exchange rate market and/or there is a confidence crisis associated with the lack of government capability in maintaining the pegged exchange rate. Under these conditions, the adjustment costs would be high. Fixed exchange rate may encourage borrowers to be more confident in going in for foreign exchange denominated loans, thought it causes major changes in the exchange rate regimes (Mohanty et al., 2005).

The adoption of a flexible exchange rate regime by emerging countries could insulate these countries from speculative attacks on their domestic currencies, since the concerned government has no commitment with regard to the level of exchange rate. At the same time, a floating exchange rate regime could increase the autonomy of the monetary policy, overcoming the 'impossible trinity' who stated that a country cannot have capital account convertibility and fixed exchange rate regimes at the same time, though in reality, it could frequently work in a way different from what was anticipated.

According to Grenville (2000), fundamentals cannot explain the behaviour of the exchange rate over a short/medium-term horizon, as exchange rate at times have exhibited long-standing swings with no apparent changes in fundamentals significant enough to justify them. For emerging countries, there are problems associated with exchange rate volatility. These include: (i) no long historical experience of market-determined exchange rate; and (ii) much larger and volatile capital flows, in relation to the size of their capital markets and economies (Grenville, 2000). Moreno (2005) suggests that emerging foreign exchange markets are more prone to one-sided bets and instability, because they are thin and are subjected to a high degree of uncertainty and information asymmetries.

Floating exchange rate regimes can be helpful in absorbing the capital flow, and respond to the changing productive capacity of emerging economies. A floating exchange rate regime can also inhibit some short-term flows, by serving as a constant reminder where "exchange rate volatility can balance the interest rate advantage of foreign currency borrowings" (Grenville, 2005). According to Frenkel (2006), a managed floating exchange rates regime can be helpful to the central bank when its objective is to reduce the exchange rate volatility and also to influence the real exchange rate for international trade purposes. The central bank intervenes in foreign exchange markets to achieve a variety of macroeconomic objectives, like controlling inflation, maintaining external competitiveness and/or maintaining financial stability. In pegged exchange rate regimes, authorities may intervene to limit exchange rate movements, but may not target a certain level of the exchange rate. Maintaining a competitive and stable real exchange rate can be used as an intermediate target of macroeconomic policies oriented towards employment and growth objectives.

Concerns have been expressed on the use of foreign exchange intervention to resist currency appreciation. Firstly, a large portfolio currency assets can lead the central bank to potential valuation losses for currency appreciation. Secondly, the carrying costs of reserves are determined by the difference between the return on domestic assets and foreign assets. Finally, continuous reserve accumulation might at some point pose problems for the central bank in controlling money growth. The recent experience of exchange reserve accumulation in emerging countries shows that some of them have so far been in sterilising reserve operations (Mohanty et al., 2004; and Turner et al., 2006). On the other hand, many central banks have opted for reserve accumulation to expand the monetary base to deliberately ease monetary policy in an environment of low inflation and large excess capacity. Due to the effectiveness of official foreign exchange intervention and low inflation environment, real

exchange rate has not risen significantly in many countries with large and persistent current account surplus.

2.4. New Exchange Rate Regime Classifications: De Jure and De Facto

In the international Macroeconomics, choosing the right exchange rate regime has always been a debatable topic. De jure and de facto exchange rate regimes are the two classifications made of exchange rate regimes.

Most of the empirical studies on exchange rate regimes made till the late 1990s was based on the De jure exchange rate regimes'. Such classifications were first reported in the Annual Report on Exchange rate Arrangements and Exchange rate Restrictions (AREAER) of International Monetary Fund (IMF). The report was actually based on the official notification to the IMF made by the respected nations. The De Jure classification is divided into three major categories: first, pegged exchange rate regimes; second, limited flexible regimes (which is usually within a band or cooperative arrangement); and finally, the exchange rate arrangements which are more flexible –managed or free floating regimes. Later, Ghose, Gulde and Wolf (2003) subdivided these into 15 subcategories.

According to Edwards and Savastano's (1999) study, which is known for its comprehensiveness in terms of country and their historical coverage, De Jure classification system has a serious disadvantage as compared to De Facto classification system. Often exchange rate regimes appear differently from what is actually theorized. For instance, among the pegged exchange rate regimes, some are devalued frequently, while many other floats are exchanged within a tight band. Over the period, at the global level, De Jure imprecisely characterized the dispersal of functional currency regimes. Besides, the empirical analysis commissioning through the De Jure classification is mainly to test the choice of exchange rate regimes, or to evaluate the association between the choice of exchange rate

regime and the risked economic performance in reaching a misleading conclusion, which in turn leads to the deceiving policy implications.

It is the De Facto exchange rate regimes that classifies nations according to what they do. It is also an attempt to make sure that the classifications made officially are in tune with the everyday acts. A number of proposed De Facto classification systems have identified the excellences of the classified exchange rate regimes more credibly. It was Ghosh and others in 1997 who classified the exchange rate regimes on the basis of De Facto classification taking the evidences from actual exchange rate movements. Later, in 2003 Ghose, Gulde and Wolf reconsidered the facts produced under macroeconomic performance of De Jure exchange rate regimes under another classification. They did so by checking the strength of these results against the hybrid De Jure/De Facto classification. In the different classification system experimented by Levy-Yeyati and Struzenegger in 2002 and 2003, they rejected the De Jure classification and initiated a classification system that is new and is solely depended on the exchange rate's statistical techniques and it reserves data, to fix the regimes of De Facto flexible exchange rates. It also categorizes 180 nations annually. Apart from all these, the IMF itself in 1999 chose the de facto classification system. It was Babula and Otker-Robe in 2002, started using historical data and information based on countries' exchange rate pacts. In IMF, the De Facto classification system usually pools the obtainable data on the monetary policy frameworks, and exchange rate frameworks, and later authorizes these formal or informal policy intentions with data on actual exchange rate and then waits to conclude with a right judgment on the actual regimes of exchange rates.

A more distinct characterization of regimes are required in analysis apart from all these newer concepts. Nations experiencing occurrences of macroeconomic instability often face very high inflation rates, which also mirrors frequent and at the same time high depreciation of exchange rates. Regimes are mainly classified into pegged, intermediate and floating. This

classification is challenging because of the macroeconomic disturbances that could be erroneously attributed to the regime of exchange rates. Moreover, when the exchange rates vary significantly from the officially set paths, it is the movements that run parallel that could provide a more realistic indicator of monetary policy that lie beneath, for the nations that have a distinct parallel foreign exchange markets. When a nation follows an officially set exchange rate but experiences high inflation and parallel rates that deflate rapidly, it cannot be regarded to hold a monetary stance which could be stable with the pegged exchange rate regime. Besides while examining the association between the longer-term economic performance and the exchange rate regimes, identification of longer-term regimes is important than the short-term influences within the regime like the expansion of horizontal band or a single devaluation after re-peg. A large number of changes related to short-term disturbances possibly temporal economic or political shocks which do not cause changes in regime could be recorded potentially by using a De Facto regime which is comparatively of shorter horizon along with the classification algorithms as found by the Levy-Yeyati and Struzenegger.

Reinhart and Rogoff in 2004 made another natural classification focus on such shortcomings. In this method they separated episodes of severe macroeconomic stress and incorporated detailed information on parallel/dual market exchange rates. This classification mostly depends on wide rang of sets descriptive statistics and meticulous chronologies made on each nation's exchange rate arrangements to the group regimes.

The selection of exchange rate regime has been analysed from the perspective of including their effect on the macroeconomic performance, especially their impact on inflation and growth. Several studies have taken up this issue (Baillie *et al.,* 2001 and 2003; Bleaney and Francisco, 2007; De Grauwe and Schnabl, 2005; Ghose *et al.*, 1997 and 2002; Husain *et al.*, 2005; Levy-yeyati and Strurzenegger, 2001 and 2003b; and Rogoff *et al.*, 2003). Most of these studies implied that pegged exchange rate regimes in

comparision to the floating exchange rate regimes have lower inflation rate, and the output growth is also slow. Later, in a study conducted by Nashashibi and Bazzoni in 1993, it is suggested that price stability is achieved by countries with fixed exchange rates. Yet such countries face problem in fulfilling other macroeconomic objectives, especially competitiveness, fiscal imbalance and growth. Other recent studies also found that pegged regimes has no major impact on inflation, except for the lower correlation between per capita output growth and pegged regime.

2.5. BRICS Nations Attracting the Global Financial Markets

This section divided into two parts as section 2.5.1 explains the global monetary system in current days and section 2.5.2 explains the why dollar is decreased.

2.5.1. Considering the Current Global Monetary System

The world presently is at crossroads of international monetary relations. The reforms adopted during the next few years will definitely impact the 21st century's international monetary system and the socioeconomic conditions around the world. The different options before the global community are to: (a) revert back to a fixed exchange rate system such as Bretton Woods System, (b) adopting a truly free flexible exchange rate system, (c) adopt a monetary system where international payment adjustments will rely on macroeconomic policy coordination among the leading industrial countries and exchange rate management to a certain degree that has until now proved elusive; and (d) revise the present international exchange rate arrangements.

The four main characteristics of the present international monetary system are:

1. Among the 172 members of the IMF, out of the wide variety of exchange rate arrangements, 76 developing countries chose pegged or quasi-pegged exchange rate arrangements, 13 chose managed

flexibility, while 83 chose full flexibility (IMF, 1994). Two-thirds to four-fifths of world trade is conducted under managed or full flexibility (IMF, 1984). Therefore, the present system can be regarded more as a flexible regime than a fixed exchange rate regime.

2. Countries enjoy almost complete freedom of choice in exchange rate regimes. The 1976 Jamaica Accords mandates that a national's exchange rate actions should not disrupt its trade partners or the world economy.

3. Exchange rate variability has been highly noticed. It is equally applicable for nominal and real, bilateral and effective, short-run and long-run exchange rates. According to IMF estimates, the exchange rate variability was about five times more during the period of flexible exchange rate as compared to that under the preceding fixed exchange rate or Bretton Woods System. Exchange rate variability of 2-3% per day and 20-30% per year has been common under the present system.

4. Contrary to earlier expectations, official intervention in foreign exchange markets has not decreased significantly under the present flexible exchange rate system as compared to the previous exchange rate system. Nations have intervened in foreign exchange markets not only to smooth out day-to-day movements, but also to resist trends and to keep exchange rates within the soft implicit target zones.

The period of the flexible exchange rate system since 1976 has been characterized by far greater macroeconomic instability in the leading industrial countries as compared to the previous fixed exchange rate or Bretton Woods period. Two rounds of huge increase in oil price (1973-74 and 1979-80) had crippled the system, leading to double digit inflation and thereafter, recessions. The period also saw the rapid growth of the

Eurodollar market and the liberalization of capital controls. The resulting sharp increase in international capital flows, as well as the institutional changes and adjustments, followed the collapse of the Bretton Woods system since 1971. The prevailing flexible exchange rates were the primary causes for the large macroeconomic instability experienced by the leading industrial countries. Indeed, it is now widely agreed that no fixed exchange rate system could have survived the combination of oil shocks, portfolio shifts and structural and institutional changes that the world faced during the past two decades.

The present international financial system, however, has certain important shortcomings. They are the large volatilities in exchange rates, the gross and persistent misalignments of exchange rates and the failure to promote greater coordination of economic policies among the leading industrial nations. There is little disagreement on the fact that the exchange rates have exhibited large volatility since the establishment of the present managed exchange rate system. The IMF concluded that exchange rate volatility did not seem to have a significant adverse impact on trade to an alarming degree.

The most recent example of exchange rate misalignment is the overvaluation of the US dollar during the 1980s. According to the US Federal Reserve System's Board of Governors, from 1980 to its peak in February 1985, the US dollar has appreciated by about 40% on a trade-weighted basis against the currency of the 10 largest industrial countries. This appreciation resulted in the huge trade deficit in the US and equally a large trade surplus of Japan and Germany. It was estimated that in 1985 US trade deficit was $60-$70 billion greater than what it would have been, if the dollar remained at its 1980 level.

Misaligned exchange rates can be regarded as the immediate and fundamental cause of prevailing global trade imbalances in the leading industrial countries today because of the structural disequilibria. The current international financial system could possibly be blamed as it has

failed to provide smoother and timely adjustment to such large and persistent global imbalances created due to trade and budget deficits of the US and the trade surpluses of Japan and Germany.

A more serious issue is that the present international financial system has failed to promote greater coordination of macroeconomic policies, especially fiscal policies, among the leading industrial countries. To a large extent this is due to the very different inflation-unemployment trade-off in the US, France, UK, Italy and Canada, on one hand, and in Germany and Japan, on the other. Policy coordination under the present system has taken place only occasionally, as its scope very limited presently. One such example was seen in 1978 when Germany agreed to serve as a 'locomotive' to stimulate growth in the world economy. Plaza Agreement of September, 1985, under which G-5 countries (US, Japan, Germany, UK and France) intervened in foreign exchange markets to bring about a gradual depreciation or soft landing of the dollar, in order to eliminate it from being grossly overvalued is another example of limited policy coordination. Further, Louvre Accord of February 1987, which established soft reference ranges or target zones for the dollar-yen and dollar-mark exchange rates is also a related example of successful, but limited coordination of policies. Despite these, a great deal of dissatisfaction still remains with the operation of the present international monetary system remains and there are widespread calls for reforms (Salvatore et al., 1993).

2.5.2. Why Dollar's Value Fell

Less flexible exchange rate regimes in the emerging markets which is consistent with the fear of floating appears to be associated with higher dollarization. Compared to the less dollarized countries in the group, pegged regimes are more prevalent in highly dollarized emerging markets where the fear of floating appears to be stronger. On the contrary, emerging markets having minimum and standard degrees of dollarization are more likely to have managed or free floating exchange rate regimes. The other developing countries with high dollarization ratios appear to be

in favour of regimes with limited flexibility to pegs about which fear of floating failed to explain. An explanation for this could be that many of these countries became highly dollarized followed by a free episode and lack of credibility that is necessary in defending a peg. On the other hand, the benefits of a relatively stable currency were obtained from a limited flexible regime along with some capability of adjusting to shocks.

2.5.2.1 Important Factors That Have Led to the Depreciation of the US Dollar

Monetary Policy: The Federal Reserve of the United States have implemented monetary policies to either fortify or debilitate the US dollar. Implementing what is known as 'easy' monetary policy which can weaken the dollar, thereby leading to its deprecation, is the basic level. For example, it is said to be 'easing' when the fed lowers interest rates or put forward quantitative easing measures like the purchase of bonds. Easing happens, when the investors are encouraged to borrow money as the banks reduce interest rates.

U.S dollar being a paper currency can be created since it is not funded by any tangible commodity like gold or silver. The existing money becomes less valuable as per the law of demand-supply, when more money is created.

Inflation: Inflation is another important element. The U.S inflation rate versus that of its trading partners and currency depreciation or appreciation are inversely proportional to each other. Because of the rising cost of goods and services, higher inflation diminishes the value of currency. The demand reduces as prices are raises. On the contrary, for consumers in the higher inflation country imported goods are more attractive to purchase.

Demand for Currency: The currency of a country stays strong if it is in demand. The U.S dollar behaves like reserve currencies, which are used by nations all around the world to buy desired commodities such as oil and gold. An artificial demand for reserve currency is created as sellers of these

commodities demand payment in these currencies, thereby making it stronger than it could have been.

China's growing interest in achieving reserve currency status for the Yuan will decrease the demand for US dollars and thus, US is afraid of China. Oil producing nations are hardly demanding US dollars. Thus, the diminution in the artificial demand for US dollar may diminish its value.

Slowing Growth Rate: Strong and weak economies are likely to have strong and weak currencies respectively. Investors usually invest their money elsewhere due to declining growth and corporate profits.

2.5.3 Impact of US Dollar as a resource Currency in the Global Monetary System

In recent times, the exchange rates of most currencies vacillated at an unprecedented pace, obstructing the capital transfers and commercial activity. There are currencies which are witnessed by policy-driven exchange rate volatility; the US dollar (USD), the Euro (EUR) and the Japanese yen (JPY). Emerging market currencies appreciated rapidly as international capital chased economic performance, by shortly depreciating when foreign money fled, driven by risk aversion. Over the following few years, uncertainty and volatility of currency markets are likely to remain high.

The emergence of a currency as leading "global reserve currency" reflects the role of the issuing state in transnational trade and finance. When a currency is more powerful in the global economy, the more it would be internationally accepted. When a "global reserve currency" come to be widely exchanged, through the growing levels of international trade and investment the global economy can sustain very well. In the earlier, several currencies became dominant in international transactions. These included: Athens' silver drachma (5^{th} century BC), in India's silver coins (4^{th} BC), Rome's gold aureus and silver denarius (1^{st} c BC-4^{th} c AD), the

Spanish dollar (13th c AD), the Chinese Liang in Asia (19th c AD), the British pounds sterling. For the last 70 years, it has been the US dollar.

One currency to become a global currency it should have following requirements like; fundamentally it should be sound, as like as enormous economy, growth wise as sustainable, it should have less inflation, financial markets point of view it has to open and deep; and (b) by focusing towards long-term growth it has to maintain full confidence.

By having these features, such a currency can play a major role at the international level. Money also has some essential role to play as: i) as responsible unit of account, 2) maintain a medium of exchange; and 3) keeping as high value of store.

A global currency delivers large economic benefits for the issuing country: firstly, seigniorage, the difference between the minimal coast of printing a banknote and its face value in terms of goods and services and secondly, the ability to borrow at exceptionally favourable interest and pay for imports- in domestic currency. However, this is a mixed sacred sign, known in the literature as "Triffin dilemma". It is given high global demand for foreign-exchange reserves dominated in the "global reserve currency", and the issuing country ends up providing the world with an extra supply of its currency, usually by selling government bonds. The funds received in exchange are used to purchase imports, thus causing a trade deficit and fundamental imbalances in the balance of payments, via the current account. As the debtor is tempted to use devaluation to reduce its external deficit, its currency loses its "global reserve" status.

2.6. Determinants of Exchange Rate Regime Choice in Developing Countries

In the previous collected research works, there are three major approaches which was explain the choice of exchange rate regimes are: (i) theory of Optimal Currency Area (OCA), (ii) Financial View, and (iii) Political View.

2.6.1 The Theory of Optimum Currency Area

In the international macroeconomics, the optimal currency area (OCA) Theory deals with complicated and intermingled issues as a core objectives. Mainly, this arrangements are with the associations among nations, regions, and currencies. In the political sense, the world is not a unity but it is divided into more than two hundred independent countries, again these nations were further separated into distinctive regions. When forming a nation or country currency considerations it may proceeds a fairly low priority. For example, after the collapse of colonial empires which were formed a new nations, as well as those nations which were formed after the collapse of the Soviet Empire all belong to currency areas. Yet, despite of all foreseeable economic consequence of independence, surprisingly still there is a slight consideration on preceding issues of optimal currency area and disintegration of the former colonial, or socialist, countries.

By concerning the adoption of fixing exchange rates or a common currency the theory of OCA has provided important insights. In his study, Mundell (1961) associations the choice of a common currency to heterogeneity. To cope with the idiosyncratic real shocks he was used a Monetary and exchange rate policies are regarded as (Keynesian) tools. This specifies that should not peg their exchange rates namely; emerging market economies, which are at a different stage of economic development than their potential anchor countries. Otherwise, in terms of their growth performance they could face losses. In line with Mundell's views, Kinnon Mc (1963) also responded that for small economies nominal shocks do matter while choosing the exchange rate regime choice. By stabilizing their exchange rates, emerging market economies can stabilize the domestic price levels, create certainty for domestic investment and reduce the transaction costs for international trade.

The later contributions provided by Mundell (1973) stressed that capital market integration can contribute to the absorption of asymmetric shocks as international borrowing and lending can facilitate smooth

consumption. In distinction to Mundell (1961), monetary and exchange rate policies were understood as an independent source of unpredictability, because foreign exchange markets are not always efficient. Furthermore, monetary policies have tended to be sources of instability followed by many emerging market economies. More or less moving into a monetary unification would be equal to eliminating instability related to undisciplined macroeconomic policies. Implicitly, or explicitly, the Optimum Currency Area (OCA) Theory, as discussed above, has defined the costs and benefits of a common currency or a fixed exchange rate, in terms of the growth performance under a specific monetary arrangement.

Finally, in the OCA theory (in the beginning articulated by Mundell, 1961), geographic location, trade links, size, openness and the intrinsic shocks are the main determinants of the exchange rate regime. From this perception, the trade and welfare gains from a stable exchange rate is compared with the benefits of exchange rate flexibility as a shock absorber. Therefore, there is a greater possibility of more open countries having pegged regime. Given the statement that smaller nations trade more, one can expect that these nations also lean towards to have a lesser amount of flexible regimes.

The forecasts of this theory can be verified by including nation's openness (the share of exports plus imports in GDP), size (real GDP), geographic concentration of trade among other determinants of the exchange rate regime. The above issues can lead one to use real growth as a dependent variable on the left-hand side of our econometric structure.

2.6.2. The Financial view

The second approach is the financial view, based on the impossible trinity hypothesis. According to this, out of three goals only two hypothesises can be achieved: stabilising the exchange rate, free capital mobility, and independent monetary policy. Latest global financial deepening and innovation have reduced the efficiency capital controls. In the presence of

free capital mobility, the impossible trinity dilemma has reduced to the bipolar view of exchange rate regimes defining the fixed exchange rate regime and independent monetary policy trade. According to this view, low-slung financial development should increase the likelihood of take on pegs.

The financial approach highlights the penalties of international financial integration to the exchange rate regimes. Countries that are highly dollarized with currency mismatches are more likely to opt for the fixed exchange rate arrangements, as emphasised by Haussmann, et al (1999), and Calvo and Reinhart (2000). Conversely, when the countries have a significant level of foreign liabilities (either public or private), a pegged exchange rate regime is very much preferred, since it can solvency risks, in the event of currency devaluation.

2.6.3. The Political view

This approach highpoints political factors as a determinant of exchange rate regime. Less developed countries, experiencing low institutional credibility, may adopt a peg as a policy crutch. These countries normally have a higher level of system of government. Therefore, they need stable currencies to fascinate the international shareholders and possibly to provide illegal opportunities for influential members of the society. In contrast, democratic countries governments are more interested in influencing economy, resulting in the greater possibility of using the flexible regimes.

The political view also holds countries that lack institutional credibility may use a fixed exchange rate regimes to lower the inflationary expectations. According to the political view, countries use an exchange rate peg (or an exchange rate anchor) as a ‘policy crutch since the governments are lacking (nominal and institutional) credibility’ (Levy Yeyati et al, 2006).

2.7. Fixed and Flexible Exchange Rate Regimes

A Pegged exchange rates, or fixed exchange rate, is where the exchange rate is fixed by the government. When referring a Pegged exchange rate it was a system in which a monetary authority announces "buying or selling rates for its currency, in terms of a foreign currency," allowing to trade in unlimited amounts at that rate. In spite of the fact that the purchasing and offering rates could be the same, in many frameworks they cary; as the situation that gives the ascent to groups inside which even settled trade rates may change (more often than not inside a slender range, for example, +/-1% to +/- 2.25 %)

2.7.1 Advantages of Fixed Exchange Rate Regimes:

These include the following:

1. **Stability in international trade:** fixed exchange rates provides a stability in international prices for the conduct of trade. The stable prices facilitate the growth of international trade and lessen risks for all the businesses. It will also show the day-to-day trade fluctuations to adjust the future plans.

2. **Anti-inflationary:** another advantage of fixed exchange rates is, it is an inherently anti-inflationary, necessitating the nation to follow restricting monetary and fiscal policies. This restrictiveness, nevertheless, can often be a burden to a nation wishing to pursue policies that address the continuing interior economic problems, such as high unemployment or slow economic growth.

3. **International reserves**: it also necessitate that central banks should maintain large quantities of international reserves (hard currencies and gold) to use in the occasional defence of the fixed rate. As a volume and size wise international currency markets have grown rapidly, for many nations increasing reserve holdings have become a significant burden.

4. **Maintaining stable economy:** Fixed rates, once in place, may be keep up at rates that are unpredictable with economic fundamentals. As the structure of a nation's economy changes, and as its trade relationships and balances evolve, the exchange rate itself should change. Flexible exchange rates will allow this to happen gradually and efficiently. Fixed rates must be changed administratively-which is usually too late and, highly publicized, at the cost of the nation's economic health.

2.7.2 Flexible Exchange Rate Regime

Another exchange rate system is available one is Flexible exchange rate system. It is a monetary system that allows the exchange rate to be determined by supply and demand. Every currency area must decide what type of exchange rate arrangement to maintain. Between permanently fixed and completely flexible. However, heterogeneous approaches.

2.8. Details of previous Exchange rate regime Classifications

Table 2.1 Details of classifications schemes and findings for developing countries

Scheme	International Monetary Fund	Bubula and Otker-Robe (2002)	Levy-Yeyati and Sturzenegger (2005)	Reinhart and Rogoff (2004)	Shambaugh (2004)	Present Study
Methodology	Nation's Self-declaration	They have checked self-declaration in contradiction of other exchange rate volatility	Cluster analysis, it was constructed on the basis of volatility in exchange rate and international reserves	Applied a comparable exchange rate, where data accessible. Float have need of > 20% months in a span of 5-year, with the change in rate as >5%.	When there was not at all change in parity of 11 months out of 12 months, or stay of exchange rate within 2% band is defined as a Peg.	It tested whether the maximum and minimum, log of the month-end values of the exchange rate within 0 to 0.04 (pegged) above 0.04 (Non-Pegged)
Data processing	Monthly	Monthly	Yearly	Monthly	Yearly	Monthly

Discoveries with respect to inflation	Hard pegs < Soft peg < other regimes	Hard pegs < other regimes	Hard pegs < other regimes	Peg < float	There was no investigation	Pegged
Findings with respect to growth	There was no significant differences	There were no substantial differences	Peg < float	There was no reliable differences	There was no investigation	Pegged
Finding Sources	*Ghosh et, al. (2002)*	*Bleaney and Francisco (2005)*	*Levy-Yeati and Sturzenegger (2001 and 2003)*	*Hussain et, al. (2005)*		
Time period	From 1970 to 1999	From 1991 to 2001	From 1974 to 2000	From 1970 to 1999		1993-2012
Regimes Type	4 types; Hard pegs; soft peg; intermediate; float	3 types; Hard pegs; soft peg; floats	4 types; firstly, Peg, secondly, crawling peg, thirdly managed float, and fourthly free float	4 types; one is Pre-announced, or peg of de facto. Two is Limited flexibility; third is managed	2 types one is Peg and 2nd is float The problem is: Weakness on robustness check	Pegged and Non-Pegged

				float and fourth is free float		
Is there any separation of high inflation observations?	No	Yes	No	Yes	No	No
Strictness on classification of peg	Medium	Medium	Medium	Low	High	High

Source: published by Berkeley Electronic Press, 2007.

The above Table précises the main structures of different exchange rate regimes classification and the empirical results. These schemes differ in some methodological aspects. In the analysing part of the association between exchange rate regimes and their macroeconomic performance, there are several researchers have been using several classifications with or without country's fixed effects; without other control variables, in mandate to test robustness. The above table has explained their results.

The IMF classification scheme which was extensively analysed by Ghosh et al, (2002). They have used a huge data set of 147 nations over a thirty year period from 1970- 1999. According to official IMF classification, they found that pegs are associated with significantly lower inflation than the intermediate regimes such as crawling pegs or tightly managed floats. When they looked into the growth rates across the regimes.

Another classification scheme is made by Bubula and Robe (2002). In their study, they examined the self-declared exchange rate regime against other official exchange rates. Here, they defined the regimes based on the documentary evidence of a policy in a pegging, as well as exchange rate stability. Earlier than 1990 this classification was not available. It appears almost similar to the IMF classification scheme comparing their results on inflation and growth.

Levy-Yeyati and Sturzenegger (2005) scheme. They used cluster analysis for generating one observation per calendar year, unlike the earlier studies. Their classification depended on three variables: (a) the stability of the ostensible swapping scale level against the distinguished stay money (it is normal outright month to month % change); (b) the unpredictability of conversion scale transforms (it is a standard deviation of month to month % changes); and (c) is the volatility of foreign exchange rate reserves (it is average absolute monthly % change in net dollar international reserves relative to the dollar value of the monetary base in the previous month). According to this classification, floats are more associated with significantly higher growth in non-industrial countries.

Shambaugh (2004) made a scheme only to differentiate pegs from the other regimes. In his classification for the peg, the nominal exchange rate must

remain within a 2% band within the year, or should have zero movements for 11 out of 12 months, which is a relatively strict definition. For example, he excluded all crawling pegs. If no criterion is met, the regime was to be termed as a non-peg.

As a final point, Reinhart and Rogoff (2004) used a classification procedure which is constructed on the parallel, rather than the official, exchange rate, where such rates exist.

2.8.1. Exchange Rate Regime Classifications used in this Study

The classification used in this study is purely based on the generally accepted principles for characterizing exchange rate regimes. A de facto classification model has been used in this study. There are three well-known de facto classification schemes in literature. These schemes are measured by Yeyati and Sturzenegger (2001), Reinhart and Rogoff (2004), and Klein and Shambaugh (2008). Each scheme has been widely used by other researchers.

Yeyati and Sturzenegger (2001), also known as the LYS de facto classification (LYS), includes three subcategories: fixed regimes, intermediate regimes, and flexible regimes. The LYS scheme uses constellation analysis to create one observation per calendar year, constructed on the exchange rate volatility, as measured by percentage change of absolute monthly average. The instability of exchange rate changes is measured as the standard deviation of monthly percentage changes. The volatility of foreign exchange reserves is measured as the absolute monthly percentage change in net dollar international reserves, relative to the dollar value of monetary base in the previous month. According to the LYS scheme, if a nation having exchange rate volatility, but large reserve volatility in one year, it is categorized as a fixed regime. If a country has a relatively constant, but not at the non-zero rate of change, and with a high rate of change in reserves, then it is categorized as an intermediate regime. Finally, if any country falls under high level of exchange volatility, but a low level of reserve volatility, then a country's exchange rate arrangement is considered as a flexible exchange rate regime. The LYS scheme was the first de facto scheme classification in international economics. It is being used by many researchers. However, the scheme does not give a clear picture of what is

defined as a peg or a non-peg. Furthermore, it is hard to obtain data on reserves to make the classification.

Reinhart and Rogoff (2004) created exchange rate regimes based on the behaviour of parallel (unofficial, which is determined by market rates) rather than the official exchange rate. According to the Reinhart & Rogoff scheme (RR Scheme), observations are categorized built on the probabilities of the parallel exchange rates actuality outside a band terminated a five-year window. They use a five-year rolling window to avoid spurious switches in exchange rate regimes due to devaluations. The RR scheme is the best-suited analyses to focus on transactions taking place at unofficial exchange rates. The biggest problem with this scheme is that it is not easy to obtain data on black market rates to create the scheme.

Finally, Klein and Shambaugh (2008) created their own de facto classification and used two categories: a fixed regime and a floating regime. The Klein and Shambaugh (KS scheme) is based on bilateral (national currency/ U.S. dollar) and annual country/ year observations. A nation is considered as having an altered swapping scale administration if its end-of-month authority reciprocal conversion scale stays inside +/- 2% band, both for every month and through the span of that year. This requires a money inside the same +/- 2% band toward the end of every month, for the entire year. Since the coding is yearly, the peg should keep going for a full timetable year for a nation to be delegated a pegged administration in that year. Pegs that last not exactly an entire year are delegated non-pegs.

This study uses the KS scheme as a core classification. The KS scheme is most straightforward, and the newest de facto classification in the literature. The use of official exchange rate data has a wider coverage and is easier than other classifications that require black market rates, central banks' reserves, and interest rates. In addition, a 2% band makes the distinction between pegged regimes and non-pegged regimes more obvious. According to Shambaugh (2008), the KS scheme competitions the historic descriptions of pegs such as gold points in the gold standard and the bands in the Bretton Woods's era.

2.9. Conclusion

This chapter presented a momentary summary of the literature on the choice and classification of exchange rate regimes. Literature on flexible and fixed exchange rate regime choice is broad, but can be grouped under six main topics, as presented in this chapter. These are the classification of the trends in exchange rate regimes, and also various exchange rate regimes advantages, and disadvantages.

The classification of exchange rate regimes has been one of the most debated issues in the present days since the earlier analysis of exchange rate regimes were based on the officially declared (De Jure) exchange rate regime of a country, and another one has found to analyse differently the exchange rate regimes of countries in practice (De Facto). It is defined by different measures like exchange rate volatility, interest rate volatility and other methods as well. This has led to several studies on exchange rate regime classifications. Among these, the most widely used are one the de facto classification systems being the actual performance of the exchange rate system made by Jay C. Shambaugh (2003).

There are advantages and disadvantages for both pegged and non-pegged exchange rate regimes. The main advantages of a pegged exchange rate regime are that provides a nominal anchor to control the inflation. In contrast to the main advantages of non-pegged exchange rate regimes, it allows monetary policy independency. The choice between pegged and non-pegged exchange rate regimes is seen as a trade-off between exchange rate stability and flexibility.

The macroeconomic performance under different exchange rate regimes by a number of studies. Some of these studies have found inflation to be generally lower in countries with pegged exchange rate regimes, compared to countries with non-pegged exchange rate regimes. However, this relationship is only significant for the developing countries. Lower inflation rates in countries with following pegged exchange rate regimes have also been associated with lower growth rates and higher volatility of output in the real economy. Regarding the probability or frequency of currency crisis, pegged exchange rates have a high risk of speculative attacks against currency, especially when

exposed to volatile capital flows. Therefore, pegged exchange rate regimes are more susceptible to banking sector distress and financial crisis.

The choice of exchange rate regimes and its determinants are discussed by using the OCA theory, the political view, and the financial view. There are several determinants of exchange rate regime choices acknowledged in the earlier literature such as the size of the economy, and the openness of the economy, trade integration, diversification of production/exports, nature of economic shocks, and unit of dollarization, exchange rate pass-through, central bank independence and credibility, and level of foreign exchange reserves.

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Chapter 3

Exchange rates, Inflation and Growth: Review of Literature

3.1. Introduction

Of late, within the emerging market economies, the issue of exchange rate has gained more importance. The influence of exchange rate regimes on inflation has been talk over in many papers/studies. The debate revolves around the type of exchange rate regime and its influence on inflation and growth.

The study follows into different sections like Section 3.2 briefly brings out the literature review on the exchange rate regimes and inflation. Section 3.3 discuss the literature review on exchange rate regimes and growth and their major issues in the context of BRICS countries and chapter concludes with Section 3.4.

3.2. Literature Reviews on Exchange rate regimes and Inflation

Agnieszka Markiewicz (2006) done study on transition economies (TE's) and their exchange rate determinations. For this study, they used two different regimes like one is de jure and other one is de facto, within the time period of 1993 to 2002. They analysed through logit model for 23 TEs and found that whichever countries had stronger governments and balancing of political stability was largely in favour of pegs. Luis, et al (2009) examined on the exchange rate depreciation, by using a panel data from 1996 (Q1) to 2004 (Q4) in 124 countries, by using an inflation pass-through regression model. They concluded that, there was a balance-sheet effects of large depreciations noticed by the fixed exchange rates followers. Andrew Abbott et al. (2012) examined on how the foreign direct investments are affected by exchange rate regimes in the case of

developing countries. They analysed the data for these 70 countries from the period 1985-2004. To find out the relationship between FDI and exchange rate regime they employed a generalized method of moment's estimation. It found that de facto of fixed and intermediate regimes are significantly outperformed, while the choosing of de facto option shows an attraction towards FDI flows.

Berdiev et al. (2012) examined on the choice of exchange rate regimes and the influence of government ideology, political institutions and globalisation via a panel multinomial logit approach. For their study, they used a panel set of 180 countries and data period covers from 1974-2004. Of these, 26 countries were developed and 154, developing. They found both of developing and developed countries exchange rate regimes choice got effects from political economic factors. The study brought out mainly two things, one is economic development decreases and secondly, in developing countries there was a probability of flexible regime.

Another study on alternative exchange rate regimes done by Bleaney et al. (2007) applied an official classification and four way of classification schemes, it was measured on the basis of observed exchange rate behaviour. It was used for 91 developing countries over a period of 1984-2001, to examine the inter linkage between growth and inflation. They concluded that: (a) there was a similar growth rates between floats and soft pegs and in case of inflation it was slightly higher, and (b) lower inflation and slower growth in the case of hard pegs than other regimes.

Durban (2009) used De Jure classification adopted from the International Monetary Fund (IMF) and investigated on the choice of exchange rate regimes and their misalignments. He applied an empirical analysis method, it utilized and it seems to be a new way of non-stationary panel data method. He estimated a panel co-integration vector estimator for 102 countries, with a robust measure of misalignment. Another study followed by Marc (1998) analysed exchange rate regimes choice and its

determinants in developing countries, by using the IMF classification. He employed a probit model to for the period 1977-1995 and found lower inflation rate tend to have fixed exchange rate, rather than flexible exchange rates. In connection with these studies Javier, et al (1996) studied the growth, inflation, and the exchange rate regime on OECD countries during 1961-1992, by using Balassa-Samuelson effect. They found exchange rate regimes are more important when we measure the inflation costs, in expressions of long-term growth.

Hussain et al. (2005) analysed between developing countries versus advanced countries over a period 1970-99 to check the exchange rate regimes performance and durability. On the classification they come up with new data set and improvements. They found worse economic performance on dual exchange rates association. To understand their macroeconomic outcomes, and to cement these findings much further research is required on exchange rate regimes. These were also sufficiently broad sweeping and complex topic. More or less, every exchange rate regime performance should focus on classification, behaviour of exchange rate and also it has to look on market-based exchange rates.

In the connection with the above study on choice of exchange rate regime done by Jurgen et al. (2004) on developing counties analysed the exchange rate regime choice by applying the random-effect models like static and dynamic models. The data period was from 1981-1999. There were ‘affecting variables like currency crisis and political and institutional features. Finally, they concluded that to bring changes in inflation, choice of exchange rate regime is very important factor.

Levy-Yeyati and Sturzenegger (2001) studied the how the exchange rate regimes might impact on inflation and nominal money growth, real interest rates and GDP growth. Annual observations over a period from 1974-1999 for 154 countries for testing the model. For the estimation of inflation and growth, they used a standard money demand,

money growth and cross-section regression models. It found that in developing countries, non-industrial economies are associated with lower inflation when compare to flats. However, the trade-off would be slower growth. In the case of hard pegs the trade-off inflation and growth also presented, whose growth performance does not differ from the conventional pegs.

Mandadjiew (2005) did a study on the countries with floating exchange rates and employed a regression analysis. Empirically it was to test the crisis-proneness, and the differences for the levels of inflation and per capita growth. To find out the performance comparison between hard peg regimes-currency boards in particular-against that of soft pegs, free floats and hard pegs, he applied a four-way classification of de jure and de facto exchange rate regime. The study brought out that in the choice of regime, exceptional inflation performance were offered by hard pegs when accounting for the endogeneity possibility of regime choice.

Another study examined by Michel Bleaney et al. (2002) mainly focused from the developing countries point of view, in the relations towards exchange rate regimes, inflation and volatility of output. They used the exchange rate regime classification of Ghose et al. (1995). In their analysis, they used data from 1980-1989 for 80 developing countries to test the inflation and output volatility. Finally, they concluded that in the choice of exchange rate regimes there is a trade-off between the stability of output and reduction of inflation.

Mohanty et al. (2014) investigated the effects of de facto exchange rate regimes on inflation in the case of India with the different exchange rate stability. They found that inflation is not visible. Another study done by Ghosh et al. (2001) to capture the nominal exchange rate regimes, did a comparative study on the classifications of De Jure and De Facto. Their study period was 1970-1999. With the regression scaled inflation rate, they tested the link between exchange rate regime and inflation. It was found

that under pegged exchange rates inflation was lower. Finally, for regimes choice different definitions were used, for contamination of cross-regime and controlling for the potential dependence of the regimes which allowed them to test.

In connection with the reduction in the inflation study brought by Romer (1993) showed that fixed rates are able to reduce inflation due to their role as a mechanism for monetary authorities. Similarly, in their book, Cobb and Field (2008) indicate that fixed regimes are needed to provide such effects to monetary policies when a country is struggling with high inflation rates.

Virgine and Marc (2005) used a new de-facto exchange rate regime and performed pooled regressions on the dummies of lagged exchange rate regimes and several controlled variables. They undertook a comparative study of different exchange rate regimes and bring into being that pegs have a greater degree of association with weaker growth than floating exchange rate regimes. Finally, their impact on inflation can be a moot point.

3.2.1 Openness and inflation

This section will explore the relationship between trade openness an inflation. Adolfo et al. (2003) examined to test the relationship between inflation and trade openness. By applying a panel data approach and it confirms that by nature there was negative relationship between inflation and trade openness. Amit Ghosh (2013) did a comparative study on advanced and low-income nations with the choice of exchange rate regime in emerging markets for the period 1999-2011. The study found for choosing a fixed exchange rate regime, trade openness, economic development, liabilities in foreign currency, and holding of foreign exchange reserves are important, while size of economy, concentration ratios of export, and financial development were reduces such type of chances. While choosing of exchange rate regimes in advanced and low-

income countries there are main important influenced variables like; capital controls, inflation differential with an anchor nation and size of land also significantly influence. However, these are largely insignificant in the case of emerging markets.

Jang C. Jin (2006) did a case study on South Korea to see the increasing openness effect on inflation and economic growth in the 1997-98 crisis period. It found that in the long run there was no such type of effect. Another study from Laura Alfaro (2005) on overall 130 countries from developing and developed countries with the data period 1973-1998. In his analysis, he found that openness does not play a role of restricting of inflation in the short run. Whereas, fixed exchange rate regime played a significant role. Finally, the less inflation and a commitment mechanism services done through fixed exchange rate regime.

Michael Bleaney (1999) examined the subject; the relationship between disappearing of openness and inflation with a cross-country analysis. He found that, between openness and inflation there was a negative correlation for the period 1970s to 1980s, when in 1990s it was disappeared. Another major finding was that after allowing for other factors since 1973, there was an association of floating regimes at least 10 percent a year than the pegged regimes. According to Barro-Gordon type model, a rise in inflation can be caused by an unanticipated monetary expansion Barro et al. (1983) and Prescott (1977). On the basis of this model, Romer (1993) suggested that between openness and inflation there was an inverse relationship, it can also rise through the openness impact on policy makers to purse expansionary policies. In more open economies, it is expected that when the country had more openness, the harms of real depreciation also greater, and thus there was also less expansion of monetary surprise could be expectable. Inflation can fall such type of cases.

In link with the above relation, Romer (1993) given evidence on inflation. Countries like broad cross-section had enough evidence that might negatively impact on inflation through the openness. To the previous study there was a supportive study found by Lane (1997) also noticed that across the countries there was an inverse relationship between inflation and openness. His argument shows that in the ground level there was inverse relationship in non-tradable sector, it was due to imperfect competition and price rigidity. There was another same argument raised by Terra (1998) shows that it is important to raise their revenue towards their prepayment of debts, which was caused by the inverse relationship in Latin American countries. It conforms that indebted countries were found sever negative relationship.

3.2.2 Money Supply and Inflation

Boris Hofmann (2009) examined whether monetary indicators will lead to inflation on the basis of quarterly data from 1980 (Q1) to 2005 (Q3). He applied the standard bivariate forecasting model and found a generalized quantity theory or two-pillar Philips Curve-forecasting model that shows a fairly goof and stable forecasting performance.

Chengsi Zhang (2013) examined the money, housing and consumer price relationship among these variable. It was on China with the quarterly data period 1998 (Q1) to 2010 (Q3). By applying a standard multivariate dynamic model, he found that excessive monetary growth can able to lead real estate market boom, which was dominates by the underlying pattern of Chinese inflation.

Emiliano Basco et al. (2009) studied the issue of Argentina's dependence on the money-prices relationship, with the data from 1977-2006. They tried to identify the role of inflation expectations through the VAR analysis, it was driven to see the short-run dynamics between the money growth and inflation relationship with condition of high inflation.

They found in the case of Argentina, the role of money is always explained the way of inflation reductions.

Ibrahim Turhan et al. (2014) undertook a comparative study on the G2o member countries, to see the dynamic correlations among the oil prices and exchange rates. The data used was for the period 02/01/2000 to 17/04/2012. By applying the model of DCC, they found the stronger negative level between shifts of correlations and global financial crisis.

Juthathip Jongwanich et al. (2013) taken a study on emerging Asian countries during 2000 to 2009, to examine the capital flows impact on real exchange rates. They applied a dynamic panel data model. They concluded that capital flows impact on real exchange rates are can determined by composition of capital flows. Increasing Acquisition activities and importance of merger in FDI makes these flows to become very closer in the region. Overall, their results indicated that when swift rebound capital flows comes into the region, it could excessive the appreciation of currencies, when capital flows are in the form of portfolio investment.

Michael Christensen (2001) analysed United States of monetary growth and the inflation rate performance in the short run and long run. The study period was 1973 to 1997 and for testing of short-run behaviour of monetary supply growth rate, he applied error-correction model. He concluded that for the United Sates, the money growth rate, and inflation performance is in a one-to-one relation in the long run.

Oliver Holtemoller et al. (2013) examined on misalignment of real exchange rate and currency crisis of 69 countries. They found that misalignment is lower, when higher is the flexibility of currency regime. By bringing out of issues on currency crisis and exchange rate misalignment, finally it was form a debate on exchange rate regime choice. By applying this process, they suggested that for minimising the degree of misalignment flexible exchange rate policy should be inevitable. Raising

of nominal exchange rate volatility was the main disadvantage they found in this study.

Shubhada Sabade (2014) in the context of India he did a validity test of quantity theory of money. He says that, for the developing countries, inflation dynamics are playing differently and it is necessary to re-examine the present validity of the perception that inflation is always a monetary phenomenon.

Most of the earlier studies on exchange rate regimes and its effects have been examined via developed countries, particularly larger economies like the US. Though, of late, there have been more cross-sectional and country-specific studies found in the case of developing countries. Since there is now a greater motivation towards the exchange rate regimes and its effects in emerging economies like BRICS countries. However, there were no studies on BRICS countries.

It was seen from the empirical literature point of view, such as related to exchange rate regimes and inflation has not able to draw or not having a final conclusion regarding the relationship between inflation and exchange rate regimes.

3.3. Literature reviews on Growth and Exchange rate regime Relationship

Alan Ling (2010) examined the aggregate export volumes of nine Western European economies over the period 1980 (Q1) to 1992 (Q4), by using the sample two-regime model. He noticed that there was a co-integration relationship in all cases. Another study done by Amit Ghosh (2014) did as study on choice of exchange rate regimes with comparison between advanced and nations of low-income for 1999 to 2011. He classified regimes into three types and by choosing the fixed exchange rate regimes, he found increases in trade openness, economic development, liabilities of foreign currency. While, in emerging markets the size of

economy, concentration of export ratios and financial development become lower. On the other hand, in advanced and low-income nations while choosing the choice of exchange rate regimes size of land, capital controls and inflation differential significantly influences. In case of emerging markets it was quite opposite.

Andreas Hoffmann (2010) studied on how the growth rate impacted by exchange rate volatility in the case of emerging countries with the Optimum Currency Area framework. The writer employed a panel model which had cross-country and applied on emerging market economies with the data period from 1990-2007. The study found that, the volatility of exchange rate had negative impact on growth.

Berdiev et al. (2012) examined on the choice of exchange rate regimes and its effects on globalization. In their study it confirmed that by adopting floating exchange rate regimes globalized countries become higher probability. Another study related to this, which is done by Bosworth (2008) pointed out that in the industrial sector China wants to put remarkable growth which was reduction in trade barriers, and continues encouragement for inflows of Foreign Direct Investment. Whereas, in the case of India by expansion of the service sector the rapid growth was primarily in due. Both the countries are quite different in the sources of their growth.

Dubas (2009) examined the issue of exchange rate regimes choice and how it effect on exchange rate misalignment. For this analysis he was used developing and developed countries. He used the six-way of IMF exchange rate regime classification. He also utilized a panel co-integration vector estimator for 102 countries and for developing countries exchange rate misalignment is matter but not to the developed countries.

Firat Demir (2010) analysed on how the employment growth was effected by exchange rate volatility in the case of Turkey. For their analysis the time period covers from 1983-2005. Through the point

estimation method, they found that employment growth was reduces by increasing the volatility of real exchange rate.

Another related study done by Firat Demir (2013) examined on how growth performance will affects by exchange rate volatility in case of domestic versus foreign one side and another side publicly trade versus non-traded manufacturing firms in Turkey. On manufacturing firms there was a significant growth-reducing impact from exchange rate volatility.

Another study done by F.V.Vieira et al. (2013) examined on how the real exchange rate volatility can effect on long-run economic growth. For this analysis, they have used a set of 82 emerging economies and advanced countries with the data period covers form 1970 to 2009. To show the volatility effect on economic growth, they have applied a panel growth model and GMM. They found that, real exchange rate volatility and long-run growth had negative and relevant relation.

Another empirical study done by Ghosh et al. (1997) used the IMF declared report for the period 1960 to 1990. In their study, related to exchange rate regimes effects on growth they did not find proper evidence.

Glauco De Vita (2014) investigated on how the international tourism flows affect by exchange rate regimes in the long-run. For this analysis, he used a set of 27 non-OECD and OCED countries for the time period 1980 to 2011. By employing a SYS-GMM, he found that to attract the international tourist, one has to stabilize their exchange rate system.

Graham Bird et al. (2009) taken a full sample of developing and emerging countries to examine the relationship between IMF programme and exchange rate regimes. The study co0vered a twenty-six years, from 1974-2000. They used classifications of de jure and de facto's and found there was intermediate are viable and possibly desirable ones.

Husain et al. (2005) analysed the exchange rate regime durability and its performance on developing versus advanced economies over the

period of 1970-1999. The study found that pegs are having least durables and exposing countries to higher risks, whereas flexible regimes become more financially developed and become richer.

Harris Dellas (2013) focused on the alternative exchange rate regimes implications for asset prices in a frame of portfolio balance model, it was motivated by China-US experience. They found that equity price are stronger under flexible exchange rate regimes.

Ibrahim A. Elbasawi et al. (2012) analysed the linkage between misalignment of exchange rate, foreign aid and economic growth of Sub-Sharan Africa. By employing the GMM estimator they found that overvaluation reduces the growth and, on another hand, the negative effects can be corrected by financial development. Ila Patnaik (2011) empirically analysed on the Asia's exchange rate regimes, from the period of crisis to crisis and found a new way of dollar measuring peg, "the Bretton Woods II Score". The writer concluded that from Bretton Woods II arrangements Asia has moving away.

Iulian Ihnatov et al. (2012) studied on Central and Eastern European Countries to see the economic growth and exchange rate regimes relation. To see the exchange rate regimes effects on economic growth, for the growth model they applied an Ordinary Least Square and Generalized Maximum Method and also used dummy variables. The study covers 16 central and Eastern European countries and before the adoption of Euro choice of exchange rate regime is a key point. While comparing growth effects with floating, intermediate regimes and fixed arrangements, it was found that there was a superior effect on economic growth from floating regimes.

Jeannie Bailliu et al. (2002) examined on how the growth impact with the exchange rate arrangements with a panel data set which is consisting of 60 countries from the period 1973 to 1998. They have applied a dynamic generalized method of moment in their study. They found a

positive relationship on exchange rate regimes which is characterized by a monetary policy anchor, either they follow pegged, intermediate or flexible. They finally concluded by saying, for any countries economic growth it is important to follow monetary policy framework rather than exchange rate regime.

Jean-Pierre Allegret (2014) analysed on how the global imbalance will affected by real exchange rate adjustments. By applying the multilateral approach method with the sample consisting of advanced countries 15 and emerging countries. The writer used quarterly data which is consisting from the period 1980 to 2010 and applied a GVAR model and found that dollar misalignment significantly influence the world economy.

Julian di Giovanni et al. (2012) studied on the role of exchange rate regime and the economy how they affected by foreign interest rates. In the case of domestic economy they found high foreign interest rates have contractionary effects on annual real GDP growth. But, this effect centered on countries which follows fixed exchange rates. There is a possibility that interest rate may affect the trade-off also.

Jurgen et al. (2007) examined on developing countries choice in exchange rate regimes since 1980. They focused mainly on fundamentals of Optimum Currency Area, consideration of stabilizing the economy, factors affecting on currency crisis and political factors and features of institutions, by applying simulation-based techniques. It brought out the strong state dependence in choosing the regimes choice.

Karim Barhomi (2005) taken a sample of 24 developing countries with the data period covering from 1980 to 2003 and examined on the import prices and exchange rate pass-through. By applying Pooled Mean group approach. The study found that the variation in import prices and it was duly affected by major macroeconomic determinants. They are, regimes of inflation, exchange rate regimes and trade barriers.

Similarly, Levey-Yeyati and Sturzenegger (2000) explored the growth and exchange rate regime relationship. For their study, they used annual data from 1974 to 1999. The major findings were: (a) lower per capita output growth rate are associated with fixed exchange rate regimes. (b) While comparing with nonindustrial and industrial, there was a higher output volatility association with fixed exchange rate regimes with nonindustrial countries than industrial countries.

Ludger Schuknecht (1999) empirically analysed the relationship between exchange rate regime and fiscal policy cycles on 25 developing countries. He applied regression technique with covering of annual data set from 1978 to 1992. He found that by adopting fiscal policies, the governments are try to improve their re-election prospects with fixed exchange rates and adequate reserve levels.

Marelli and Signorelli (2011) examined on India and China's trade openness facilities towards economic growth under a panel data set. While, methodological choice wise it is a questionable to apply panel data set on India and China, since both the countries have quite different growth experiences.

Muhammad et al. (2013) investigated on energy consumption and economic growth relationship, in the case of China with the data covering from 1970-2011. To see the long-run relationship among the series, he applied co-integration and ARDL test. Their empirical shows that there was a positive impact on economic growth by these variables. Through another test like granger causality, they found international trade and energy use, had a bidirectional causality.

In the light of this, Mundell (1995) also examined the industrial countries growth performance, before and after the Bretton woods. They found that, industrial countries are having faster average growth rates with the association of fixed exchange rate regimes.

Philippe Aghion (2009) examined the role of financial development with regards to the exchange rate volatility and productivity growth. He applied GMM dynamic panel data estimator and found that any effect must be depends on countries financial development.

Rolnick and Weber (1997) used a set of long-term historical data to find out the output growth rate. While looking into the output growth performance, it confirmed that a higher output growth under first standards than commodity standards like gold.

Sarkar (2008) examined on the trade openness and its impact on India's growth, he found it has negative impact. The study considered variables as imports and exports, trade openness and GDP. There are many different measures for Trade openness, while some of them used absolute trade volumes, some studies applied an openness indices which is based on the trade barriers. However, to get the complete picture on this issue we need to apply different measures.

Sebastian Edwards et al. (2005) analysed under the alternative exchange rate regimes, how the economic performance may affect through terms of trade. For analysis he used 183 countries covering with the data period 1974-2000. They employed the growth dynamic regression model and found that in rigid exchange rate regime countries terms of trade get better response. When comparing with the fixed and flexible exchange rate regimes performance, it shown that there was a faster grow in flexible exchange rate regimes. Simon Sosvilla-Rivero et al. (2014) empirically analysed relationship between economic growth and exchange rate regimes for 123 countries. In their analysis they found that under intermediate exchange rate regimes, the growth performance is best while the smallest growth rates are associated with flexible exchange rates.

Taro Esaka (2013) empirically examined the treatment effect of de facto pegged regimes and the currency crisis occurrence on 84 nations from the period 1980 to 2001. By employing average treatment effects, the

writer brought two major issues regarding pegged regimes: (a) the likelihood of currency crisis significantly decreases in pegged exchange rate regimes while comparing with floating regimes, and (b) regarding capital account liberalization, the likelihood of currency crisis become lower comparing with other regimes. Finally, it was concluded that on speculative attacks substantially less with capital account liberalization in the pegged regimes. It was due to their strict discipline in their monetary and macroeconomic policies.

Unay Tamgac (2013) examined whether the duration of any exchange rate regime had any effect on emerging economies. By applying the classification of Rainhart and Rogoff (2004), he found that for pegged regimes, change in foreign reserves, misalignment of real exchange rate, growth, trade openness are influenced by the duration.

Virginie et al. (2005) examined on inflation and growth are affecting by exchange rate regimes for the Asian Countries for the period 1990:01-2001:04. They used the de facto classification of four categories. They found floating regimes are associated higher growth than pegs, whereas inflation was questionable, due to bias in endogeneity.

Walid Chkili et al. (2014) investigated on BRICS countries to see the linkage between stock market returns and exchange rates, by using regime switching model approach. The data period covers on weekly stock prices and exchange rates of US dollar on BRICS countries taken up from March 1997 to February 2013. During periods of turbulent and calm, they found exchange rate are more influenced by stock markets.

Prior studies in the field which was provided by the earlier studies are in the mixed view on currency crisis occurrence impacted by exchange rate regimes. The studies are useful in judging, examining and drawing conclusions about the exchange rate regimes types that were useful to maintain a sustainable growth in BRICS countries and in fining what type regime can avoid currency crisis.

Table 3.1. Summary-table of the empirical research of the exchange-rate regime effect on growth

Study	Data and period of sample(s)	Exchange Rate arrangement	Model used in their study	Method	Outcomes with Peg and Growth	Problems
Bailliu et al. (2003)	From 1973 to 1998, sample of 60 countries	Both de-facto & de-jure were applied, but the latter part added important in terms of findings	Applied a Real per capita growth method	Generalized Method of Moments	It was positive relation Any monetary anchor positively effects on growth when it was exercised by Exchange rate regimes, or else, Exchange Rate Regime other than peg destructs growth	It was weak on robustness check
Bleaney and Francisco (2007)	From 1984 to 2001, considered 91 developing countries	De-facto	Applied a growth model	Ordinary Least Squared	Negative Growth was slower under more rigid exchange-rate regime	There was a weak in specification; not preserved for endogeneity; didn't check robustness
De Grauwe and Schnabl (2004)	From 1994 to 2002, 10 CEE countries	De-facto	Applied a Real growth analysis	Generalized Method of Moments	It was positive relation It confines that for reducing economic growth Pegged doesn't fit.	Short time period and small sample
Domac et al. (2004b)	10 years; considered only on twenty two transition countries	De-jure	Applied a growth model	Switched towards technique of regression	Results are Inconclusive There was an association between Exchange rate regimes and Growth. While,	Sample size and time period was small; there is no reason for the behaviour of de-

					but then for each exchange rate regimes the strength is different.	facto exchange rate
Dubas et al. (2005)	From 1960 to 2002, total sample 180 countries	Considered as de-facto versus de-jure	Used a Random-effects and panel regression;	Did an estimation of Random-effects	Results were positive When comparing with de-facto floater with de-facto fixers on average it has 1% lesser growth; Both de-jure floaters and de-facto fixers grow at 1 level, while de-jure and de-facto floaters 12% above. For non-industrialized countries the conclusions are significant.	There was no checking of diagnostics either robustness. Along with the theory many variables also not reported.
Edwards and Levy-Yeyati (2003)	From 1974 to 2000, total of 183 countries were taken	Applied a de-facto classification	Applied a Pooled regression	Ordinary Least Squared	It has a negative relation While compared with flexible it had Lower growth under fixed regime.	Questioned; Is growth equation good or Other policy factors?
Eichengreen and Leblang (2003)	From 1880 to 1997, sample was 21 countries	De-jure	Used a Real per capita growth analysis	Applied a panel of Dynamic and IV way estimators	It was negative For faster growth there is a string association with flexible exchange rates	De-jure classification and sample selection; weak robustness
Garofalo (2005)	From 1861 to 1998 only on Italy	De-facto	Applied a Simple regression model	For endogeneity Ordinary Leas Squared & 2Stage Least Squared are correct	Inconclusive Under soft peg either managed float the growth rate is highest	Same; it found weakness in robustness check; another problem is classification measures.

Ghosh et al. (1997)	1960 to 1990: 145 countries	Categorized by de-jure supplement method, changes in the frequency parity on-floating regimes.	Descriptive analysis	Compared across the means of exchange rate regimes and standard deviations.	Their results were Inconclusive. Under floating regime it was Marginally higher growth. In case of soft or managed float growth was showed highest	Their analysis was Unconditional: findings shows on effects of exchange rate regimes on productivity was no proper evidence. The effect on productivity was assumed only causal relationships.
Huang and Malhotra (2004)	From 1976 to 2001, out of 30, 12 from developing and 18 from developed countries	Classification method was de-facto	Applied a Panel regression	Ordinary Least Squared	Inconclusive and no relation In terms of growth in developing economies, fixed and managed float outperform the others; in case of developed economies, no relationship revealed	Growth framework was weak and there were certainly not checked their robustness
Husain et al. (2004)	From 1970 to 1999, total of 158 countries	De-jure method	Applied a Pooled regression;	Ordinary Least Squared	Inconclusive Regarding growth, there is no harm from Pegs, but there is no deliverance in flexible rates	Same; it found weakness in robustness check; another problem is classification measures.

Levy-Yeyati and Sturzenegger (2002)	From 1974 to 2000 and total of 183 countries	Used a de-facto	Applied a pooled regression;	To accurate the endogeneity: Ordinary Least Squared; 2Stage Least Squared.	Negative and no relation Under developing countries it was Slower growth; underdeveloped countries there is no association.	Questioned; Is growth equation good or Other policy factors?
Moreno (2000 and 2001)	From 1974 to 1999: Taken of 98 emerging countries and countries of East-Asian	Applied method of de-facto	Descriptive analysis	Compared across the means of exchange rate regimes and standard deviations.	Results were positive. Under higher growth from both studies it was defined as a peg by 1, 1 p.ps and 3 p.ps correspondingly. By considering survivor bias, the differences narrows.	Still investigation was Unconditional
Mundell (1995)	1947 to 1993: U.S, Japan, Canada, EC, and other Europe	Considered as, general floating and general fixing of sub-periods.	Descriptive analysis	They have taken an average growth rates among two sub-periods	It was found a positive relation. It was measured as a higher growth under generalised peg.	Problem raised from the Unconditional examination
Stockman and Baxter (1989)	From 1946 to 1984, taken as a sample of 49 countries	Considered as, general floating and general fixing of sub-periods.	Descriptive analysis	Taken, one is standard deviations and other one is averages.	They found there was no effect. It was also showed that no systematic relationship between system of exchange rate and real aggregates.	The problem was with the Unrestricted examination

The main objective of this present analysis was to summarise the main discussions towards which type of relation does exchange rate regimes had with economic growth. On the theoretical point of view, there are plenty of ways in which way exchange rate regimes might impact on productivity, investment and trade, growth of output. Most of the theoretical studies on exchange rate effects on growth shows that there is an uncertainty impose from the flexible exchange rate regimes. In case of policy uncertainty reduction under exchange rate, it provides growth environment and output effect. At the time of external shocks, it doesn't give adjustments.

Many empirical studies on reviews hardly reached to a conclusion. There are many groups has did observation. Out of that, one of the group came with pegged regimes stimulates growth, in case of flexible regimes doesn't have. One more group given opposite conclusions. Yet another group of studies did not come up with conclusive results. Some groups came with the measurement errors such as classification of regimes (Strurzegger and levy-yeyati, 2002). In the study done by Du and Zhu (2001), divergences were found in measuring exchange rate uncertainty or sampling bias found by Hung & Malhotra (2004). Another study was done by Bleaney and Francisco (2007) majorly focused exchange rate parameters but unable to control countries characteristics, even by applying framework of growth. On endogeneity point of view not yet all treated well, in many cases repeatedly used inappropriate instruments in the approach. A few studies paid only attention towards the context of monetary regimes. The empirical analysis study done by Du and Zhu (2001) shows that many empirical studies differ in a number of ways. For instance, it is not proper for countries to use same as earlier methods, which was used their countries. For this type of issues, time periods and different methods are required.

The overall evaluation on the literature examined in the case of growth and exchange rate regime relationship is given by Goldstein (2002), his study might be useful in two ways; first is to find how a nominal variable affect the growth, secondly, exchange rate regimes not affected in the long-run growth.

3.4. Summary and Conclusion

This chapter discussed a brief literature review on each objective wise. Firstly, it was looking on the exchange rate regimes and its impact on inflation-related

issues towards the BRICS countries. Secondly, it presented a brief a brief critical literature review on exchange rate regimes and its impact on the growth of BRICS countries. By focusing on different classification of exchange rate regimes, measurements and their conclusions on these issues. It was observed that there is a no clear conclusion on which exchange rate regimes id fit for these macroeconomic variables stabilisation.

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Chapter 4

Macroeconomic Trends in BRICS Countries

4.1 Introduction

Brazil, Russia, India and China together form the grouping acronym BRIC. Jim O' Neill of Goldman Sachs in his paper "Building Better Global Economic BRICs" a paper focusing on the growth aspects of the four largest emerging economies that are distinct in cultural aspects and geographical positions, coined the term for the first time in 2011. According to him in the current global scenario, the cooperative strength of BRIC has a pivotal role to play in the growth of the global economy. The BRIC nations witnessed rapid growth changing the life style of the population and the global economy as compared to the other nations that stumbled across the deficit budgets, mounting unemployment rates, and ineffectual growth.

Goldman Sachs' report on the effective economic growth happening in Brazil, Russia, India and China (BRIC) nudged the world to realize the potential and importance of the group at the global level. The report pointed towards the unnoticed gradual shift occurring in the global economic power from the developed to the developing countries. The four countries together accounted for more than 25% of the world's geographical area, with 40% of the world's population, and their economies together contributed about 46.8% to the global growth in 2011.

Goldman Sachs noting the rapid growth of BRIC nations, proved in a paper that by 2050 the combined economies of BRIC could conceal the pooled economies of the current world opulent countries. These nations were seeking to form a 'political club' or 'alliance' which could convert their growing economic power into a greater 'geopolitical clout', so that at every global scale they would become the largest entity, the biggest and the fastest growing emerging markets. Jim O'Neill in August 2010, opined

that Africa would be the next BRIC nation, and thus, on December 24, 2010, South Africa was officially admitted into the BRIC nations. It was China and the other BRIC countries who had invited Africa to join the group. Thus, the cluster of BRIC nations now became plural in literal sense and was called BRICS.

This study is organized as follows: Section 4.2 Deals with the monetary policy frameworks in BRICS countries. Section 4.3 discussed the Global financial crisis and their impact on BRICS countries. Section 4.4 explains the economic structure of BRICS countries. Section 4.5 examines the exchange rate regimes and inflation. Section 4.6 briefly discuss the growth performance in BRICS countries and why BRICS are important in the emerging world order and the chapter concludes with Section 4.7.

4.2 Monetary Policy Framework in BRICS Nations

The monetary policy framework of the economies of BRICS operates differently as evident from Table 4.1. Nations like South Africa and Brazil concentrate on inflation- targeting regimes, while China, Russia and India operate various frameworks. The monetary phenomenon history is discussed here in brief.

Table 4. 1 Monetary Policy Framework in BRICS

Country	Monetary Policy Framework	Key Monetary Policy Tools	Objectives
Brazil	Inflation Targeting	Interest rate (Selic rate): Interest rate on overnight interbank loans collateralized on federal debt instruments	Inflation point target 4.5 per cent with tolerance range of 2% points headline CPI
Russia	No single target indicator -Inflation (CPI) targeting for 3 years period -Managed floating exchange rate regime	OMOs and standing facilities; reserve requirements	To ensure stability of national currency
India	Multiple Indicators Approach	Key policy Report/ reverse repo rate and reserve requirements, CRR and SLR	Maintain price stability, financial stability and ensure appropriate flow of credit to productive sectors
China	Multiple Indicators Approach	Reserve requirement ratio, central bank base interest rate, rediscounting, central bank relending, open market operation,	Maintain the stability of the value of the currency and thereby promote economic growth

		and other policy instruments specified by the State Council	
South Africa	Inflation Targeting	Key policy rate: Repurchase rate	Inflation target range for headline CPI of 3-6 per cent combined with financial stability objective

4.2.1 The Central Bank of Brazil

It was in June 20, 1996, that the monetary policy committee (COPOM) of the Central Bank of Brazil (BCB) was created. It was allotted the responsibility of setting the viewpoints regarding the interim interest rate and a suitable monetary policy. Enhancing the transparency, providing regularity in monetary policy and their decision making processes were the major objectives behind the creation of COPOM.

In June 1999, for making the monetary policy effective a formal inflation-targeting framework was executed by Brazil. In this process, COPOM set their main target in monetary policy decisions to achieve the National Monetary Council's (CMN) inflation targets. The Governor of the Central Bank writes an open letter to the Minister of Finance when the inflation breaks the target set by the CMN. The letter clarifies the reasons for the mishap along with the rectifying measures taken to bring inflation back to the target, and the required period to obtain the effect of the changes made.

Over-Selic rate, which is commonly understood as inter-bank interest rate is the main instrumental policy of the BCB. The target for over-selic rate is set in the BCB's monetary policy committee's (COPOM) regular meetings. Open Market Operations Department (Demab) is made responsible to meet 22 such set targets began by the COPOM through market operations.

Since 2006, COPOM has met eight times, with each meeting lasting for two days. Every minute of the meeting is made available by the Committee on the website of the Bank exactly eight days after each meeting and the press officer then passes it onto the press. The Inflation Report of Central Bank is published quarterly (March, June, September, December) by COPOM detailing information on nation's economic conditions and COPOM's new inflation projections made in its latest meeting.

4.2.2 Bank of Russia

The Bank of Russia's monetary policy is intended to preserve the financial stability of the nation and create new conditions favorable for the economic growth that can be sustained. It was in the beginning of the 21st century that Russia started new policies to contain inflation rates and smoothen the fluctuations of nominal exchange rate. In reducing the rate of inflation, the bank

started measures like reducing the interventions made in the domestic foreign exchange market, increasing the flexibility of exchange rates, and gradually initiated winding up anti-crisis measures for stimulating the interest rate policy. The monetary policy committee set their principal objective as reducing inflation to an annual rate of 5% for the following three years.

Currently, the Bank of Russia uses standing facilities, open market operations and reserve requirements as the different monetary policy instruments. The Bank of Russia impacts its interest rates through the open market operations and standing facilities, where the REPO and lombard loans ─ the fixed rate on overnight refinancing operations become the upper limit of the interest rate corridor and fixed overnight deposit rate turns out to be the lower limit.

Intended at justifying the effects of external shocks caused at the background of managed floating regime on the economy of Russia, the exchange rate policy was implemented by the Bank of Russia. For Russia, the ruble value of the bi-currency basket is the functional standard of the exchange rate policy which presently consists of 0.55 US dollar and 0.45 euro. The floating operational intra-day band of fluctuations in the value of bi-currency basket is used by the Bank of Russia.

4.2.3 Reserve Bank of India

Reserve Bank of India (RBI), the nation's sole monetary authority formulates, implements, and monitors the country's monetary policy to confirm adequate credit flow to the productive sectors and maintain price stability as their major objective. In India, monetary policy is concerned with rising current capital account liberalization, changing patterns of credit requirements of the real sector, liberalization of the financial sector, and rapid changes in the world economic scenario. Thus, substantial changes are seen in the functional procedure of monetary policy in terms of targets and instruments.

The two major objectives of India's monetary policy as mentioned earlier are maintaining price stability and ensuring availability of adequate credit to productive sectors of the economy. This will ensure constant growth of nation even though their relative importance varies depending on the different

circumstances. Currently, along with this an inclination has developed for the interest rate that creates soft and flexible environment within the framework of macroeconomic stability. Though the use of broad money as an intermediate target has been de-emphasized, the growth in broad money (M3) is continued to be used as an important indicator of monetary policy. It was in 1998-99, that a multiple-indicator approach was adopted to draw policy perspectives where the interest rates or rates of return in different markets (i.e., money, capital, and government securities) along with high frequency data on currency, fiscal position, credit extended by banks and financial institutions, trade, inflation rate, exchange rate, capital flows, refinancing and transactions in foreign exchange are juxtaposed with output data.

RBI has also restructured its supply of instruments, slowly substituting direct instruments with the indirect ones along with the increasing market orientation of the financial structure and deregulation of the operations of commercial banks. In recent years, the thrust of monetary policy has mainly been to develop a group of instruments that could transmit liquidity and interest rate signals in a more flexible and bidirectional manner in a short period. It was in June 2000, that Liquidity Adjustment Facility (LAF) was initiated to modulate short-term liquidity and signal, with short-term interest rates. The LAF usually functions using repo and reverse repo auctions, thus establishing a vent for the short-term interest rate to be consistent with other policy objectives. The RBI has thus been able to modulate the large market borrowing program by combining strategic devolvement/private placement of government securities with active open market operations.

4.2.4 People's Bank of China

It is The People's Bank of China (PBC) that determines the objectives of monetary policy in China. Their main objective is to sustain the stability of the currency value which ultimately promotes economic growth. The central bank base interest rate, reserve requirement ratio, central bank lending, rediscounting, open market operations, and other policy instruments specified by the State Council are the major monetary policy methodologies initiated by the PBC.

In the formulation and adjustment of monetary policy and in macroeconomic management, China's Monetary Policy Committee plays an important role. It is the State Council that prescribes the composition, responsibilities, and working procedures of the committee and the committee made the consultative body responsible for the formulation of monetary policy by the PBC. The major responsibilities of this body are to advise on the formulation and adjustment of monetary policy, the targets needed for a certain period, application of monetary policy instruments and major monetary policy measures, and coordination between monetary policy and other macroeconomic policies. The committee also plays a consultative role based on the inclusive study made on macroeconomic situations and the macro targets set by the government. The committee usually functions through regular quarterly meetings. An ad hoc meeting could be held in urgent case, if proposed by the chairman or recommended by more than one-third members of the monetary policy committee.

4.2.5 South African Reserve Bank

In the Constitution of the Republic of South Africa, the South African Reserve Bank's (SARB) mandate is defined as "the protection of the value of the currency in the interest of balanced and sustainable economic growth in the Republic." It is from this constitutional mandate, that the bank derives its primary goal of the South African economic system. Their main objective is 'achievement and maintenance of price stability'. In February 2000, the monetary policy adopted inflation targeting as a framework. The main objective was to achieve and sustain headline with CPI inflation within the range of 3-6% on a continuous basis.

The government also helps in setting the inflation target in consultation with the Reserve Bank. The monetary policy committee of SARB meets at least six times a year. Decisions made are publicized immediately after the meeting at a press conference that is transmitted on television and later the monetary policy committee statement is published on SARB's website. The minutes of the meetings are not publicized on the website, but the bi-annual Monetary Policy Review, which is published later discusses the factors influencing inflation and the risks to the output. SARB also conducts Monetary Policy

Forums that connect directly with the public twice a year held in major centres of the country. In addition to this, the Governor of SARB appears at least thrice a year before the Parliament's Portfolio Committee on Finance.

The SARB thus, implements inflation targeting in a flexible and forward-looking manner acquiring knowledge of external shocks to the economy, along with other factors like the changes in the output gap and domestic imbalances. Financial stability is yet another important objective of SARB.

SARB also focuses on maintaining and improving its domestic market operations. It carefully monitors the liquidity in the domestic and international interbank markets. It was not necessary to provide any special or additional liquidity to domestic banks beyond the normal daily operations during the global financial crisis and the subsequent recession, even when the contingency plans were put in place and communicated to the banking counterparties,.

Further, the monetary policy committee grasps new movements in the exchange rate and their potential impact on inflation in determining policy rates. Still, the rand is a free-floating exchange rate and SARB never tried to influence the level of the currency. Interventions, if any, were aimed at easing the excessive currency volatility through open-market operations in the short term. Through the last few years, reserve accumulation became very necessary to reduce South Africa's external vulnerability in confronting a rising current account deficit.

4.3 Global Financial Crisis and Its Impact on BRICS Nations

Developed countries had witnessed a global financial crisis in 2008 which had impacted the world economy severely and their economic recovery prospects. The BRICS countries or the newly emerging economies, namely, Brazil, Russia, India, China and South Africa had to confront bigger challenges during this crisis. Thus, it becomes important for each of these nations to alter their development strategies so that sustainable economic development could be achieved fast.

The BRICS nations are all developing countries. They ensure healthy economic development and a speedy growth. Today, though they have become prominent names on the world economic stage, they have to face several challenges like unstable economic development models, the pressure of

economic transformation and upgrading, the negative impact of unfamiliar challenges, and external strategic pressure/internal political uncertainty.

The economic development models of developed countries like the United States, Europe and Japan are totally different from that of the BRICS nations. Abundant mineral resources, low-cost labour and few technological innovations form the basis of economic growth in the five BRICS countries. For instance, China depends mostly on investments vis-a-vis consumption which does not have any contributing value for the growth of its economy.

4.4 The Economic Structures of BRICS Nations

In reality, the economic structures of BRICS nations are not sufficient. Russia mainly depends on energy, military and heavy industries for its economy, while Russian services and financial sector are underdeveloped. China stands at the farther end of the industry-chain structure, while South Africa, Brazil and India cannot claim to have a comprehensive industrial system and their external dependence is evident.

Considering the inflation prospective, both the external and internal environmental changes had caused these large emerging economies to devote their time to the transformation, the urgent and the most difficult task. At the global level, it is noted that for the BRICS countries there was a general rise in the inflation rate. In the last few years, the overall inflation rate of BRICS countries have increased year after year. In 2012, the exchange rate of the Russian ruble to the US dollar had appreciated by 5% and renminbi (currency of the People's Republic of China) had appreciated by 5%. On the other hand, the Indian rupee, Brazilian real and South African rand together confronted serious devaluations as these countries experienced a drop in the growth of capital flight and foreign investment.

China and India in regarding the case of labour force mainly relied on profuse and at the same time low-cost labour force. Thus, these countries are engaged in the outsourcing of services and in processing and exporting of low value-added labour-concentrated products. This will easily influence the international market, which substantially decline the demand in developed markets and market protection policies. Russia, Brazil and South Africa

primarily develop mineral products for the purpose of export. It is the export revenue that is vulnerable to international demand and price fluctuations.

External challenges like the South China's Sea dispute, the East China's Sea Diaoyu Island's issue, and the China/India territorial issue add to the domestic pressures of each nation. Similarly, Russia had a strained relationship with western countries due to Crimea and the recent Malaysian plane tragedy in Ukraine. These issues will surely decline the economic growth of the nation. At the same time internal challenges also matter. In BRICS countries political transparency is not so good. Corruption, polarization and terrorism are other issues which affect economic development, political stability and market confidence.

These challenges give the impression that the relation among the BRICS nations is not very smooth. BRICS is a group of nations where each country has its own circumstances. But these evident cracks between the BRICS countries imply that the economic ties between the countries are not very strong. The volume of trade is insufficient; their industries do not complement each other satisfactorily and information exchange needs to be strengthened. To resolve these issues, the rift is relatively compared to that of developed economies and are studied as the temporary fluctuations that happen during the process of economic cyclical changes. If handled properly, these cracks will not change the overall trend of the economic development of the BRICS countries.

The huge population that provides resource advantages and some industrial advantages important in the international division of labour is the advantage of BRIC nations. Only such inclusive reforms can promote rapid economic development. In the BRICS countries, economic development is not aided by technology. The support of technology can do more wonders when merged with labour resources. BRICS nations must also increase innovative ability along with the advancement of continuous independent and integrated innovation. They should also create a social atmosphere for creative innovative ideas in order to improve economic innovation which is possible only by introducing and training the talented mass. The talents should be used to build an innovative environment and the rights of intellectual property should be protected with the strictest legal measures.

The spatial disparity among BRICS countries has resulted in increasing the cost relatively more than economic cooperation. During this period of globalization, it is proper for the BRICS countries to have a more practical approach, where more effective measures and longer-term plans are necessary to further promote economic cooperation.

To meet these challenges, few developments were recently introduced by the New Development Bank (NDB), commonly known as the BRICS Development Bank, whose sole purpose is to establish greater financial and development cooperation among the five emerging markets. It is expected that through these relations between these countries will be strengthened, creating more opportunities for sustained economic growth and development.

4.5 Exchange Rate Regimes and Inflation

Researches in the context of both developed and developing countries have been conducted on choice of exchange rate regimes in countries. Distinctly, in the BRICS countries, literature on the exchange rate regimes and its inflation and economic growth effects are very few. Although, the available literature explains the association of the different exchange rate regimes with the indicators of macroeconomic performance, like trade flows, growth and inflation, but is limited. More than empirical investigation, most of these studies focus on theoretical and conceptual discussions on the link between exchange rate regimes and macroeconomic performance. The main reason behind this is the complexity of the issue that gives rise to problems in relation with the exchange rate regime classification systems. Moving on, there is no consensus in the existing literature about the link between exchange rate regimes and macroeconomic performance. As it has been identified that the macroeconomic performance under different exchange rate regimes differ according to the structural characteristics and the development stages of a country, the succeeding analysis focuses mainly on literature on developing countries. For example, the result for an advanced economy may be different from that of a developing economy, when we differentiate macroeconomic performance under a certain exchange rate regime. There is an inevitable difference in countries which are more linked with world capital markets as compared to those that are not among the developing countries.

4.5.1. Inflation:

Theoretical literature establishes a healthy relationship between inflation and fixed exchange rate regime. The government by maintaining an acceptable nominal anchor can reduce inflation to maintain fixed exchange rate regime. Empirical research on this topic shows inconclusive and extensive results. Husain *et al*. (2005) using the data from 158 advanced, emerging and developing countries for the period 1970-1990 studied and classified exchange rate regimes on the basis of the Reinhart and Rogoff's (2004) 'natural classification'. The performance of exchange rate regimes in terms of inflation, growth and crisis vulnerability was explored under natural classification and the results were separately evaluated based on the country's development stage. Following are the main results of the evaluation with regard to inflation for developing countries:

a) The exchange rate regime and lower inflation are directly proportional to each other. The former being more rigid, controls the later better, without giving-up in terms of economic growth.

b) Higher inflation is seen in developing countries with flexible exchange rates, while effects of positive economic growth are deficient.

c) Developing countries with fixed exchange regimes that have limited access to international financial markets, have minimum inflation and maximum regime durability.

The study also found that an inflexible exchange rate regime is related to minimum inflation, though the difference in inflation between those with inflexible and flexible regimes is lesser for developing countries as compared to emerging market economies that are more integrated with financial markets. On the contrary, a relation between the flexible exchange rate regime and higher inflation was not found for the advanced countries.

Further, Ghosh et al. (1997) used a sample of 140 countries with data spanning from 1960-1990 and found a very similar result. In the results of both the studies, pegged exchange rate regimes were found to be associated with lower inflation because of minimum monetary growth and lower residual velocity growth that controls interest rate effects and income. These results were held even after controlling for endogeneity of regime choice. The same results were not obtained for countries that have De Jure pegs, but De Facto floats. In

spite of this, Ghosh *et al*. (1997) like Hussain *et al*. (2005) did not compare the different groups of countries. Grabbing a different methodology from these studies, Bleaney and Francisco (2007b) alienated soft pegs from hard pegs in their study on developing countries. Subsequently, instead of distinctly categorizing crawling bands and crawling pegs they were all grouped as soft pegs. They also encompassed other variables like past inflation and employed fixed country effects to make the relationship among the inflation and exchange rate regime healthy. Conclusively, they discovered that though hard pegs achieve minimum inflation in developing countries, soft pegs do not have any counter-inflationary benefits in the case of further flexible exchange rate regimes.

4.6. Growth Performance in BRICS Countries/Why BRICS are Important in the Emerging World Order

It is broadly observed that in the past few decades the growth caused by the biggest developing countries, predominantly the BRICS, became a much more substantial force in the world economy besides playing an inevitable role in decision making.

India and Brazil are found to be comparatively more domestic demand-driven economies in BRICS. They achieved faster economic recovery from the financial crisis of 2008 than other advanced and emerging market economies. Though their external linkages are very strong, they have however, undertaken trivial rebalancing of their economies with regard to their domestic sectors during the post-crisis period. On the basis of an assessment by Goldman Sachs, among BRICS, four countries are estimated to be accountable for 47% of global GDP by 2050 that would noticeably alter the list of the 10 largest economies in the world. Over the medium- to long-term a vital variation that we may expect is that there may be difference between the top 10 countries in terms of per capita GDP and the top 10 countries in terms of GDP. The inborn potency of the BRICS originates from solid domestic demand-based economies in the case of Brazil and India, important external relationships in the case of Russia and China, while the huge resource base and vast unexploited growth potential of the African continent are the benefits of South Africa.

In the present decade, amid BRICS, the economies which have been growing rapidly are China, followed by India. The Chinese economy grew at an average annual rate of 9.9% during the period 1978 -2009 that is much higher than the world average growth rate. After the financial crises of the 1990s, the growth performance of Brazil and Russia have also enhanced expressively. Table 4.2 shows that the persisting economic reforms and enriched macroeconomic fundamentals accompanied by a buoyant macroeconomic environment have led to improved growth performance of the BRICS in the last decade (Table 4.2).

Table 4.2: Growth Rate of Gross Domestic Product of BRICS Countries

Names	1991-2002	2002	2005	2006	2007	2008	2009	2010
Brazil	2.6	2.7	3.2	4.0	6.1	5.2	-0.6	7.5P
Russia	6.3	4.7	6.4	8.2	8.5	5.2	-7.8	4.0P
India	5.7	4.6	9.2	9.8	9.4	7.3	5.7	10.4
China	10.3	9.1	10.4	11.6	13.0	9.6	8.7	10.3
South Africa	2.1	3.7	5.3	5.6	5.8	3.7	-1.7	2.8
Advanced Economies	2.8	1.7	2.7	3	2.8	0.5	-3.2	3.0
Euro Area	2.1	0.9	1.7	3	2.8	0.6	-4.1	1.7
USA	3.5	1.8	3.1	2.7	2.1	0.4	-2.4	2.8
World	3.2	2.9	4.5	5.1	5.2	3.0	-0.6	5.0

Note: P implies projected value.

Source: World Economic Outlook, IMF (2011).

As replicated in the high savings and investment rates, the strong macroeconomic fundamentals are the basic reason for the strong growth performance of the BRICS, though South Africa and Brazil still have chances to further increase their growth rates. Over the past decade, as government and public corporations have moved into infrastructure investment, the investment ratio of South Africa has increased intensely, but due to low savings there is suppression on their overall investment. China top the list, followed by India with regard to investment and savings among BRICS nations. In the case of China and India, the contribution of net exports to GDP reduced because of high

savings. Consequently, domestic savings largely sponsored the investment-led growth. Table 4.3 presents the savings-investment profile of BRICS nations.

Table 4.3. Gross Domestic Investment and Savings of BRICS Countries

Country		1990	1995	2000	2006	2007	2008	2009	2010
1		2	3	4	5	6	7	8	9
Brazil	Investment	20.2	18	18.3	16.8	18.3	20.7	16.5	19.3
	Saving	21.4	16.5	16.5	19.7	18.8	18.4	16.1	17.0
Russia	Investment	NA	25.4	18.7	21.4	24.1	26.2	22.7	19.8
	Saving	NA	28.8	38.7	34.1	33.2	34.9	33	24.7
India	Investment	24.2	26.6	24.2	36	37.6	35.6	34.5	37.9
	Saving	22.7	25.4	23.2	32.9	33.5	30.2	29.8	34.7
China	Investment	36.1	41.9	35.1	43.6	41.7	42.5	44.8	48.8
	Saving	39.6	44.1	37.5	51.3	50.5	50.2	54.2	54.0
South Africa	Investment	NA	18.2	15.9	19.7	21.3	22.0	19.4	21.7
	Saving	19.1	16.5	15.8	14.4	14.1	14.9	15.4	20.0

Note: Not available

Source: World Bank Database

Huge topographical dimensions and population size are the prominent features of the BRICS economies. It is generally observed that for initiating the most stabilizing forces, all the BRICS economies have a wealthy middle class, which is considered to be their great potential. By offering a strong foundation for the growth and expansion of the economies, this middle-income group in each country is emerging at wavering rates although the upcoming path is clear, which is the broadening and deepening of the middle class.

4.6.1. Market Share in Global GDP

Over the last two decades, the BRICS economies have developed as a global force due to their increasing share in the world GDP. BRICS accounted for 10% of the world GDP in 1990, which is currently more than 25%. Table 4.4 shows that BRICS' share in the world GDP increased by 150% during the past 20 years, which compared to their economic size is considered insignificant.

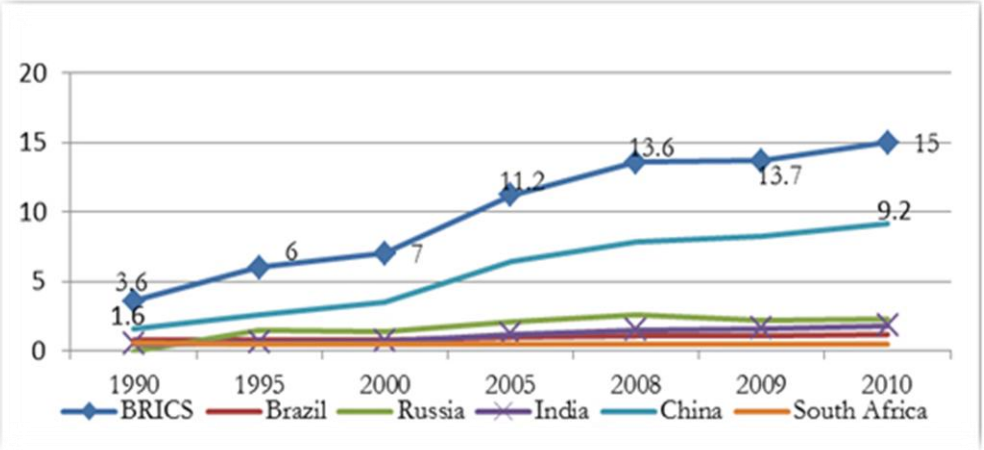
Table 4.4: Overview of BRICS, 1990 and 2010								
Country	**Rank in World**	**GDP (PPP bn)**	**GDP ($ bn)**		**Share in World GDP (%)**		**Per Capita GDP ($)**	
			1990	**2010**	**1990**	**2010**	**1990**	**2010**
Brazil	8	2,172	508	2,090	3.3	2.9	3,464	10,816
Russia	6	2,223	–	1,465	–	3	–	10,437
India	4	4,060	326	1,538	3.1	5.4	378	1,265
China	2	10,086	390	5,878	3.9	13.6	341	4,382
South Africa	26	524	112	357	0.9	0.7	5,456	7,158

Source: International Monetary Fund database adapted from the BRICS Report, 2012

4.6.2. Share in the Trade

There has been an invariable improvement from 3.6% to 15% in the share of trade of BRICS in world GDP during the last two decades. China accounted for the majority of it; its share rose from 2% to more than 9% over the period. Shares of other countries have also increased. Brazil's share rose from 0.8% to 1.2%, while Russia's share increased from 1.5% to 2.3% and in case of India the share increased from 0.5% to 1.8%. However, South Africa's share has remained persistent in the world trade during the past two decades. Figure 4.1 presents the trends of BRICS nation's trade share over the last two decades.

Figure 4.1: Trend of Share of BRICS' Trade in Global Trade, 1990-2010 (in %)

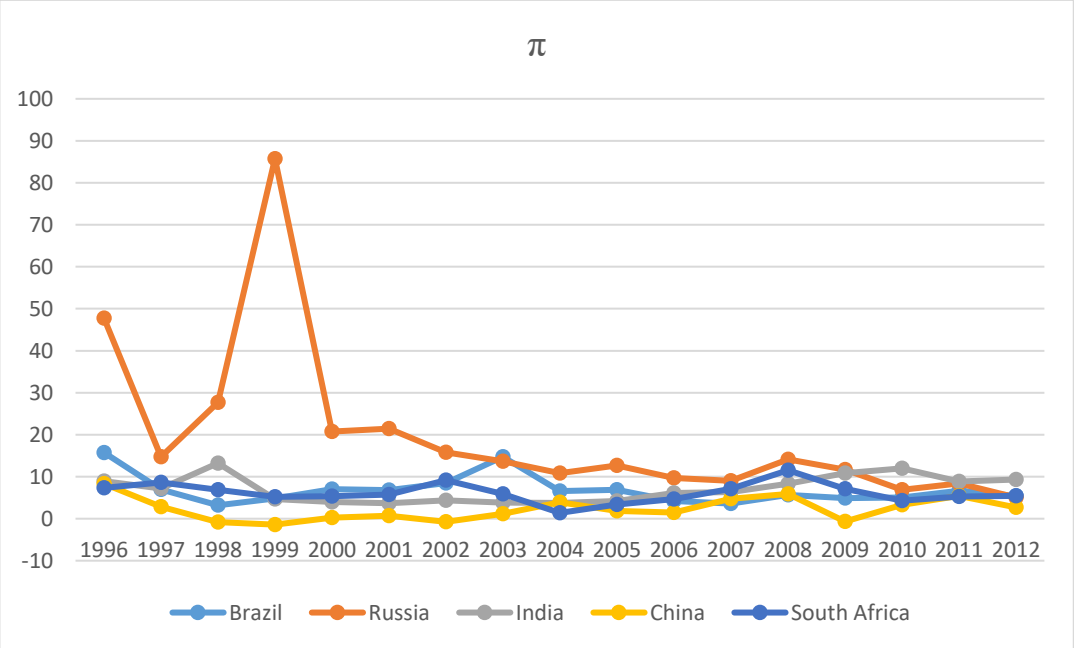


Source: UNCTAD, adapted from the BRICS Report 2012.

From the point of trade, their shares play an important role in enhancing the economic development of these countries. Evidences show that trade liberalisation played a major role in encouraging economic growth and simplifying development in all the BRICS countries. The main economic parameters like extent of trade openness, present account balance and forex assets amid others show the plainness and maintenance of a healthy relation among BRICS countries.

When we consider the issue of inflation performance of the BRICS countries, it is observed that inflation has radically diminished from a binary numeral to solitary numeral. During the period 1996-2000, the highest rate of inflation was in Russia (47.7%) and huge reduction was observed from 2000. From 2000, the rapidity of the rate reduced and it came down to the solitary number at 5.06% in the year 2012. From the beginning of 1992, Russia experienced a negative economic growth and high inflation which was persistent till 1998. However, after 1998 Russia succeeded in maintaining good economic development. Figure 4.2 presents the inflation rates of BRICS nations over the last two decades

Figure 4.2: Inflation in BRICS Countries



Source: Author's own calculations based on the data obtained from WDI

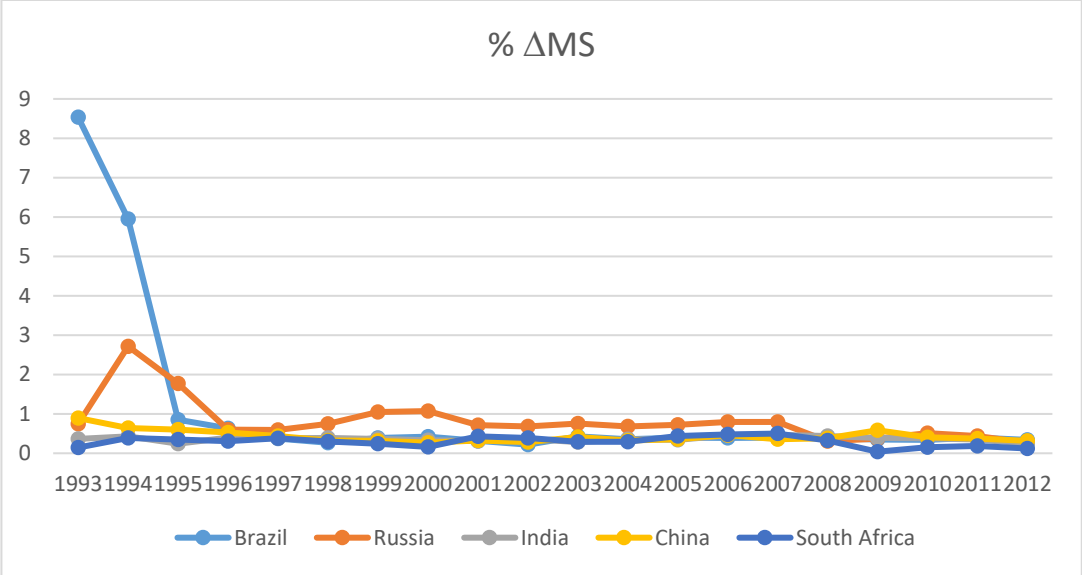
Before 1996, other countries like Brazil faced a similar situation. It is observed from Figure 4.2 that Brazil's inflation rate improved from 15.7% in 1996 to 5.4% in 2012. During the early 1990s, although Brazil faced a period of hyperinflation, it redeemed its stability by accepting the 'Real Plan'. In 2004, Brazil's growth rate was 5% approximately.

In case of China, the inflation decreased from 8.3% in 1996 to 2.6% in 2012. Since 1990s, China has been showing a great stability in its growth and minimum inflation rate. In case of India, the inflation rate was 8.9% in 1996, which rose to 9.3% in 2012, which is considered as a stable rise. Finally, South Africa experienced an inflation rate of 7.3% in 1996 which came down to 5.4% in 2012. Overall, BRICS countries succeeded in maintaining a minimum inflation rate as compared to the other emerging countries.

Around 10% of present global exports involve exports from the BRICS nations. In global export, the percentage share of BRICS nations increased from 4.2% in 1992 to 10.1% in 2004, when global trade amid the developed countries reduced from 52.6% to 42.1%. Among the BRICS countries, a great gap is found between China and the other four nations. China's exports have risen to 6.4% of global exports as a volume to imports, in comparison to those of Brazil of 1.3%, Russia of 1.8%, India of 0.8%, and South Africa of 0.4%.

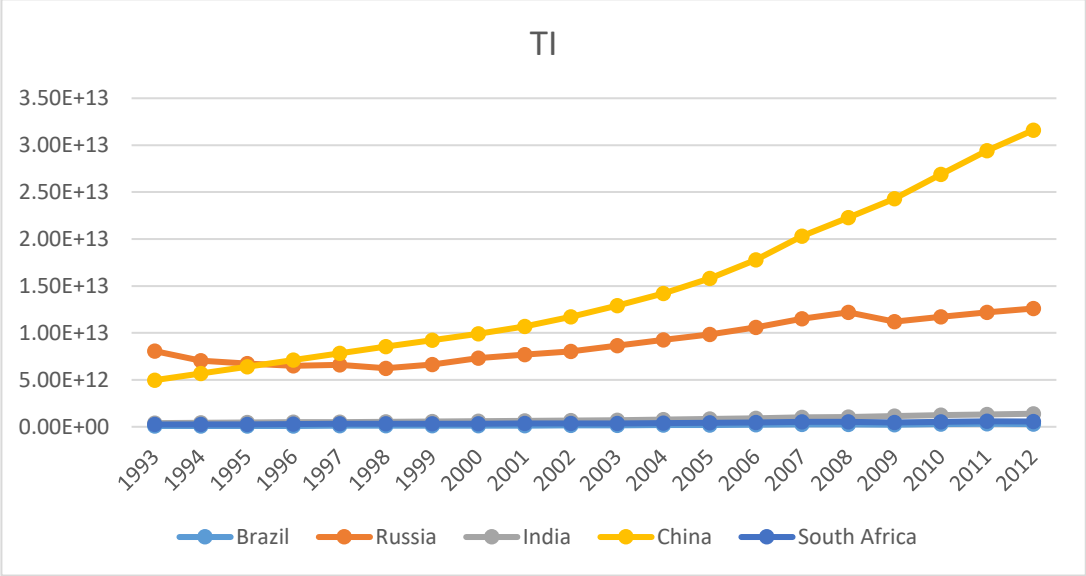
The following figures 4.3 and 4.4 and 4.5 shows the Rate of Growth of Money Supply in BRICS Countries, Terms of Trade in BRICS Countries and Trade Openness in BRICS Countries respectively.

Figure 4.3: Rate of Growth of Money Supply in BRICS Countries



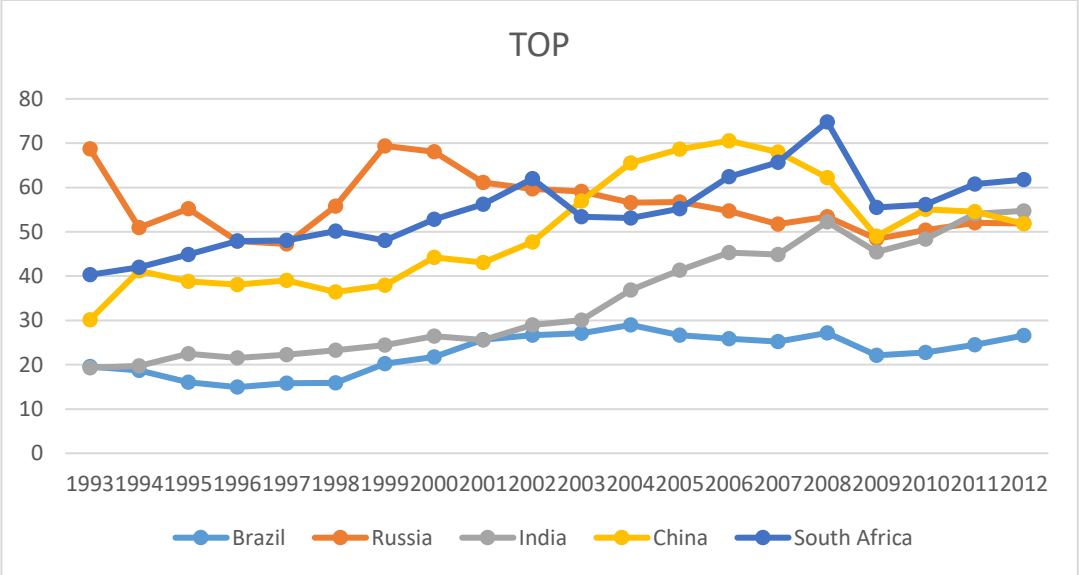
Source: Author's own calculations based on the data obtained from WDI

Figure 4.4: Terms of Trade in BRICS Countries



Source: Author's own Calculations based on the data obtained from WDI

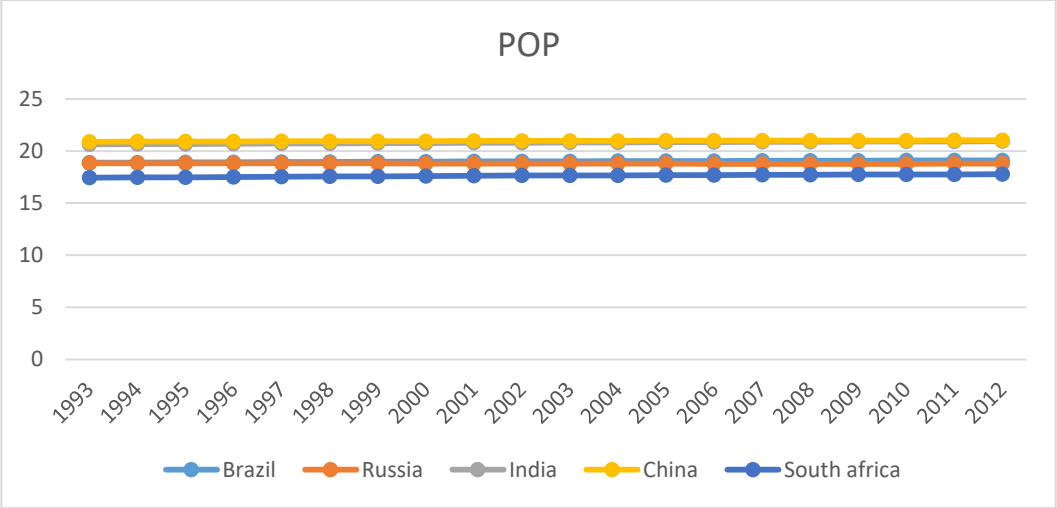
Figure 4.5: Trade Openness in BRICS Countries



Source: Author's own Calculations based on the data obtained from WDI

With regard to population, India and Russia's population began to diminish, on contrary to the enduring healthy growth in that of China's, while South Africa and Brazil managed to maintain a gentle growth in population. On the other hand, Africa's population that has been rising rapidly may double by 2050. The consequences of population growth on per capita GDP growth is direct and universally negative. When relations are involved in the statistical model it will become stronger. Presently, in developing countries population growth can be influenced by their respective governments. A clear example is obtained from China, where the government unexpectedly presented a group of highly coercive approaches to decrease the total fertility rate from 5.8 to 2.2 births per women during 1970 and 1980. Figure 4.6 presents the population statistics of BRICS nations over the last two decades.

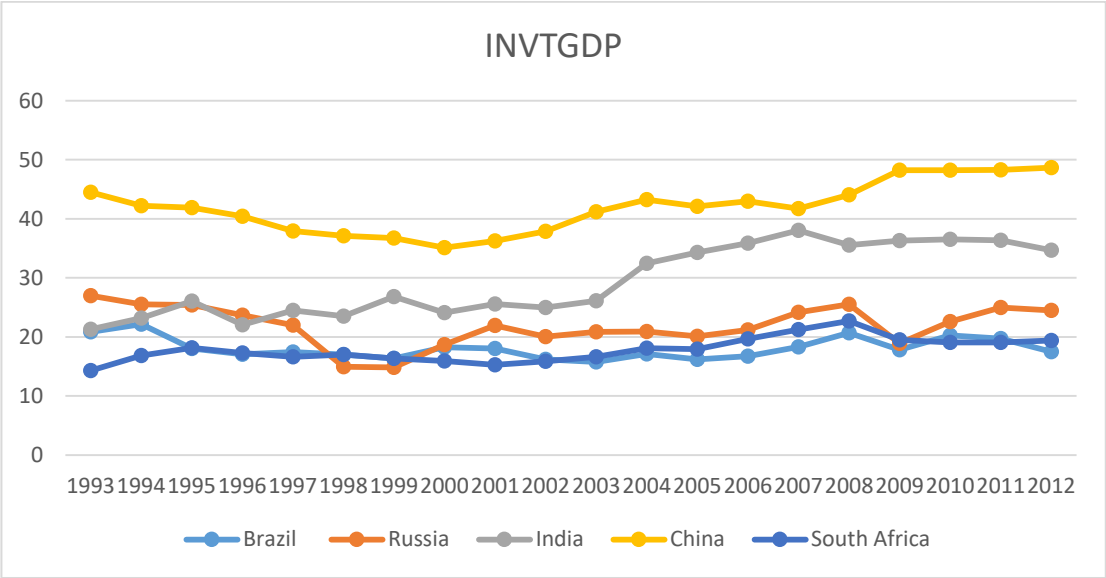
Figure 4.6: Population in BRICS Countries



Source: Author's own Calculations based on the data obtained from WDI

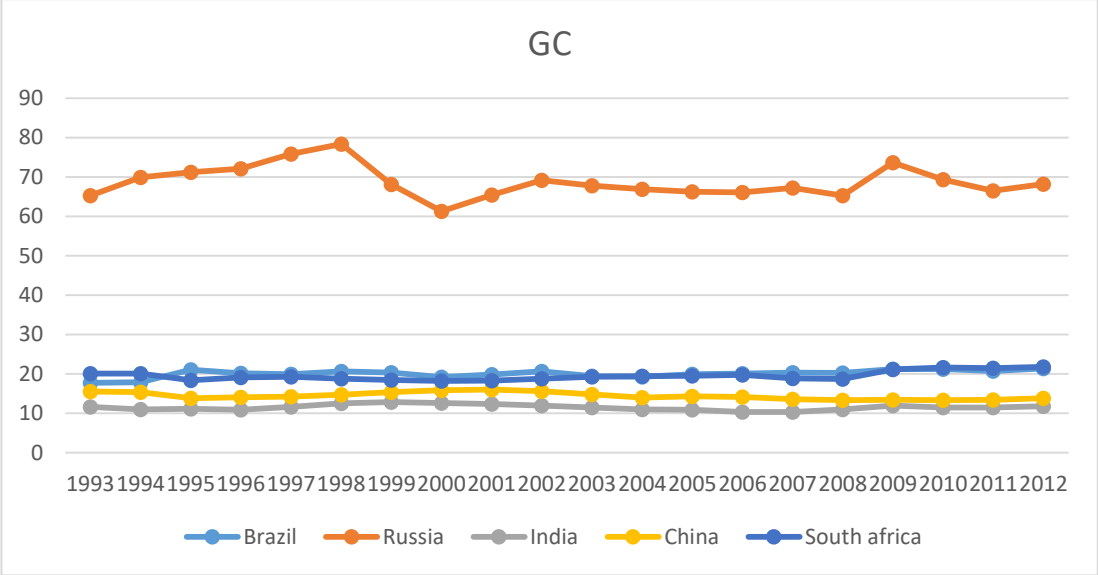
Since 1990s, with regard to investment/GDP ratio, China has topped the list of BRICS nations (with above 40% trepidations regarding 'excess investment') vis-a-vis the unproductivity in Russia and Brazil. China maintained a constant investment-GDP ratio from 1990 till 2012. China was followed by India in terms of investment/GDP ratio, while South Africa was at the fourth position. Figure 4.7 presents the investment-GDP ratios of BRICS nations over the last two decades.

Figure 4.7: Investment-GDP Ratio in BRICS Countries



Source: Author's own calculations based on the data obtained from WDI

Figure 4.8 Government Consumption in BRICS Countries



Source: Author's own calculations based on the data obtained from WDI

4.7 Conclusion

This chapter presents a concise picture of the BRICS nations' developments and their challenges in the present world portraying the economic structures of the

BRICS nations. Their financial policies, exchange rate regimes and exchange rate management systems are sketched. The chapter further discusses the effects of global currency crisis on BRICS nations. The aftermath of the crisis on BRICS nations are also discussed. The chapter briefly presents the BRICS nations' macroeconomic trend configuration, their share in the world GDP and trade as well as their investment and growth rates.

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Chapter 5

Data and Methodology

5.1. Introduction

This chapter deals with the modelling of exchange rate regimes, inflation, and growth. The purpose of the empirical investigation is to know whether exchange rate regimes have any impact on inflation and growth in the case of BRICS countries. The econometric issues and methods are discussed in section 5.2. The panel unit root techniques used in the study is covered in section 5.3. Section 5.4 deals with different panel regression methods. Sample period and data frequency is discussed in section 5.5, data and variables selection has explained in section 5.6, conclusion of the findings are provided in section 5.7.

5.2. Econometrics issues and methods

Panel stationarity (unit root) test have its root from time series stationarity. The main difference between panel and time series unit roots tests is that in time series asymptotic behaviour of the time-series dimension T is considered whereas, in the case of cross-sectional N dimension. In this way convergence of N and T is critical, if one wants to determine the asymptotic behaviour of estimators and tests used for nonstationary panels.There are numerous options to handle the asymptotics:

1. **Sequential limit theory**: In this case, the dimension is fixed, say for example N, and other i.e., T is allowed to go to infinity. It also provides intermediate limit; beginning from this intermediate point and N is allowed to grow large.
2. **Diagonal path limits:** In this case, N and T tend to infinity along a diagonal path. For example, monotonic increasingly connection amid N and T.
3. **Joint limits:** In this case, N and T are permitted to tend to infinity at the same time.

5.3. Panel Unit root Tests

5.3. 1. Levin-Lin-Chu Test

In time series or panel data studies, individual unit root tests have limited power. The power of unit root test lies in the probability of rejecting the null when it is false. The Levin-Lin-Chu test is one of the famous test of unit root in panel data. The test suggests following hypothesis:

H_0: Each time series has a unit root

H_1: Each time series is stationary

Where, across individual time series lag order p is permitted to vary. The technique works as follows:

First, for each cross-section augmented Dickey-Fuller (ADF) is run on the equation:

$$\Delta y_{it} = \rho_i y_{i,t-1} + \sum_{L=1}^{pi} \theta iL\, \Delta_{yit-L} + \alpha_{mi} d_{mt} + \varepsilon_{it} \text{ ---------- (1)}$$

Second, two auxiliary regressions are runned:

1. Δy_{it} On Δ_{yit-L} and d_{mt} to find the residuals *e ˆit and*
2. $y_{i,t-1}$ On Δ_{yit-L} and d_{mt} to obtain residuals *v ˆi,t*−1.

Third, residuals are standardized by performing:

$$e\tilde{}it = \hat{} eit/\sigma \hat{}\varepsilon i \quad \text{---------- (2)}$$

$$v\tilde{}i,t-1 = \hat{} vit/\sigma \hat{}\varepsilon i \quad \text{---------- (3)}$$

Where $\sigma_{\varepsilon i}$ signifies the standard error from each ADF test, and finally the pooled OLS regression is performed:

$$e\tilde{}it = \rho v\tilde{}i,t-1 + \tilde{}\varepsilon it \text{ ---------- (4)}$$

In case of null, ρ = 0. It can be seen in the original work of Levin *et al.*, (2002) that the standard deviation for t-statistics has to be adjusted. In Levin-Lin-Chu test the necessary condition is √NT /T → 0 whereas, sufficient conditions would be NT /T → 0 and NT /T → κ. (meaning that NT cross-sectional dimension N is a monotonic function of time dimension T). The

study (Levin *et al.*, 2002), also tells statistic performs well when N lies between 10 and 250 and T lies between 5 and 250. In the case of very small T, the test has low power due to is undersized. The cross-sectional independence of the test statistic is one of the important disadvantages of the test. Besides, under the null, all the cross sections have a unit root is very restrictive. Meaning that, in this case, intermediate case is not allowed in which at some cases individuals are subject to a unit root and some are not. In the case of very large T, Levin *et al.*, (2002) suggest individual unit root tests should be applied. On the other hand, if N is too large, usual panel data technique should be applied.

5.3.2. Im, Pesaran and Shin Test

As compare to as the Levin-Lin-Chu test the Im-Pesaran-Shin (IPS) test is not as restrictive since it allows for heterogeneous coefficients. Under null hypothesis all individuals unit root process follows :

$$H_0: \rho_i = 0 \forall_i$$

In case of alternative hypothesis it permits some of the individuals to have unit roots:

$$H_i: \{\rho_i < 0 \; for \; i = 1,2, \ldots., N_1$$

$$\rho_i = 0 \; for \; i = \; N_1 + 1, \ldots \ldots., N$$

In case of null,$\rho_i = 0$, , $t_{\rho i}$ is the individual t-statistic for all i, then the test is based on averaging individual unit root tests $\bar{t} = \frac{1}{N}\sum_{i=1}^{N} t_{\rho i}$. If the test statistic is properaly standardized, asymptotically it is N (0, 1) distributed. Under Monto Carlo simulations it is found the small sample performance of Im-Pesaran-Shin test is better than Levin-Lin-Chu test. In case of IPS, it requires N/T → 0 for N → ∞. If either N is large or if N is small as compare to T, the both IPS and LLC shows size distortions.

5.4. Panel Regression analysis

According to Asteriou and Hall (2007) basic linear panel model takes the following form:

$$Y_{it} = \alpha + \beta X_{it} + \mu_{it} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (1)$$

Basically, simple linear panel data model can be estimated using following methods:

A. **Pooled Ordinary Least Square method**: The model contains the common constant term.
B. **Fixed Effects Method:** the fixed effect model treat constant as group or section specific.
C. **Random Effects Method:** the random effect model treat constant for each group or section is random.

These methods can be briefly explained as follows:

5.4.1 Pooled OLS method:

This model can be specified as equation 1. A. the simple Pooled Ordinary Least Square method estimates a common constant $'\alpha'$ for all cross sections. This is based on the assumption that that the data set is a-priori homogenous. However, this method is bit limited and other more general versions involve inclusion of fixed and random effects in the method of estimation.

5.4.2 Fixed Effects (FE) Method:

It is one of the very versions of the panel regression model. In this method constant is considered as group specific, meaning that the method permits for different constants for each group. The FE estimators are also referred to be least-squares dummy variables (LSDV) estimator because, in order to allow for various constants for each group, the model takes the form:

$$Y_{it} = \alpha_i + \beta_i X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \cdots + \beta_k X_{kit} + \mu_{it} \quad \ldots\ldots\ldots (2)$$

5.4.3 Random Effects (RE) Method:

In this method constant is handled as different for different section or group. Therefore, the variability of the constant for each section comes from the fact that:

$$\alpha_i = \alpha + v_i \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

In the above equation v_i is a zero mean standard random variable and RE model takes the following form:

$$Y_{it} = (\alpha + v_i) + \beta_2 X_{2it} + \beta_3 X_{3it} + \cdots + \beta_k X_{kit} + \mu_{it} \quad \ldots\ldots\ldots\ldots\ldots\ldots (4)$$

$$Y_{it} = \alpha + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \cdots + \beta_k X_{kit} + (v_i + \mu_{it}) \text{ …….. (5)}$$

It can be understood the difference between FE and RE methods of testing panel data models by comparing equation 2 and 3. In the case of FE model, it assumes each country differs in its error term. Generally, in the case of a balanced panel, it is expected the FE model will work the best. In other cases, if the panel is unbalanced, the RE model might be appropriate. Hauman (1978) test is used to select the appropriate model between the FE and RE estimations. According to Hausman test, under null(H_0), RE model is suitable whereas, under alternate (H_1), FE model is suitable. Hence, under Hausman test, if 'p' value is significant then one has to reject H_0 and accept H_1. If not, RE model will be suitable for estimation.

5.5. Sample period and Data Frequency

The study covers annual observations for 5 BRICS (Brazil, Russia, India, China and South Africa) countries over the period from 1993 to 2012.

5.6. Data Sources and Variable selection

Table 5.1. ***Variables of Definitions and Sources***

Variables	Definitions and Sources
%ΔGDP	Rate of growth of real GDP (World Bank)
GC	Government consumption to GDP ratio (World Bank)
INGDP	Natural logarithm of initial real GDP (World Bank)
%ΔMS	Rate of growth of Money Supply (World Bank)
INVTGDP	Ratio of investment to real GDP (World Bank)
TOP	Openness ratio of the sum of the Exports and Imports to real GDP (World Bank)
POP	Natural logarithm of total population (World Bank)
TOTI	Terms of Trade; the ratio of the price exports to price of imports (World Bank)
$\boldsymbol{\pi}$	Annual percentage change in the Consumer Price Index (World Bank)
$\boldsymbol{\pi_{t-1}}$	One year lagged value of inflation rate.

PEGGED (exchange rate regime)	A binary variable. Takes the value 1 if a country has a pegged regime; takes the value 0 if a country has a non-pegged regime.
INFPEGGED	An interaction variable that consists of inflation and pegged

5.7. Conclusion

This chapter had briefly explained the data and methodological part. It discussed in detail of Unit root tests which were used and tested for the data analysis part of this study. The detailed theory and its implication were explained in this section. It also covers the Panel regression and Fixed and Random effects methods were explained concept wise. Finally, sample period and data variables, data sources which have used in the analysis also briefly summarised in this chapter.

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Chapter 6

Impact of Exchange Rate Regimes on Inflation of BRICS Countries

6.1. Introduction

In the current competitive economic world, the exchange rate regime plays a major role to determine and improve the country's economic activities and growth performance and acts as the fundamental macroeconomic policy choice for small and developing countries.

There are debates on the exchange rate regimes which have been prevalent in many policy circles. They have infrequently been independent of the regulations of international financial markets. According to the study of Calvo and Vegh (1994), the emphasis on issues in academic literature has been changed since 1980. The economists in the 1980s have tried to study the best stabilization instruments to implement the exchange rate regimes. Their debate focuses on, in what way different regimes will act as absorbers of external shocks or provide a shield against speculative attacks. The lack of consensus on the subject has been running parallel due to the recent developments in the real world. The debate on the exchange rate regime is questionable due to its differentiation in its categorization.

The influence of exchange rate regimes in developing countries has been a debatable issue and it is one of the most important arguments in the international economies. For the last four decades, there are many small and developing countries have been facing these types of issues. They are Mexican economic crisis (1982 and 1995), Crisis in East Asia (1997), Argentina's Great Depression (1998-2002) and Turkey crisis (2001). These issues have become a big challenge to the global economy since the great depression and provided a severe "stress test" for the global economic performance. Change in exchange rate regime has led to the high inflation rates and low or negative growth rates. There is an ongoing discussion in many countries over the years about the choice

of countries' exchange rate regimes. Their main focus is how the regimes have contributed to macroeconomic instability; and how the choice of exchange rate regimes might fix that macroeconomic turmoil and economic performance in developing countries. On the basis of these questions, this study is focusing only on BRICS countries to study the impact of exchange rate regimes on inflation in BRICS countries.

This study is organized as follows: Data and definitions of variables and sample period and data frequency are explained in section 6.2. The exchange rate regime classification procedure and coding are covered in section 6.3. Section 6.4 briefly discussed the econometric issues and methodology, the theoretical framework of inflation model and methodology. Empirical analysis and results, empirical findings of inflation performance are discussed in section 6.5. Section 6.6 tells the summary and conclusion.

6.2. Data and Definitions

The study delves into the annual observations of economic variables of BRICS' countries from 1993 to 2012.

6.2.1. Variables

Table 6.1. Definitions and Sources

Variables	Definitions and Sources
%ΔGDP	Rate of growth of real GDP (WDI)
$\boldsymbol{\pi}$	Annual percentage change in the Consumer Price Index (WDI)
%ΔMS	Rate of growth of Money Supply (WDI)
TOP	Openness: it is ratio of sum of the Exports and Imports to real GDP (WDI)
TI	Terms of Trade; the ratio of the price exports to price of imports (WDI)
PEGGED	A binary variable. It takes the value 1 when a country has a pegged regime; takes the value 0 when a country has a non-pegged regime.
$\boldsymbol{\pi_{t-1}}$	One year lagged value of inflation rate.

6.2.2. Sample Period and Data Frequency

The annual sample period covers from the year 1993 to 2012. The data frequency is determined according to the variable with the lowest frequency published, as a result, is expected with a strong relationship between Exchange rate regimes on inflation affected variables included in this study.

6.3. Exchange rate regime classification procedure and coding

There are different methods to classify exchange rate regimes to different countries. The IMF uses De Jure classification system to give coding for the countries that have fixed exchange rates for many years. There are few countries which have declared their regime choice whereas some other countries are not able to declare their regimes choice.

De Facto classification is a kind of coding that is based on the exchange rate movements and interest rate differentials. Some of these countries can use intervention data and direct intervention of currency markets. The changes in domestic interests ensure that the government is actively managing the exchange rate.

By using these annual classifications, it is determined that the exchange rate stayed within +/- 2% bands against base currency. Technically, it is testified that if the month end maximum and a minimum value of exchange stay within 0.4, this can be considered as pegged exchange rate regime. If it exceeds 0.04, it can be categorized as non-pegged. In order to prevent breaks in the peg status due to one-time realignments, if an exchange rate possesses the value of zero in eleven out of twelve months is considered to be a fixed entity. By using the annual data of BRICS countries from 1993 to 2012, out of 200 country/year observations with exchange rate data 87 are coded as Pegged, 101 as Non-Pegged and 12 do not have any data.

6.4. Econometric Issues and Methodology

The following section 6.4.1 deals with the theoretical framework and model building.

6.4.1. Theoretical Framework of Inflation Model

The earlier studies prove that the Inflation is mostly affected by the following variables like exchange rate, money supply, government consumption, real GDP, population, Terms of Trade and Trade openness. Based on these variables' relationship we present a functional form of these variables' impact of exchange rate regimes on inflation of BRICS countries.

The most typical association of fixed exchange rates with lower inflation rates is based primarily on the belief that a peg may play the role of a commitment

mechanism for monetary authorities. On that basis, this effect works entirely through the behavior of the monetary aggregates in the case of BRICS countries. The very important issues are that a credible peg may also lead to higher money demand and low inflation expectations and reduce the sensitivity of prices with respect to upward changes in money growth.

According to its supporters, many of suggested that lower inflation rates are associated because of following pegged exchange rate regime system. As mentioned above, a pegged regime may play a role as an anti-inflationary tool for developing countries. In addition, the literature focuses on a credibility effect of a pegged rate expectations on inflation that may soothe the velocity of money and price fluctuations in the developing world. In theory, a pegged exchange rate regime is expected to have an impact on the link between money and prices. Since a pegged regime is expected to affect the relationship between prices and money. This study uses a standard money demand theory as the core model to explain inflation performance. Therefore, the base model takes the form of a simple demand function in a time series model as the following:

$$\frac{M_t V_t}{P_t} = Y_t^{\alpha}\, i_t^{-\beta} \quad \alpha, \beta > 0 \qquad (1)$$

where M_t is broad money, V_t is residual velocity controlling for interest and income effect, P_t is the price level, Y_t is the real income, and i_t is the nominal interest rate at time t. Money demand increases with real income and decreases with nominal interest rate. Nominal interest rate can be formed by the Fisher equation, as the following:

$$i_t = r_t + \pi_t^e \qquad (2)$$

Where r_t is, the real interest rate and π_t^e is the expected rate of inflation, which can be defined as:

$$\pi_t^e = \ln(P_{t+1}^e) - \ln(P_t) \qquad (3)$$

In money market equilibrium it requires that money demand equals money supply; hence, money supply and money demand are denoted byM_t. By taking the natural logarithm and representing all variables but the real interest rate by lower case letters (i.e. ln Z=z), this study uses the following equation:

$$m_t + v_t = p_t + \alpha y_t - \beta(i_t) \qquad (4)$$

This can be formed and expressed as a percentage of change terms by taking the first difference of each variable. After rearranging the equation and using the Fisher equation in the equation (4), the study finds that inflation ($\pi_{i,t}$), is the percentage change in prices, and it's a function of the percentage change of money supply ($\%\Delta m_{i,t}$), the percentage change of income ($\%\Delta yi, t$), and the expected inflation rate ($\pi^e_{i,t}$), which is the lagged dependent variable, "inflation", to bring out the effect of past policies on present expectations. Therefore, a core regression equation is based on:

$$\pi_{i,t} = \emptyset\%m_{i,t} + \beta\pi^e_{i,t} - \alpha\%\Delta y_{i,t} + \in_{i,t} \qquad (5)$$

$\in_{i,t}$ is a regression error term defined as the sum of the unobservable change in the real interest rate (Δrt) and the change in the money shock (Δvt).

Finally, we come to the main regression model to bring out the effects of exchange rate regime policies on inflation; this study includes a regime of dummy variable (PEGGED). It shows, PEGGED takes the value of 1 when a country is categorized as a pegged and takes the value of 0 when a country is categorized as a non-pegged. Lastly, a dummy variable PEGGED is measured by using the Jay C. Shambaugh de facto scheme. Thus, the regression framework for inflation performance is the following:

$$\pi_{i,t} = \beta_0 + \beta_1\%\Delta MS_{i,t} + \beta_2\pi_{i,t-1} + \beta_3\%\Delta GDP_{i,t} + \beta_4 PEGGED_{i,t} + \beta_5 TOP_{i,t} + \beta_6 TI_{i,t} + \epsilon_{i,t} \qquad (6)$$

Based on the equation (6), the annual percentage change in inflation for country *i* (*i*=1, 2… 5) over time period *t*, with *t*= 1993, 1994- …-, 2012, depends on upon other explanatory variables. TOP is the openness to trade; it is the ratio

of the sum of exports and imports to real GDP. TOP is included to capture the effect of international trade on inflation in BRICS countries. TOP is predictable to be associated with lower rates of inflation because greater openness to trade creates incentives for adopting stable macroeconomic policies. Stable macroeconomic policies reduce fluctuation in prices. Moreover, an increase in openness to trade leads to a great variety in consumption, which could also reduce price volatility in BRICS economies. Another explanatory variable in the inflation model is the Terms of trade (TI). TI is the ratio of a country's price of exports to its price of imports. TI is contained within in the model to control the effect of outward shocks. TI is predictable to be a negative relation to inflation as long as the terms of trade rising for a country. Finally, to bring out the effect of past policies of inflation on present expectations, the lagged variable of the dependent variable is also used (π_{t-1}) in this model.

6.4.2. Methodology

The study uses econometric models to explain the effects of currency policies on inflation. The country fixed effects model is used to control unobserved or difficult to measure country characteristics in panel data when such variables differ crosswise countries but do not change over time in inflation model. For instance, cultural or historical ties could also play a role the choice of currency policies that do not change dramatically over time, but it differs across developing countries. Therefore, by using the country fixed effects model, the study can capture the effects of these unobserved omitted variables on inflation and eliminate the omitted variable bias in analysis part. Moreover, clustered standard errors are used in country fixed effects regressions. Clustered standard errors allow for heteroskedasticity and for autocorrelation within a country, but are uncorrelated across entities. Therefore, clustered standard errors are valid whether or not there are issues on heteroskedasticity, autocorrelation or both.

Additionally, time dummies are also used in inflation model. The reason is that common shocks from corner to corner countries (such as spikes in oil prices or fluctuations in the U.S dollar) influence all economies beyond the effects focused through the observed variables. Therefore, the time dummies

can control for unobserved or difficult to measure variables that are constant across countries but evolve over time.

6.5. Empirical Analysis and Results

The following section divided into three sub-sections. 6.5.1 explains the Descriptive statistical analysis. Section 6.5.2 explains the Unit root test analysis. Section 6.5.3. Explains the empirical analysis and discussion of the results.

6.5.1 Descriptive Statistical analysis

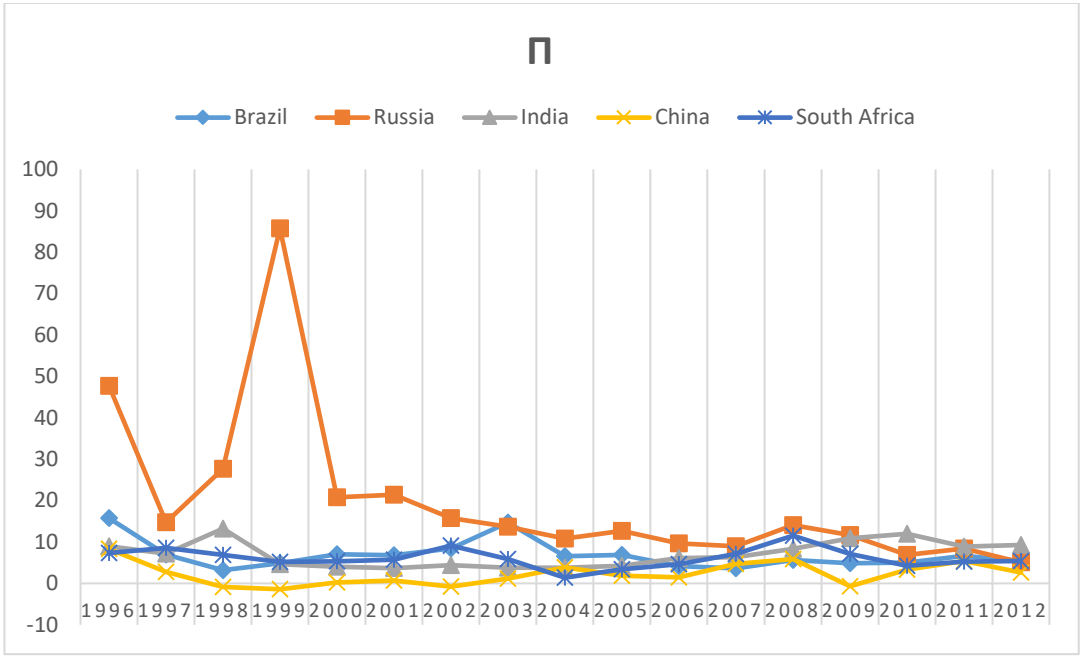
Table 6.2. Descriptive Statistics

Variables → values ↓	**TOP**	**TI**	**%ΔMS**	%ΔGDP	**INF**
Mean	43.48	5.05	0.59	0.141	62.749
Median	47.81	6.82	0.38	0.119	6.873
Maximum	74.82	3.16	8.53	0.604	2075.8
Minimum	14.93	8.94	0.04	-0.311	-1.407
Std. Dev.	15.97	7.06	1.02	0.152	293.9
Skewness	-0.17	1.76	6.27	0.253	6.070
Kurtosis	1.86	5.97	44.6	4.194	39.598
Jarque-Bera	5.86	89.0	7889.7	7.012	6195.2
Probability	0.05	0.00	0.00	0.03	0.000
Sum	4348.5	5.05	59.8	14.17	6274.9
Sum Sq. Dev.	25265.2	4.93	103.7	2.30	8553020.
Observations	100	100	100	100	100

Source: Author's calculations

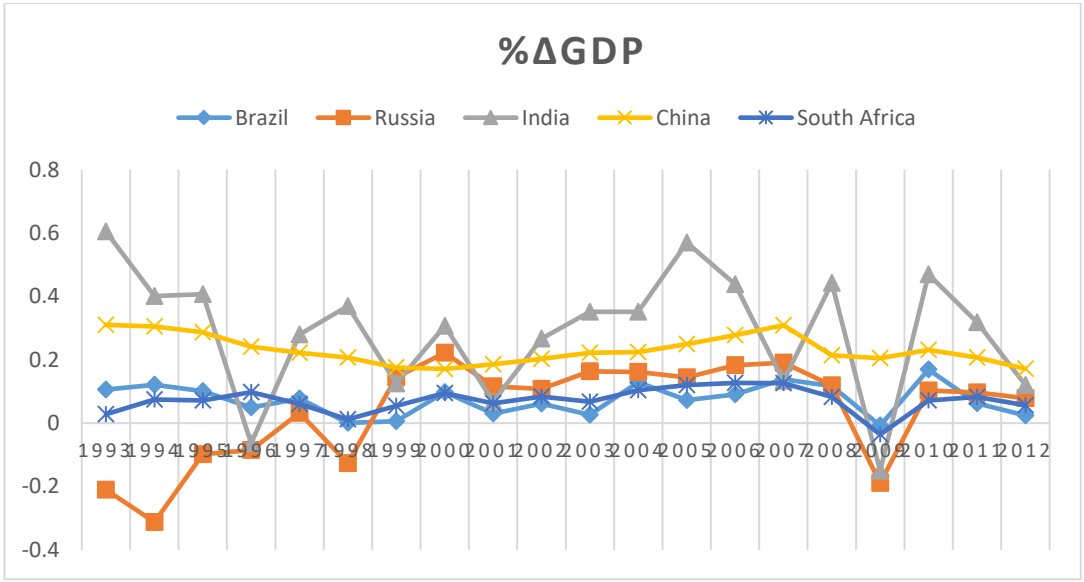
Table 6.2 enlightens the results and summary statistics of all variables which were used in this study. The table reports the summary statistics for inflation and depending upon the chosen country's exchange rate policies. Here, it's revealed that the maximum value of the INF and 2075.8

Figure 6.1. Inflation of BRICS Countries



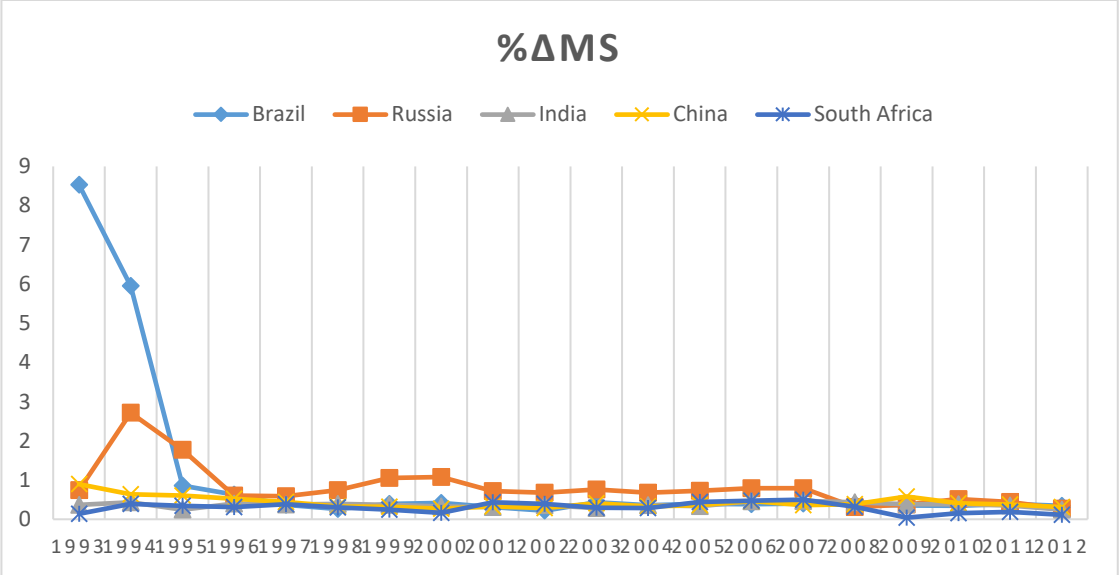
Source: Author's Calculations

Figure 6.2. %ΔGDP of BRICS Countries



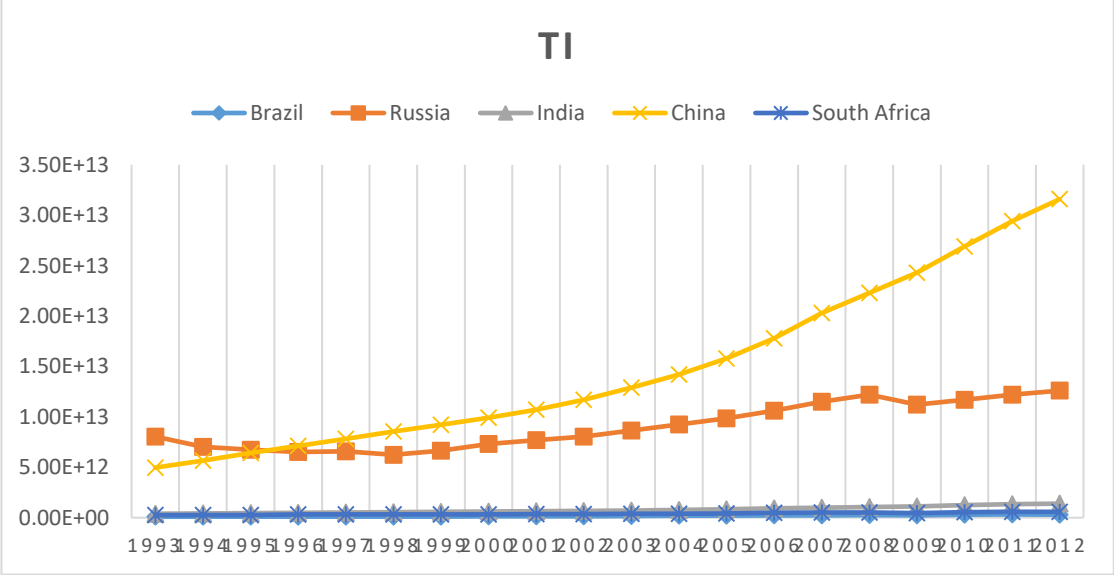
Source: Author's Calculations

Figure 6.3. %ΔMS of BRICS Countries



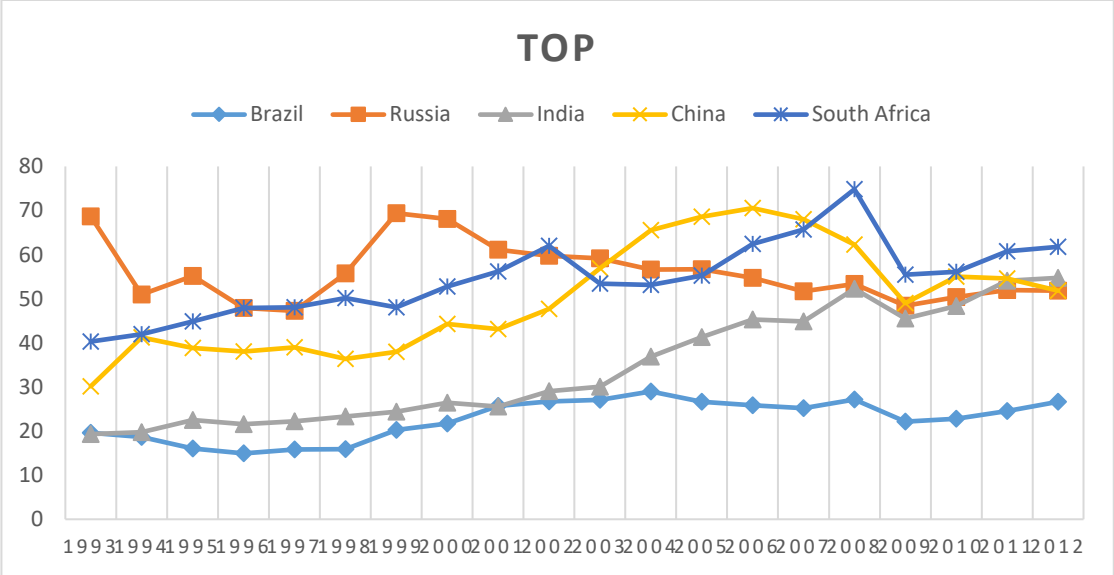
Source: Author's Calculations

Figure 6.4. TI of BRICS Countries



Source: Author's Calculations

Figure 6.5. TOP of BRICS Countries



Source: Author's Calculations

Figure 6.1 to Figure 6.5 shows the Descriptive Data analysis of Inflation (INF), Trade Openness (TOP), and terms of trade as a capacity to Imports (TI), the rate of growth of real GDP (%ΔGDP) and rate of growth Money Supply (%ΔMS) for the period 1993 to 2012. Here, above graphs shows on x-axis countries with observed data period and y-axis Data scaling value of variables.

6.5.2 Unit root test analysis

The following table 6.3 and 6.4 briefly shows the unit root results and discussion as follows.

Table 6.3. Unit root Test results at Level

Variables	LLC	IPS	Fisher-ADF	Fisher PP
INF	-4.16961(0.0000)	-4.20007(0.0000)	35.6489(0.0000)	31.8379(0.0001)
%ΔMS	-3.43076(0.0003)	-4.54052(0.0000)	37.2691(0.0000)	51.4209(0.0000)
%ΔGDP	-6.51825(0.0000)	-5.84321(0.0000)	49.1617(0.0000)	61.3495(0.0000)

Source: Author's Calculations'

Table 6.4. Unit root Test results with 1st difference

Variables	LLC	IPS	Fisher-ADF	Fisher PP
TI	-0.85367(0.1966)	-3.46002(0.0003)	41.9743(0.0000)	45.4341(0.0000)
TI (2nd)	-12.1019(0.0000)	-13.4656(0.0000)	124.250(0.0000)	86.5067(0.0000)
TOP	-6.86453(0.0000)	-6.44938(0.0000)	54.8049(0.0000)	111.932(0.0000)

Source: Author's Calculations'

Unit root test statistics of Fisher-ADF, Fisher-PP, IPS and LLC, test statistics in Table 6.3, includes two stages viz, first, at level and second, with a 1st difference. The above tests have been applied to test stationarity property of the variables used in the present study. A regression using non-stationary variables may provide a spurious result (Granger and Newbold (1974)). Table 6.3 shows the stationarity at a level for the INF, %ΔMS and %ΔGDP variables and remaining got all non-stationary variables at level. Other variables like, TI and TOP got stationary at the difference. In direction to apply co-integration technique, all non-stationary variables must have the same level factor of integration. But, our results shows that non-stationary variables have mixed pattern level of integration. For, this reason co-integration analysis doesn't apply here. These estimated results are showed in table 6.5.

6.5.3 Empirical analysis and discussion of the results

Table 6.5. Estimates Fixed-effects GLS regression (Dependent Variable INFL) Dependent variable Inf

infl	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
%Δmsl	0.7678	0.1662	4.62	0.000	0.4376	1.0981
linfl	0.4373	0.0753	5.81	0.000	0.2876	0.5869
%Δgdp	0.0584	0.1064	0.55	0.584	-0.1530	0.2699
pegged	-0.2004	0.0812	-2.47	0.016	-0.3618	-0.0389
topl	0.7350	0.4513	1.63	0.107	-0.1613	1.6323
Til	-0.5127	0.2776	-1.85	0.068	-1.0644	0.3897
_cons	5.9868	2.9384	2.04	0.045	0.1482	11.825
sigma_u		0.3502		Prob > F = 0.000		
sigma_e		0.3023		R-sq: 0.5407		

Source: Authors' calculation

Table 6.6. Random-effects GLS regression

Dependent variable Infl

infl	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
%Δmsl	.845	.150	5.64	0.000	.551	1.14
linfl	.485	.069	6.95	0.000	.348	.622
%Δgdp	.071	.081	0.88	0.379	-.087	.230
pegged	-.190	.075	-2.51	0.012	-.338	-.042
topl	.398	.239	1.66	0.097	-.071	.868
Til	-.084	.065	-1.29	0.197	-.214	.044
_cons	1.32	.643	2.06	0.040	.062	2.58
sigma_u	0			Prob > F	= 0.000	
sigma_e	0.302			R-sq:	0.7470	

Source: Authors' calculation

Table 6.7. Hausman Fixed Random

	(b)	(B)	(b-B)	Sqrt (diag(v_b-v_B))
	Fixed	**Random**	**Difference**	**S.E**
%ΔMsl	0.767	0.845	-0.077	0.071
Linfl	0.437	0.048	-0.048	0.028
%Δgdpl	0.058	0.071	-0.012	0.068
Pegged	-0.2	-0.19	-0.01	0.029
Topl	0.735	0.398	0.337	0.382
Til	-0.512	-0.084	-0.427	0.269
Chi2 (6)= 6.39			**Prob >Chi2= 0.380**	

Source: Authors' calculation

6.5.3.1 Empirical Findings of Inflation Performance

Most importantly we have to see before analysing the regression results in the inflation model, one might suspect that the variable " inflation" has a unit-root since time series are more likely to have unit-roots and are non-stationary (i.e. lagged value of inflation is used as an independent variable). Based on the Fisher test for using of panel root an Augmented Dickey-Fuller Test with one lag, the null hypothesis (that "inflation" has a unit root) is rejected, since the probability of Chi2 is less than 1%. Therefore, the variable "inflation" do not have a unit root and is also at stationary.

Table 6.5 reports the regression results. As mentioned, time dummy variables are used in all the regressions to control the effects of common

unobservable shocks across countries. Table 6.5 explains the BRICS countries analysis. This chapter empirically analyses inflation models across all BRICS nations, to see the differences of regime impact on inflation.

The above table explains the regression results. Results indicate under a pegged exchange rate regime rate of inflation is negatively associated. Coefficients of other variables like Change in money supply (%ΔMS) would have a progressive impact on inflation ($\alpha > 0$), as it is given that any increase in money supply is expected to increase the price rise. It is significant and positively related to inflation and on other hand GDP growth also should have positive impact ($\beta > 0$) as it is seen in the Philips curve, as we assume that a high growth rates are expected to cause economic activity to heat up the wages and rise of prices. Here, our results shows that the %ΔGDP is positively related to inflation but it is not significant. %ΔGDP is positively impacted on inflation rate. The trade openness (TOP) is significant with a positive coefficient. Trade openness increases the costs of a monetary expansion, which is logically have to imply lower inflation in open economies. On the other hand, the terms of trade (TI) is significant and with a negative coefficient. Finally the PEGGED has played a negative effect on the inflation performance. It implies that the countries following PEGGED regimes have witnessed lower inflation rate when compared with non-pegged exchange rate regimes.

6.6 Summary and Conclusion

This chapter analyzed the effects of exchange rate regimes on inflation of BRICS countries, with 20 years of yearly data from 1993-2012. A brief literature review of the theoretical and empirical literature on inflation of BRICS economies specified the importance of theories of inflation in explaining the issues on inflation.

This chapter examined the impact of exchange rate regimes on inflation on BRICS. It mainly examined the role of exchange rate regimes in the inflation performance and more specifically, on choosing what type of regimes will help for the BRICS countries to control the inflation.

The panel co-integration tests were not run due to stationarity test results not satisfying the prerequisites. In the consumption basket there was a high content of imports in the consumption basket (both way indirectly as inputs to services and goods, and directly as consumption goods) and the incapability to inspiration prices in the importing countries, domestic prices are extremely approachable to the changes in foreign prices but suggest some price stickiness in the short run. Conferring to the variance analysis, shocks to inflation are explained mostly by its own past values, suggestive of inflation inertia. The second most key source to foreign prices is Shockwave of the variation in domestic prices, followed by the nominal exchange rates and exchange rate policies. The anticipated long-run relationship based on the monetary theory of inflation indicated that an increase in money supply is inflationary, feasible due to structural bottlenecks.

The analysis in this chapter proposes that exchange rate regimes choice and money supply influence the inflation dynamics in the BRICS countries. In addition, the empirical results attained from the analysis of inflation show that the real depreciation resulting from a nominal depreciation will be unwound in a short-time which will reduce the advantages of a flexible exchange rate regime. The analysis in this chapter also shows that there is a positive relationship between monetary expansion and inflation in the BRICS countries.

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Chapter 7

Pegged Exchange rate regime and its impact on Inflation in BRICS nations: Country wise evidence

7.1. Introduction

The chapter tries to analyse the impact of pegged exchange rate regime on Inflation in BRICS nations for the period spanning from 1993 to 2012. Individual country analysis is carried out to examine the impact of pegged exchange rate regime on rate of inflation. The long-run dynamics among inflation, pegged exchange rate and other considered variables are studied using by ARDL method. Augmented Dickey-Fuller (ADF) and Phillips and Perron (PP) tests are employed to check unit root in the considered variables.

7.2. Empirical Model and Methodology

Auto Regressive Distributed Lag (ARDL) method was introduced by Pesaran et al. (2001) in order to incorporate I (0) and I (1) variables in same estimation. If the variables are stationary I (0) then OLS is appropriate and if all are non-stationary I (1) then it is advisable to do VECM (Johnson Approach). The ARDL test found in most applied empirical papers, based on Pesaran, Shin (1999) and Pesaran, Shin, Smith (2001). This technique is reported to offer several advantages. The test is based on a single ARDL equation, rather than a VAR as in Johnsen, thus reducing the number of parameters to be estimated. The ARDL approach also does not require pre-testing for the order of integration (0 or 1) of the variables used in the model estimation. By considering the following ARDL model for a time series model. To carry out a clear analysis of exchange

rate regimes and its impact on inflation, the inflation model can be written in the ARDL framework for estimation as follows:

$$DINF = c + \sum_{t=1}^{p} bi\, MSLOG_{t-1} + \sum_{t=1}^{p} di\, PGDPLOG_{t-1} + \sum_{t=1}^{p} ei\, TOPLOG_{t-1} + \sum_{t=1}^{p} fi\, LOGTI_{t-1} + \sum_{t=1}^{p} gi\, PEGGED_{t-1} + \delta_1 INF_{t-1} + \delta_1 MSLOG_{t-1} + \delta_1 PGDPLOG_{t-1} + \delta_1 TOPLOG_{t-1} + \delta_1 LOGTI_{t-1} + \delta_1 PEGGED_{t-1} + u_t \quad \ldots\ldots \quad (1)$$

Where INF is inflation, MS is money supply, PGDP is growth rate, TOP is trade openness, TI is terms of trade and PEGGED is measure of exchange rate regime.

When the long-run relationship exists among the variables, then there is an error correction representation and thus, the following error correction model is required. Equation 2, is estimated:

$$DINF = c + \sum_{t-1}^{p} bi\, DMSLOG_{t-1} + \sum_{t-1}^{p} di\, PGDPLOG_{t-1} + \sum_{t-1}^{p} ei\, TOPLOG_{t-1} + \sum_{t-1}^{p} fi\, LOGTI_{t-1} + \sum_{t-1}^{p} gi\, PEGGED_{t-1} \ldots\ldots (2)$$

The error correction model indicates the speed of adjustment returning back to long-run equilibrium after a short-run shock. To encounter the problem of possible two way causality (endogeneity) between regime and inflation and to check the possible channels through which exchange rate regime influences inflation in BRICS countries, granger causality test is used.

7.3. Individual country analysis

The section covers individual county analysis of the impact of pegged exchange rate on the rate of inflation for BRICS nations, namely, Brazil, Russia, India, China and South Africa.

7.3.1 Brazil

We carry out the unit root tests to check the order of integration of variables. Unit root tests in the ARDL procedure is necessary to ensure that none of the variables is I (2) or higher. Although both I (0) and I (1) variables can be used in the ARDL approach, the variables must not be I (2) stationary because, in the presence of I (2) variables the computed F-statistics provided by Pesaran et al. (2001) are not valid. For checking the stationary property of the variables, we have carried out the ADF and PP tests. The tests are performed without trend (only with intercept) and also with trend and intercept. The results of test are presented in table 7.1 shows that almost all of the variables are stationary of I (1) 1st difference except GC and POP, which are stationary at I (2) 2nd difference.

Table 7.1 Unit root tests of Brazil

Augmented Dickey-Fuller Tests				
Time Series Variable	**ADF**		**PP**	
	Intercept	**Intercept and trend**	**Intercept**	**Intercept and Trend**
GC	-8.372(0.000)*	-7.833(0.000)*	-7.190(0.000)*	-5.982(0.007)*
INF	-9.994(0.000)*	4.834(0.007)*	-4.083(0.005)*	-11.750(0.000)*
INGDP	-4.712(0.001)*	-4.746(0.007)*	-4.712(0.008)*	-4.859(0.005)*
INVT	-2.730(0.087)	-2.660(0.261)	-4.992(0.001)	-5.583(0.001)
MS	-9.943(0.000)	-8.534(0.000)	-8.299(0.000)	-7.432(0.000)
PGDP	-4.025(0.007)*	-6.861(0.000)**	-6.568(0.000)*	-6.318(0.000)

TI	-4.270(0.004)*	-4.192(0.020)**	-4.296(0.004)*	-4.296(0.004)*
POP	-2.739(0.090)*	-2.855(0.20)**	-8.269(0.000)	-2.145(0.488)*
TOP	-7.704(0.000)**	-7.486(0.000)**	-7.704(0.000)**	-7.698(0.000)**

Note: * indicates stationary at 1st difference. ** indicates stationary at 2nd Difference

The MacKinon t-statistic values for both ADF and PP tests are with intercept and with intercept and trend values.

Table 7.2 reports Co-integration relationship among inflation, pegged exchange rate and other considered variables. After ensuring that once the series is I (2) or higher, the model in equation (1) is tested for the presence long-run relationship. To carry out the bounds tests, the equation is estimated following OLS procedure and F-statistics is computed for the joint significance of lagged levels of variables. Before proceeding to bound F-test is conducted using each variable as dependent variable. It is evident from the analysis that the computed F-value is higher than upper bounds critical values indicating strong evidence of long-run relationship among the variables of equation (1) evincing a unique relationship between INF as dependent variable and the explanatory variables. From Table 7.2, all variables are found to be significant. MSLOG measures money supply in the economy. The coefficient of the variable is significant at 1 percent level. The variable is positively associated with rate of inflation and preserve similar sign as suggested by economic theory. LINFOG measures one year lagged inflation and the coefficient of the variable is found to be significant at 1 percent level. The variable is positively associated with rate of inflation. The change in growth rate of GDP is measured by PGDPLOG. The PGDPLOG coefficient is found to be significant and positively associated with INF. Trade openness variable TOPLOG is positively associated with INF. The TOPLOG coefficient is significant at 1 per cent level but differs in expected sign. PEGGED is a

dummy variables that measures impact of exchange rate regime, 1 if the regime is pegged otherwise 0. In the present context, the variables are found to be significant and positively associated with INF which is in contrast to expected sign. LOGTI measure terms of trade and it is negatively associated with INF. The LOGTI coefficient is found to be significant at 1 percent level.

In case of Brazil, the result shows that pegged exchange rate has negative effect on the rate of inflation in the economy.

Long-run and Short-run Results of ARDL Model

In this step, the equation (1) is estimated following the ARDL methodology. Though the selection of the order of the ARDL model is based on both AIC and SBC lag selection criteria, the SBC based model is chosen as it has lower prediction error than the AIC in all cases. Table 7.2 and 7.3 reports the long run results of the selected ARDL model for the individual countries.

The long run coefficients and statistics suggest a strong correlation of money supply (MSLOG), PGDPLOG, and LOGTI with INF. According to the estimation if money supply grows (declines) by 1%, inflation will increase (decrease) by 2.25 %.

Again, if growth rate goes up by 1 %, inflation will decline only marginally by 0.73 %, which indicates that growth rate has significant impact on mitigating inflation. When LOGTI increases 1% of trade imports, inflation declines -7.37%. The coefficients of other variables such as, openness and PEGGED regimes are insignificant but it is useful to take note of their signs, which helps to explain whether they conform or not with the theoretical expectations. For example, openness has a positive but insignificant impact on inflation. Theoretically, we should expect a negative impact because of the disciplinary effect imposed by the higher costs of monetary expansion in open economies

(Romer (1993)). This is for the reason that monetary expansion causes real exchange rate depreciation and its adverse impact is more in open economies. Hence, monetary authorities in more open economies will, on average, expand less resulting in lower average rates of inflation. But exactly how inflation will be affected will depend on the degree to which the concerned economy's import intensity changes in the more open trade regime and the resultant influence on the cost structure of the economy. Again, adoption PEGGED regimes will likely to lead to a decrease in inflation. It implies stability of the regime is more inflationary than volatility, which may be reflecting the loss of monetary policy autonomy due to the operation of 'impossible trinity'.

Table 7.2 ARDL Results with Cointegration relationship Brazil

Estimates of ARDL Model (Dependent Variable INF)				
Explanatory Variables	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(MSLOG)	1.720144	0.053462	32.175284	0.0000
D(PGDPLOG)	0.058594	0.017851	3.282399	0.0168
D(TOPLOG)	2.668086	0.275626	9.680081	0.0001
D(LOGTI)	-3.763965	0.396463	-9.493865	0.0001
D(PEGGED)	-0.296864	0.026758	-11.094474	0.0000
C	51.653048	3.147017	16.413334	0.0000
CointEq (-1)	-0.624416	0.038012	-16.426919	0.0000

Source: Author's calculations

Table 7.3. ARDL Results with Log-Run relationship Brazil

Estimates of ARDL Model (Dependent Variable INF)				
Explanatory Variables	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
MSLOG	2.250828	0.201971	11.144291	0.0000
PGDPLOG	0.739302	0.125757	5.878792	0.0011
TOPLOG	0.525402	0.432442	1.214965	0.2700
LOGTI	-7.371846	1.055042	-6.987252	0.0004
PEGGED	-0.001207	0.179972	-0.006708	0.9949
@ TREND	0.204423	0.039273	5.205126	0.0020

Source: author's calculation

7.3.2 Russia

The table no 7.4 presents the unit root tests to check the order of integration of variables. Unit root tests in the ARDL procedure is necessary to ensure that none of the variables is I (2) or higher. Although both I (0) and I (1) variables can be used in the ARDL approach, the variables must not be I (2) stationary because, in the presence of I (2) variables the computed F-statistics provided by Pesaran et al (2001) are not valid. For checking the stationary property of the variables, we have carried out the ADF and PP tests. The tests are performed without trend (only with intercept) and also with trend and intercept. The results of test are presented in table 7.4. The results show that almost all of the variables are stationary of I (1) 1st difference except GC and POP, which are stationary at I (2) 2nd difference.

Table 7.4 Unit root tests of Russia

Augmented Dickey-Fuller Tests				
Time Series Variable	**ADF**		**PP**	
	Intercept	**Intercept and trend**	**Intercept**	**Intercept and Trend**
GC	-4.251(0.004)*	-4.659(0.012)*	-7.298(0.000)*	-6.779(0.000)*
INF	-6.800(0.000)**	-5.461(0.003)**	-4.631(0.001)	-6.558(0.000)
INGDP	-4.540(0.002)*	-4.383(0.014)*	-4.627(0.002)*	-4.443(0.012)*
INVT	-3.757(0.012)*	-4.043(0.027)*	-4.075(0.006)*	-5.952(0.000)*
MS	-4.356(0.004)*	-3.908(0.032)	-6.406(0.000)*	-6.063(0.000)*
PGDP	-3.955(0.007)	-7.305(0.000)*	-3.932(0.008)	-11.981(0.000)*
TI	-3.976(0.009)**	-4.366(0.018)**	-8.341(0.000)**	-13.405(0.000)**
POP	-2.203(0.211)	-3.384(0.085)	-2.764(0.084)**	-2.541(0.307)**
TOP	-5.199(0.000)*	-2.937(0.181)**	-5.664(0.000)*	-6.220(0.000)**

Note: * indicates stationary at 1st difference. ** indicates stationary at 2nd Difference

The MacKinon t-statistic values for both ADF and PP tests are with intercept and with intercept and trend values.

Long-run and Short-run Results of ARDL Model for Russia

In this step, the equation (1) is estimated following the ARDL methodology. Though the selection of the order of the ARDL model is based on both AIC and SBC lag selection criteria, the SBC based model is chosen as it has lower prediction error than the AIC in all cases. Table 7.5 and 7.6 reports the long run and short-run results of the selected ARDL model for the individual countries.

The long run coefficients and statistics suggests a positive correlation of money supply (MSLOG), TOPLOG, LOGTI and PEGGED with INF. According to the estimation if money supply grows (declines) by 1%, inflation will increase (decrease) by 0.61%.

Again, if growth rate goes up by 1 %, inflation will decline only marginally by 0.06%, which indicates that growth rate has significant impact on mitigating inflation. LOGTI increases 1% of trade imports inflation declines -6.11%. The coefficients of other variables such as, PGDPLOG insignificant but it is useful to take note of their signs, which helps to explain whether they conform or not with the theoretical expectations. For example, openness has a positive but insignificant impact on inflation.

Table 7.6 reports long-run relationship among inflation, pegged exchange rate and other considered variables. From Table 7.5, all variables are found to be significant except PGDPLOG. MSLOG measures money supply in the economy. The coefficient of the variable is significant at 1 percent level. The variable is positively associated with rate of inflation and preserve similar sign suggested by economic theory. The change in growth rate of GDP is measured by PGDPLOG. The PGDPLOG coefficient is found to insignificant and positively associated with INF. Trade openness variable TOPLOG is positively associated with INF. The TOPLOG coefficient is significant at 1 per cent level. PEGGED is a dummy variable measuring impact of exchange rate regime, 1 if the regime

is pegged otherwise 0. In the present context, the variables is found to be significant and positively associated with INF. LOGTI measure terms of trade and it is negatively associated with INF. The LOGTI coefficient is found significant.

Table 7.5. ARDL Results with Cointegration relationship Russia

Estimates of ARDL Model (Dependent Variable INF)				
Explanatory Variables	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(MSLOG)	0.610668	0.055762	10.951395	0.0000
D(PGDPLOG)	0.066560	0.051382	1.295399	0.2363
D(TOPLOG)	3.966902	0.241642	16.416446	0.0000
D(LOGTI)	-6.110057	0.603941	-10.116984	0.0000
D(PEGGED)	0.284247	0.022609	-12.572528	0.0000
CointEq (-1)	-0.654413	0.042662	-15.339623	0.0000

Source: Author's calculation

Table 7.6. ARDL Results with Log-Run relationship Russia

Estimates of ARDL Model (Dependent Variable INF)				
Explanatory Variables	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
MSLOG	0.591253	0.082716	7.147965	0.0002
PGDPLOG	1.415085	0.169324	8.357238	0.0001
TOPLOG	2.399978	0.683825	3.509639	0.0099
LOGTI	-1.118289	0.153731	-7.274342	0.0002
PEGGED	-0.141600	0.043641	-3.244643	0.0142
C	13.034694	3.052644	4.269969	0.0037

Source: Author's calculation

7.3.3 India

First we carry out the unit root tests to check the order of integration of variables. Unit root tests in the ARDL procedure is necessary to ensure that none of the variables is I (2) or higher. Although both I (0) and I (1) variables can be used in the ARDL approach, the variables must not be I (2) stationary because, in the presence of I (2) variables the computed F-statistics provided by Pesaran et al (2001) are not valid. For checking the stationary property of the variables, we have carried out the ADF and PP tests. The tests are performed without trend (only with intercept) and also with trend and intercept. The

results of test are presented in table 7.7. The results show that almost all of the variables are stationary of I (1) 1st difference except GC and POP, which are stationary at I (2) 2nd difference.

Table 7.7. Unit root tests of India

Augmented Dickey-Fuller Tests				
Time Series Variable	**ADF**		**PP**	
	Intercept	**Intercept and trend**	**Intercept**	**Intercept and Trend**
GC	-4.764(0.001)**	-4.436(0.016)**	-8.708(0.000)**	-8.602(0.000)**
INF	-5.290(0.000)*	-5.345(0.002)*	-5.290(0.000)*	-5.538(0.001)*
INGDP	-5.316(0.000)*	-7.604(0.000)**	-5.316(0.000)*	-5.154(0.003)*
INVT	-5.749(0.000)*	-5.610(0.001)*	-5.760(0.000)*	-5.605(0.000)*
MS	-6.921(0.000)*	-6.758(0.000)*	-6.921(0.000)*	-6.657(0.000)*
PGDP	-7.026(0.000)*	-6.784(0.000)*	-7.281(0.000)*	-6.995(0.000)*
TI	-5.393(0.000)*	-5.228(0.003)*	-10.049(0.000)*	-9.918(0.000)*
POP	-7.09590.000)**	-9.497(0.000)*	-21.86(0.000)*	-0.133(0.989)
TOP	-5.790(0.000)*	-5.592(0.001)*	-5.742(0.000)*	-5.550(0.001)*

Note: * indicates stationary at 1st difference. ** indicates stationary at 2nd Difference

The MacKinon t-statistic values for both ADF and PP tests are with intercept and with intercept and trend values.

Long-run and Short-run Results of ARDL Model for India

In this step, the equation (1) is estimated following the ARDL methodology. Though the selection of the order of the ARDL model is based on both AIC and SBC lag selection criteria, the SBC based model is chosen as it has lower prediction error than the AIC in all cases. Table 7.8 and 7.9 reports the long run and short-run results of the selected ARDL model for the individual countries.

The long run coefficients and statistics suggests a correlation relations of PGDPLOG, LOGTI and PEGGED with INF. According to the estimation if money supply grows (declines) by 1%, inflation will increase (decrease) by 0.19%.

Again, if growth rate goes up by 1 %, inflation will decline marginally by 0.23%, which indicates that growth rate has significant impact on mitigating inflation. LOGTI increases 1% of trade imports inflation declines 7.17%. The coefficients of other variables such as, MSLOG insignificant but it is useful to take note of their signs, which helps to explain whether they conform or not with the theoretical expectations. Here, the adoption of PEGGED regimes has good impact on inflation in reducing both the short and long-run relationship.

Table 7.8 reports ARDL Co-integration relationship among inflation, pegged exchange rate and other considered variables. From Table 7.8, all variables are found to be significant except PGDPLOG. MSLOG measures money supply in the economy. The coefficient of the variable is significant at 1 percent level. The variable is positively associated with rate of inflation and preserves similar sign suggested by economic theory. The change in growth rate of GDP is measured by PGDPLOG. The PGDPLOG coefficient is found to insignificant and positively associated with INF. Trade openness variable TOPLOG is positively associated with INF. The TOPLOG coefficient is significant at 1 per cent level. PEGGED is a dummy variables measures impact of exchange rate regime, 1 if the regime is pegged otherwise 0. In the present context, the variables is found to be significant and positively associated with INF. LOGTI measure terms of trade and it is negatively associated with INF. The LOGTI coefficient is found significant. Table 9 explains the long-run relationship with dependent variable inflation with the other independent variables. In this analysis, PEGGED has significant with

negative relationship with INF. Remaining variables like, PGDPLOG, TOPLOG, MSLOG and LOGTI not significant and has a positive relationship with INF.

In the long-run all variables found insignificant. There is not much impact in the long-run.

Table 7.8. ARDL Results with Cointegration relationship India

Estimates of ARDL Model (Dependent Variable INF)				
Explanatory Variables	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(MSLOG)	0.191875	0.252396	0.760214	0.4720
D(PGDPLOG)	0.236326	0.087912	2.688221	0.0312
D(TOPLOG)	-1.014470	0.886676	-1.144128	0.2902
D(LOGTI)	7.174129	1.801862	3.981509	0.0053
D(PEGGED)	-0.126998	0.066938	-1.897257	0.0996
CointEq (-1)	-0.910326	0.188128	-4.838878	0.0019

Source: Author's calculation

Table 7.9. ARDL Results with Log-Run relationship India

Estimates of ARDL Model (Dependent Variable INF)				
Explanatory Variables	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
MSLOG	0.954822	0.737896	1.293979	0.2367
PGDPLOG	0.399907	0.243520	1.642193	0.1446
TOPLOG	-3.035860	1.864312	-1.628407	0.1475
LOGTI	2.741251	1.643158	1.668282	0.1392
PEGGED	-0.424602	0.148548	-2.858340	0.0244
C	-26.389069	16.739588	-1.576447	0.1589

Source: Author's calculation

7.3.4 China

First we carry out the unit root tests to check the order of integration of variables. Unit root tests in the ARDL procedure is necessary to ensure that none of the variables is I (2) or higher. Although both I (0) and I (1) variables can be used in the ARDL approach, the variables must not be I (2) stationary because, in the presence of I (2) variables the

computed F-statistics provided by Pesaran et al. (2001) are not valid. For checking the stationary property of the variables, we have carried out the ADF and PP tests. The tests are performed without trend (only with intercept) and also with trend and intercept. The results of test are presented in table 7.10. The results show that almost all of the variables are stationary of I (1) 1st difference except GC and INVT, which are stationary at I (2) 2nd difference.

Table 7.10 Unit root tests of China

Augmented Dickey-Fuller Tests				
Time Series Variable	**ADF**		**PP**	
	Intercept	**Intercept and trend**	**Intercept**	**Intercept and Trend**
GC	-3.822(0.012)**	-3.489(0.075)**	-6.082(0.000)**	-5.960(0.000)**
INF	-5.142(0.000)*	-5.213(0.003)*	-5.266(0.000)*	-5.865(0.000)*
INGDP	-3.331(0.033)*	-4.440(0.016)*	-3.291(0.031)**	-3.139(0.129)**
INVT	-5.344(0.000)**	-5.170(0.003)**	-7.472(0.000)**	-7.908(0.000)**
MS	-5.587(0.000)*	-5.572(0.001)*	-3.103(0.004)	-5.572(0.001)*
PGDP	-3.927(0.010)	-3.595(0.065)*	--7.611(0.000)**	-9.426(0.000)**
TI	-3.226(0.040)*	-4.473(0.015)	-3.318(0.030)**	-3.163(0.124)**
POP	-3.267(0.032)*	-7.163(0.000)	-5.218(0.002)	-15.964(0.000)
TOP	-4.525(0.002)*	-4.380(0.014)*	-4.467(0.002)*	-4.338(0.015)*

Note: * indicates stationary at 1st difference. ** indicates stationary at 2nd Difference

The MacKinon t-statistic values for both ADF and PP tests are with intercept and with intercept and trend values.

Long-run and Short-run Results of ARDL Model for China

In this step, the equation (1) is estimated following the ARDL methodology. Though the selection of the order of the ARDL model is based on both AIC and SBC lag selection criteria, the SBC based model is chosen as it has lower prediction error than the AIC

in all cases. Table 7.11 and 7.12 reports the long run and short-run results of the selected ARDL model for the China.

The coefficients and statistics suggests a correlation relations of MSLOG, PGDPLOG and LOGTI with INF. According to the estimation if money supply grows (declines) by 1%, inflation will increase (decrease) by 3.39%. Again, if growth rate goes up by 1 %, inflation will decline marginally by -46.46%, which indicates that growth rate has significant negative impact on mitigating inflation. The coefficients of other variables such as, LOGTI insignificant, when LOGTI increases 10% of trade imports inflation declines 179.78%. Here, the adoption of PEGGED regimes has negative impact on inflation in reducing both the short and long-run relationship.

Table 7.11 reports ARDL Co-integration relationship among inflation, pegged exchange rate and other considered variables. From Table 7.11, all variables are found to be significant except LOGTI. MSLOG measures money supply in the economy. The coefficient of the variable is significant at 1 percent level. The variable is negatively associated with rate of inflation and preserve similar sign suggested by economic theory. The change in growth rate of GDP is measured by PGDPLOG. The PGDPLOG coefficient is found significant and negatively associated with INF. Trade openness variable TOPLOG is negatively associated with INF. The TOPLOG coefficient is significant at 1 per cent level. LOGTI measure terms of trade and it is negatively associated with INF. The LOGTI coefficient is found insignificant. Table 7.12 explains the long-run relationship with dependent variable inflation with the other independent variables. In this analysis all variables like, PGDPLOG, TOPLOG, MSLOG and LOGTI not significant and has MSLOG and TOPLOG has a positive relationship and PGDPLOG and LOGTI has negative relationship with INF.

In the long-run all variables found insignificant. There is not much impact in the long-run.

Table 7.11. ARDL Results with Cointegration relationship China

Estimates of ARDL Model (Dependent Variable INF)				
Explanatory Variables	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(INFLOG(-1)	0.460336	0.235622	1.953706	0.1224
D(MSLOG)	3.394249	0.990672	3.426309	0.0266
D(MSLOG(-1))	-5.025526	1.836151	-2.736990	0.0521
D(PGDPLOG)	-46.685365	13.008020	-3.588968	0.0230
D(PGDPLOG(-1))	3772877	1.431608	2.635411	0.0579
D(TOPLOG)	-0.182186	2.158250	-0.084414	0.9368
D(TOPLOG(-1))	-4.6806264	2.137114	-2.189950	0.0937
D(LOGTI)	374.906264	111.519397	3.361803	0.0283
D(LOGTI(-1))	-179.780118	88.644780	-2.028096	0.1125
CointEq (-1)	-1.943568	0.457041	-4.252500	0.0131

Source: Author's calculations

Table 7.12. ARDL Results with Log-Run relationship China

Estimates of ARDL Model (Dependent Variable INF)				
Explanatory Variables	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
MSLOG	7.028331	3.811068	1.844189	0.1389
PGDPLOG	-16.860423	16.337593	-1.032002	0.3604
TOPLOG	4.901822	4.873480	1.005816	0.3714
LOGTI	-1.544177	1.617441	0.954704	0.3938

Source: Author's calculations

7.3.5 South Africa

First we carry out the unit root tests to check the order of integration of variables. Unit root tests in the ARDL procedure is necessary to ensure that none of the variables is I (2) or higher. Although both I (0) and I (1) variables can be used in the ARDL approach, the

variables must not be I (2) stationary because, in the presence of I (2) variables the computed F-statistics provided by Pesaran et al (2001) are not valid. For checking the stationary property of the variables, we have carried out the ADF and PP tests. The tests are performed without trend (only with intercept) and also with trend and intercept. The results of test are presented in table 7.13. The results show that almost all of the variables are stationary of I (1) 1st difference except INGDP which is stationary at I (2) 2nd difference.

Table 7.13. Unit root tests of South Africa

Augmented Dickey-Fuller Tests				
Time Series Variable	**ADF**		**PP**	
	Intercept	**Intercept and trend**	**Intercept**	**Intercept and Trend**
GC	-4.122(0.005)*	-4.994(0.005)*	-4.193(0.005)*	-9.280(0.000)*
INF	-4.289(0.004)*	-3.989(0.034)*	-6.249(0.000)*	-6.745(0.000)*
INGDP	-4.804(0.001)**	-4.643(0.009)**	-9.294(0.000)**	-9.229(0.000)**
INVT	-2.050(0.264)	-4.904(0.007)	-3.844(0.010)*	-5.601(0.001)**
MS	-5.432(0.000)*	-5.296(0.002)*	-10.480(0.000)*	-12.347(0.000)*
PGDP	-4.289(0.004)*	-9.309(0.000)**	-10.601(0.000)*	-11.018(0.000)*
TI	-4.289(0.004)*	-4.805(0.007)**	-6.185(0.000)*	-6.008(0.000)*
POP	-4.548(0.002)	-3.682(0.052)**	-4.548(0.002)	-3.682(0.052)**
TOP	-3.495(0.024)*	-6.334(0.001)*	-6.416(0.000)*	-7.171(0.000)*

Note: * indicates stationary at 1st difference. ** indicates stationary at 2nd Difference

The MacKinon t-statistic values for both ADF and PP tests are with intercept and with intercept and trend values.

Long-run and Short-run Results of ARDL Model for South Africa

In this step, the equation (1) is estimated following the ARDL methodology. Though the selection of the order of the ARDL model is based on both AIC and SBC lag selection criteria, the SBC based model is chosen as it has lower prediction error than the AIC in all cases. Table 7.14 and 7.15 reports the long run and short-run results of the selected ARDL model for the individual countries.

The coefficients and statistics suggests a correlation relations of TOPLOG and PEGGED with INF. According to the estimation if money supply grows (declines) by 1%, inflation will increase (decrease) by -0.06%. Again, if growth rate goes up by 1 %, inflation will decline marginally by -0.126%, which indicates that growth rate has not significant negative impact with inflation. The coefficients of other variables such as, LOGTI insignificant, when LOGTI increases 10% of trade imports inflation declines -2.44%. Here, the adoption of PEGGED regimes has negative impact on inflation in reducing both the short and long-run relationship.

Table 7.14 reports ARDL Co-integration relationship among inflation, pegged exchange rate and other considered variables. From Table 7.14, only TOPLOG and PEGGED variables are found to be significant at 10% level. MSLOG measures money supply in the economy. The coefficient of the variable is insignificant. The variable is negatively associated with rate of inflation and preserve similar sign suggested by economic theory. The change in growth rate of GDP is measured by PGDPLOG. The PGDPLOG coefficient is found insignificant and positively negatively associated with INF. Trade openness variable TOPLOG is positively associated with INF. The TOPLOG coefficient is significant at 10 per cent level. LOGTI measure terms of trade and it is negatively associated with INF. The LOGTI coefficient is found insignificant. Table 7.15 explains

the long-run relationship with dependent variable inflation with the other independent variables. In this analysis all variables like, PGDPLOG, TOPLOG, MSLOG, PEGGED and LOGTI insignificant with INF. MSLOG and LOGTI has negative relationship with INF and other variables has positive relationship with INF.

In the long-run all variables found insignificant. There is not much impact in the long-run.

Table 7.14. ARDL Results with Cointegration relationship South Africa

Estimates of ARDL Model (Dependent Variable INF)				
Explanatory Variables	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(MSLOG)	-0.069940	0.189690	-0.368708	0.7232
D(PGDPLOG)	-0.121514	0.151138	-0.803991	0.4478
D(TOPLOG)	3.125287	1.218522	2.564818	0.0373
D(LOGTI)	-2.442173	1.793396	-1.361759	0.2155
D(PEGGED)	0.260375	0.131928	1.973608	0.0890
CointEq (-1)	-0.645822	0.216243	-2.986564	0.0203

Source: Author's calculations

Table 7.15. ARDL Results with Log-Run relationship South Africa

Estimates of ARDL Model (Dependent Variable INF)				
Explanatory Variables	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
MSLOG	-0.076797	0.796274	-0.096445	0.9259
PGDPLOG	0.395753	0.825209	0.479579	0.6461
TOPLOG	3.255341	5.826791	0.558685	0.5938
LOGTI	-1.456096	2.102666	-0.692500	0.5109
PEGGED	0.457539	0.705703	0.648345	0.5374
C	12.352876	14.869973	0.830726	0.4335

Source: Author's calculations

7.4 Conclusion and Policy Implication

This chapter examined the impact of Pegged exchange rate regime on inflation on BRICS nations: a country wise empirical evidence. While India made a transition from relatively fixed exchange rate regime to a managed floating regime, as claimed officially, the existing studies show that the de facto exchange rate regime behavior has exhibited considerable stability.

This is because of large intervention by the central bank to manage exchange rate fluctuations. The literature on the assessment of the optimal exchange rate regime favours stable exchange rate regime for inflation consequences; a stable exchange rate is considered less inflationary than a more flexible regime as it has restrictive impact on determinants of inflation such as, money supply and money demand. This study is seeking to find whether exchange rate stability in the managed floating regime has led to lower inflation, we find that it is not the

We found that it is not the exchange rate stability that has led to low inflation, but, rather, the sterilized intervention of RBI for India, The central bank of Brazil, The bank of Russia, The People's Bank of China and South African Reserve Bank, which has kept a check on reserve money growth and its inflationary consequences resulting from its attempt to maintain a stable exchange rate. Hence, from the country wise empirical analysis has seemingly conflicting result of the association of inflation and exchange rate regime in the regression result for the causality test as low inflation is not the result of disciplinary effect of the pegged or stable exchange rate regime in India, rather it is the less reserve money growth as an outcome of central bank's sterilized intervention. The result points to the loss of monetary policy autonomy due to the 'impossible trinity' coming to play with steady increase of capital inflows. So, the Indian case is not one

conforming to the popular view that pegged or stable exchange rate is helpful for inflation, even with the other countries like, China, South Africa and Russia also had the same issue. As it merely reflects the success of central bank in neutralizing its very effort of maintaining the pegged rate which gives rise to inflationary growth of money supply. In the absence of sterilization, whether the theoretical stable exchange rate-high inflation relationship could hold is an empirical issue.

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Chapter 8

Impact of Exchange Rate Regimes on Growth of BRICS Countries

8.1. Introduction

The high rate of economic growth is an indispensable factor for deciding the economic development of a nation. The developing countries have procured high growth rate whereas the Less Developed countries have remained in low economic rates. This distinction occurs only after the completion of the Second World War. But in the current period, the situation has been reversed.

Economic Growth is normally defined as a gradual development of per capita national output during specific time period. The growth of a particular nation is decided by the total output which should be higher than that of the nation's population growth. For instance, if an equal growth of nation's output and its population is noticeable at the same time, the per capita income of that nation won't increase. In addition to this, the standard of living remains one and the same. This condition is not good for the economic status of that country. On the other hand, if per capita income increases due to the decline of population growth, it lessens the growth of total output which finally results in the decay of nation's economy. It indicates that the per capita income increases simultaneously with the growth of population.

Another feature of economic growth is that the national output will be satisfied only when there is a maximum number of demand of the people. At the same time sustaining the rate of increase in national output for a long period of time. This is important in making the growth of the economy. In short run increase in output for one period by small increase in it and the next time does not make it. The seasonal, occasional or cyclical increase in output does not satisfy the conditions of sustainable economic growth.

In the light of these facts, the present chapter deals with affecting factors of growth, sustainable economic growth and also explains the role of pegged

exchange rate regime for the better growth performance in the case of BRICS countries.

This study is organized into different sections as follows: Section 8.2 data and definitions of variables and sample period and data frequency has explained. Section 8.3 talks about the econometric issues and methodology, theoretical framework and growth model used in this study. Section 8.4 shows the model estimation and discussion of empirical results. Section 8.5 briefly analyses the results of growth performance and the chapter ends with summary and conclusion section of 8.6.

8.2. Data and Definitions

8.2.1. Variables

The data is collected to analysing the impact of exchange rate regimes on the growth of BRICS countries.

Table 8.1. Definitions of Variables & Sources

Variables	Definitions and Sources
%ΔGDP	Rate of growth of real GDP (WDI)
GC	Government consumption to GDP ratio (WDI)
INGDP	Natural logarithm of initial real GDP (WDI)
INVTGDP	Ratio of Investment to real GDP (WDI)
TOP	Openness ration of the sum of the exports and Imports to real GDP (WDI)
POP	Natural logarithm of total population (WDI)
TOTI	Terms of trade: the ratio of the price exports to price of imports (WDI)
Π	Annual percentage change in the Consumer price index (WDI)
PEGGED	A binary variable takes the place 1 if a country has a Pegged, takes the value 0 if a country has Non-Pegged.
INFPEGGED	An interaction variable that consists of inflation and pegged

8.2.2. Sample Period and Data Frequency

The annual sample period from 1993-2012 is used. For model specifications, the data from the time period 1993 to 2012 is collected.

8.3. Econometric Issues and Methodology

The following section 8.3.1 deals with the theoretical framework and Growth model building.

8.3.1. Theoretical framework and Growth Model

In this study, a simple growth model is applied to describe the effects of exchange rate regimes on growth. Therefore, growth model is based on:

$$\%\Delta GDP_{i,t} = \delta GDP_0 + \emptyset INVTGDP_0 - \partial GC_0 + \infty POP_0 + \in_{i,t} \quad (1)$$

Where, $\%\Delta GDP_{i,t}$, the annual rate of GDP growth, GDP_0 , the natural logarithm of initial GDP, $INVTGDP_0$, the initial ration of investment to real GDP, GC_0 , the initial ratio of government consumption to real GDP, POP_0 is the natural logarithm of total population and $\in_{i,t}$ is the error term.

The effects of exchange regimes on growth is explained using a five-year average panel model. The sample includes five BRICS countries over the period 1993-2012.

The baseline growth regression equation is formed as the following:

$$\%\Delta GDP_{i,t} = \beta_0 + +\beta_1 GDP_0 + \beta_2 INVTGDP_0 + \beta_3 GC_0 + \beta_4 TOP_0 + \beta_5 POP_0 + \beta_6 TOTI_0 + \beta_7 PEGGED_{i,t} + \beta_8 INF_0 + \beta_9 INFPEGGED_0 + \in_{i,t} \quad (2)$$

According to the equation (2) the five-year average rate of real GDP growth ($\%\Delta GDP_{i,t}$) for country *I (i=1,2…5)* over time period *t,* with *t*= 1993-1997, 1998-2002, 2003-2007 am 2008-2012 depends upon several additional control variables. GDP_0, the initial GDP, and is expected to have a negative sign (conditional convergence). Initial GDP is to control the conditional convergence. It is initial an relation of investment to real GDP as higher investment rates leads to higher economic growth. $INVTGDP_0$ is the initial ratio of investment to real GDP, and its coefficient is expected to have a positive sign since higher investment rates leads to higher economic growth. GC_0, the initial ration of government consumption to real GDP. An increase in growth of government consumption is expected to decrease GDP growth. Initial ratio of government consumption (GC) to real GDP has negative and significant influence on growth rate. GC mostly includes recurrent type of expenditure and therefore it does not

add to the capital stock. TOP_0, the initial rates of openness to trade. It is the ratio of the sum of export and import to gdp. It is expected to have a positive relationship with economic growth. POP_0 , represents the natural logarithm of initial total population, and is expected to have positive sign. $TOTI_0$, the initial terms of trade, and it is measured as the ratio of a country's price of exports to its price of imports. It is expected to have a positive sign. INF_0 is the initial percentage change in inflation, and it is expected to be a negative relationship with GDP growth based on the money demand and money supply equation in previous section. $INFPEGGED_0$, is an interaction variable that captures the trade-off between growth and inflation under the proper exchange rate regime. Finally, $PEGGED_{i,t}$ is a binary variable that proceeds the value 1 if a country adopts a pegged exchange rate regime, and the value is 0 when it has classified as a non-pegged exchange rate regime. In this section, an observation requires a time span of total four years for peg is categorized as fixed in a five-year panel, based on the Jay C. Shambaugh regime scheme. PEGGED, the main variable observes the impact of currency policies on economic growth.

8.4. Econometric issues, Model Estimation, and Empirical Results

The following section divided into three sub-sections. 8.4.1 explains the Descriptive statistical analysis. Section 8.4.2 explains the Unit root test analysis. Section 8.4.3 Empirical Findings of Growth Performance.

8.4.1. Explains the Descriptive statistical analysis

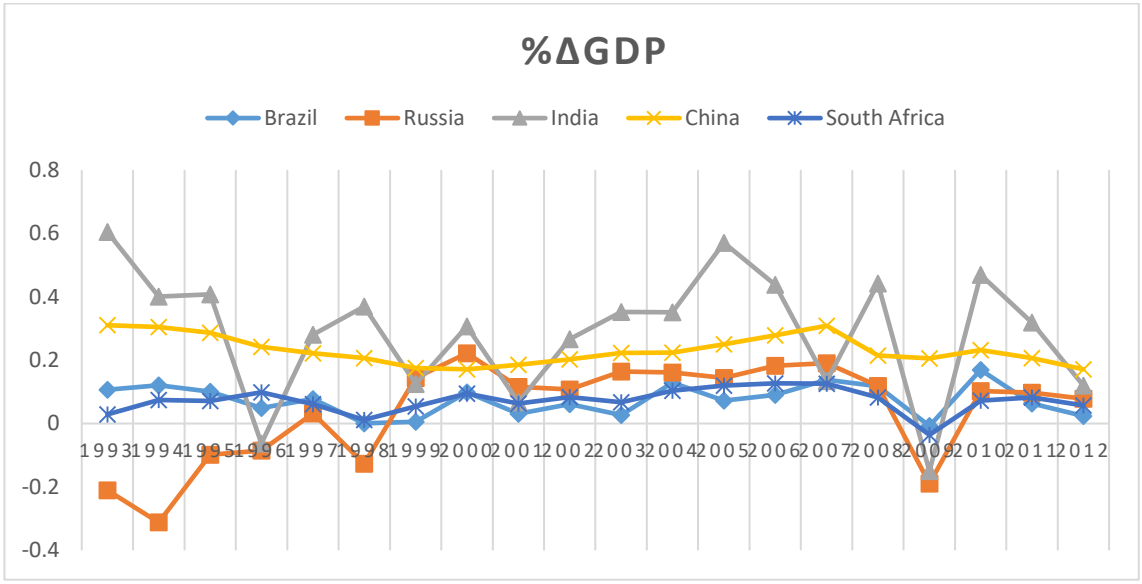
Table 8.2. Explains the results and summary statistics of the variables which were used in this study. The table reports the summary statistics for inflation, depending upon the chosen country's exchange rate policies. Here, it's revealed that the maximum value of the %ΔGDP is 0.60%.

Table 8.2. Results of Descriptive Data Analysis

Variables → values ↓	TOP	GC	TOTI	%ΔGDP	INVTGDP	INGDP	INF	POP
Mean	43.48	26.81	5.05	0.14	25.8	28.4	62.72	19.43
Median	47.81	18.97	6.82	0.11	22.0	28.4	6.87	19.01
Maximum	74.82	78.36	3.16	0.60	48.65	31.0	2075.8	21.02
Minimum	14.93	10.28	8.94	-0.31	14.3	25.8	-1.40	17.43
Std. Dev.	15.97	21.3	7.06	0.15	9.84	1.53	293.9	1.27
Skewness	-0.17	1.43	1.76	0.25	0.87	-0.17	6.07	-0.02
Kurtosis	1.86	3.25	5.97	4.19	2.42	1.82	39.59	1.53
Jarque-Bera	5.86	34.60	89.0	7.01	14.0	6.25	6195.2	8.90
Probability	0.05	0.00	0.00	0.03	0.00	0.04	0.00	0.01
Sum	4348.5	2681.5	5.05	14.17	2583.5	2842.5	6274.9	1943.7
Sum Sq. Dev.	25265.2	45211.7	4.93	2.30	9599.3	231.9	8553020.	162.0
Observations	100	100	100	100	100	100	100	100

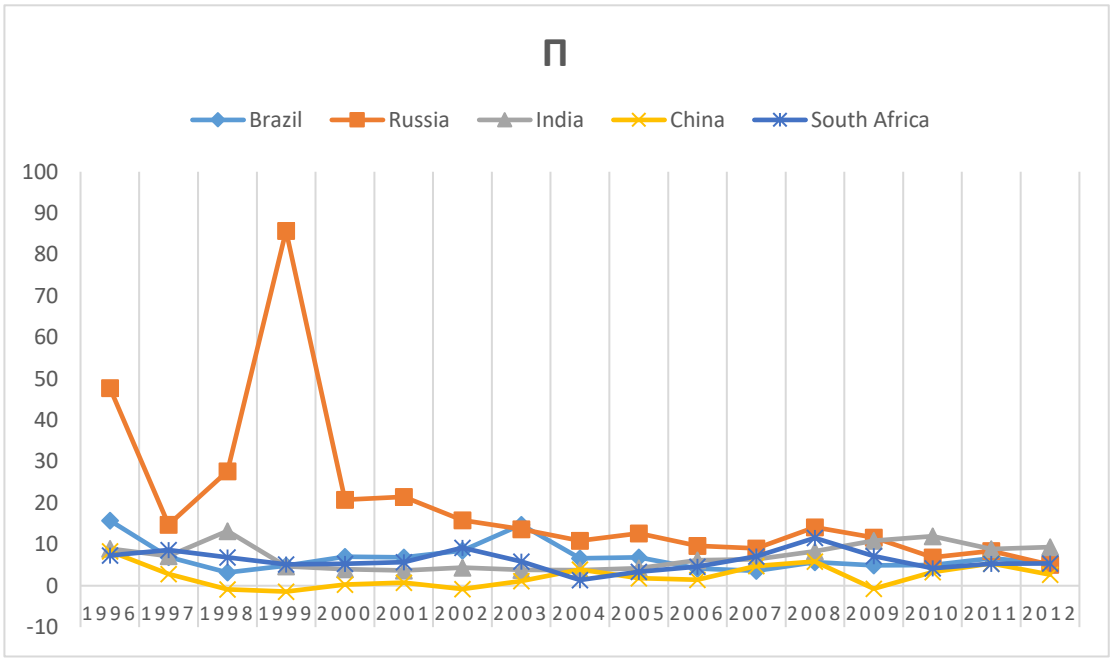
Source: Author's calculations

Figure 8.1. %ΔGDP of BRICS Countries



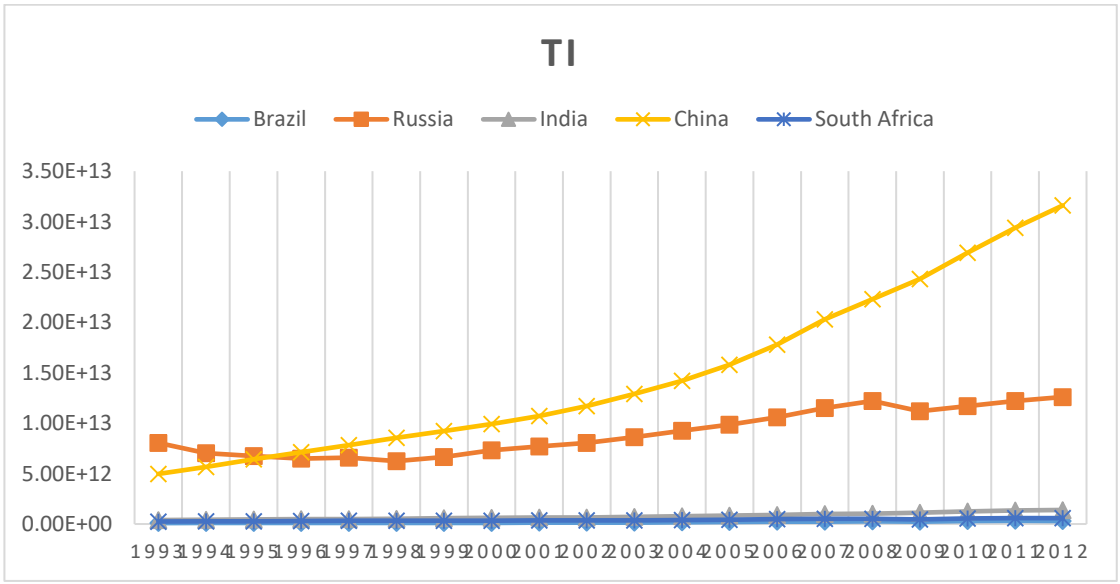
Source: Author's Calculations

Figure 8.2. Inflation of BRICS Countries



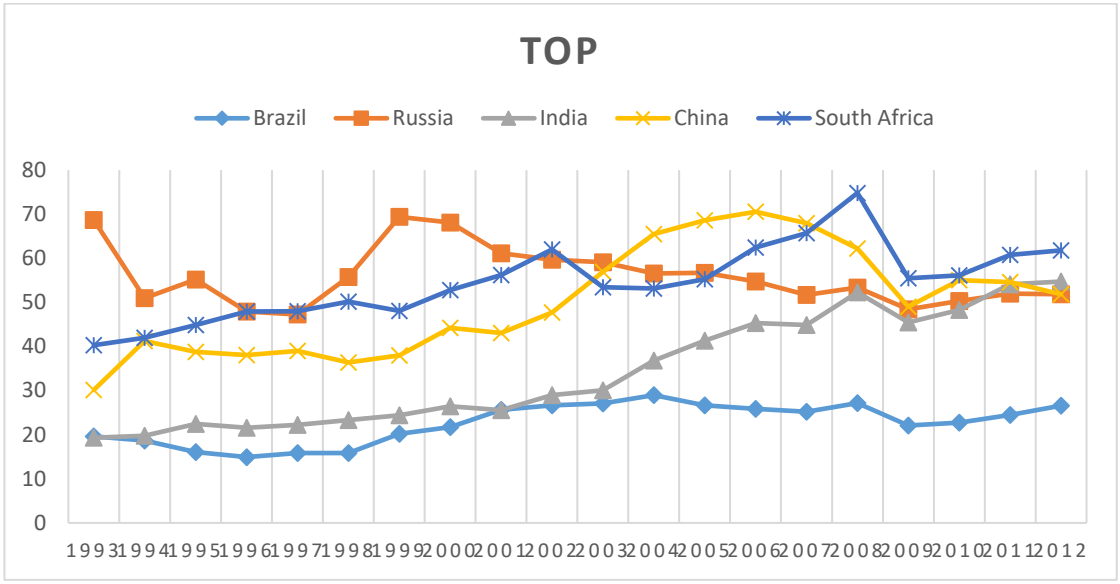
Source: Author's Calculations

Figure 8.3. Terms of Trade of BRICS Countries



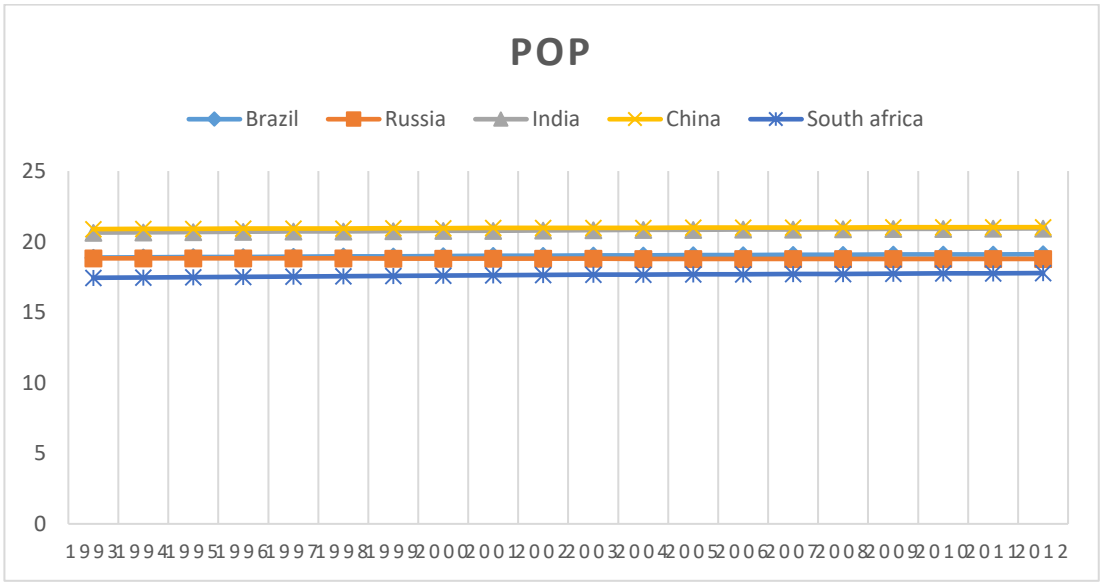
Source: Author's Calculations

Figure 8.4. Trade Openness of BRICS Countries



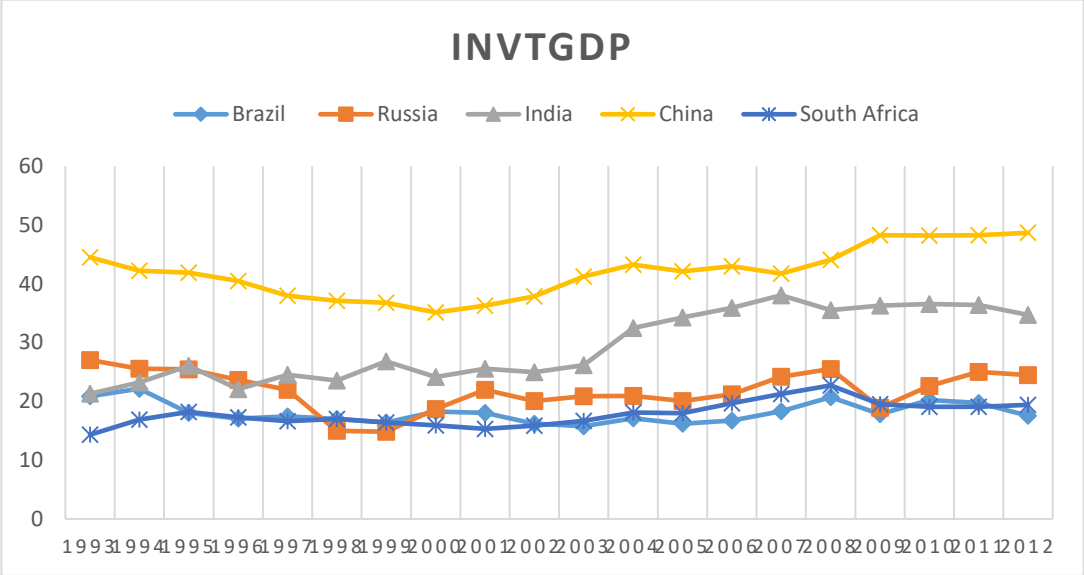
Source: Author's Calculations

Figure 8.5. Population of BRICS Countries



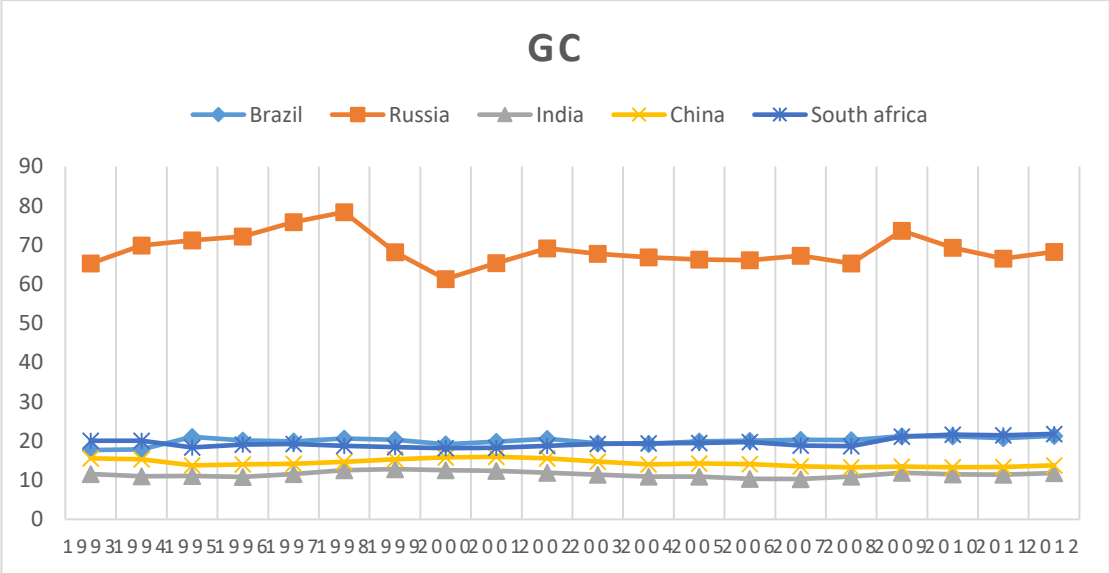
Source: Author's Calculations

Figure 8.6. Investment towards GDP of BRICS Countries



Source: Author's Calculations

Figure 8.7. Government Consumption of BRICS Countries



Source: Author's Calculations

Figure 8.1 to Figure 8.7 shows the Descriptive Data analysis of Government Consumption (GC), Investment towards GDP (INVTGDP), inflation (INF) and population (POP), Trade Openness (TOP), and terms of trade as a capacity to Imports (TI), the rate of growth of real GDP (%ΔGDP) for the period 1993 to 2012. Here, above graphs shows on x-axis countries with observed data period and y-axis Data scaling value of variables.

8.4.2 Unit root test analysis.

The following table 8.3 and 8.4 briefly shows the unit root results and discussion as follows.

8.3. Summary of Unit root test results

Stationary at level

Variables	LLC	IPS	Fisher-ADF	Fisher PP
INF	-4.169(0.000)	-4.200(0.000)	35.648(0.000)	31.837(0.000)
POP	-12.80(0.000)	-5.997(0.000)	52.343(0.000)	122.50(0.000)
%ΔGDP	-6.518(0.000)	-5.843(0.000)	49.161(0.000)	61.34(0.000)

Source: Author's calculation

Table 8.4. Stationary at 1st difference

Variables	LLC	IPS	Fisher ADF	Fisher PP
GC	-7.196(0.000)	-7.654(0.000)	67.986(0.000)	87.034(0.000)
INGDP	-5.476(0.000)	-5.458(0.000)	45.015(0.000)	66.008(0.000)
INVTGDP	-8.364(0.000)	-8.407(0.000)	75.268(0.000)	136.00(0.000)
TOTI	-0.853(0.196)	-3.460(0.000)	41.974(0.000)	45.434(0.000)
TI (2nd)	-12.10(0.000)	-13.465(0.000)	124.25(0.000)	86.506(0.000)
TOP	-6.864(0.000)	-6.449(0.000)	54.804(0.000)	111.93(0.000)

Source: Author's calculation

Unit root test statistics of LLC, IPS, Fisher-ADF, and Fisher-PP test statistics in Table 8.3 and Table 8.4. Includes two stages viz, first, at the level and second, with a 1st difference. The above tests have been applied to test stationarity property of the variables used in the present study. A regression using non-stationary variables may provide a spurious result (Granger and Newbold (1974)). Table 8.4 shows the stationarity at a level for the INF, POP, and %ΔGDP variables and all the remaining got non-stationary variables at level. Other variables like, GC, INGDP, INVTGDP, TI, and TOP got stationary at the

difference. If we want to apply co-integration technique, it is important to consider all non-stationary variables should have the same level of the integrating factor. But, according to the results, non-stationary variables have a mixed pattern of integrating level. For, this reason co-integration analysis cannot be applied. Therefore, it has to for different regression equations with and without taking the first and second difference. These estimated results are showed in table 8.5.

8.4.3 Empirical analysis and Discussion of the Results

Table 8.5. Estimates of Panel Regression Equation (Dependent Variable %GDP)

%ΔGDP	Coef.	Robust Std. Err.	Z	P>|z|	[95% Conf.	Interval]
INGDP	-2.306332	.4004161	-5.76	0.000	-3.091133	-1.521531
INVTGDP	.0300859	0.846913	0.36	0.722	-.1359061	.1960778
GC	.1678468	.1108678	1.51	0.130	-.0494501	.3851436
TOP	0.792938	.0170854	4.64	0.000	0.458069	.1127806
POP	2.884117	.2770408	10.41	0.000	2.341127	3.427107
TOTI	2.74e.14	1.07e-13	0.26	0.798	-1.83e-13	2.37e-3
PEGGED	-.817878	.9124926	-0.90	0.370	-2.606331	.9705747
INF	.0012872	.0008581	1.50	0.134	-.0003946	.0029691
PEGGEDINF	0.262739	0.465062	0.56	0.572	-.648766	.1174244
_cons	2.215678	9.575459	0.23	0.817	-16.55188	20.98323
sigma_u	0				**Prob>F Chi2 (3)**	
sigma_e	.21905499				**R-sq: 0.9352**	
Rho	0 (is a fraction of variance due to u_i)					

Source: Author's calculation

8.4.3.1. Empirical Findings of Growth Performance

Based on the past studies, there was no consensus on the impact of proper exchange rate regimes on economic growth. Hence, this section investigates

whether the exchange rate regimes affect the growth or not. As discussed earlier, the proper exchange rate regime and its effects on growth are explained using the five-year average panel with the country fixed effects model (time dummy variables are included in all regressions). In this section, an observation requires a total of four years for a peg to be categorized as a pegged in the five-year panel, based on the KS regime scheme. The regime dummy PEGGED is the main variable that looks on the impact of currency policies on economic growth. Table 8.5 represents the empirical findings for the growth performance.

As per the expectation, the initial GDP has a negative and significant relationship with growth rate. It implies that the BRICS countries namely: Brazil, Russia, India, China and South Africa, exhibits conditional convergence, which means that the countries away from the steady state output are growing faster than the countries nearer to the steady state. The initial ratio of investment to real GDP (INVT GDP) had a positive and significant effect on growth rate. It implies that the countries that have started with a high level of investment to real GDP ratio have been growing at faster rate than their counterparts. The initial ratio of government consumption (GC) to real GDP has a positive and significant influence on growth rate. Since GC mostly includes the recurrent type of expenditure, it does not add to the capital stock. Therefore increasing GC is likely to crowd out much needed public expenditure on an infrastructure project. Thus, the increasing initial ratio of GC has a positive impact on growth rate. The trade openness (TOP) has a positive relationship with economic growth. Most of the developing countries have adopted export-led growth strategy resulting in more openness. This result shows that trade openness (TOP) lead towards an improvement in the growth rate of countries under consideration, the effect of openness is also significant. The model also included initial population (POP) and initial ratio of investment to real GDP as these variables indicate initial supply of factors of production. The countries which have reported higher population and high level of investment in base year are expected to grow faster than otherwise. The results indicate that population and initial investment have positive and significant effects on growth rate. The terms of trade (TOTI) variable in the model is likely to capture the effect of external shocks on the domestic economy. It is measured as the ratio of a

country's price of exports to its price of imports. The results show that the improvement in this ratio has a positive impact on growth, though the effect is insignificant. The rapid economic growth is associated with a subsequent increase in aggregate demand is likely to result in inflation (INF). According to the money demand and money supply equation for a faster growth of output and lower growth in money supply, the inflation follows the downward path. The results indicate the same positive relationship between inflation and growth rate, however, it is insignificant. Country under pegged exchange rate regime has negative growth rate (-.81%) than counties under no-pegged exchange rate regime. However, the relationship is insignificant indicating that the different exchange rate regimes (pegged and non-pegged) don't have statistically significant effect on growth rate.

8.5. Summary and Conclusion

This analysis brings several interesting facts on the de facto exchange rate regimes followed by the BRICS countries in the late 1990s and the linkage between these regimes on Economic growth performance.

An attempt is made to revisit the relationship concerning exchange rate regimes and economic growth outcomes under the recent financial crisis and external shocks. This chapter included data from BRICS countries, from 1993-2012. This time, span is not covered in the preceding studies and includes both past and present financial turbulences in BRICS countries. This chapter also deals with different classification methods that have led to several studies on exchange rate regime classifications among which most widely used is de facto classification systems it was measured by the actual performance of the exchange rate system, conferring to the Jay C. Shambaugh (2003). In accumulation, to avoid breaks in the status of peg due to one-time rearrangements, any exchange rate that had a percentage variation of zero in 11 out of 12 months is measured Pegged. This model is the newest model and focused only at Pegged or Non-Pegged exchange rate regimes effects on Economic growth in BRICS countries.

The analytical results showed, that the Pegged exchange rate regimes are not much associated with better performance in terms of growth. In the growth

performance, BRICS countries with Pegged regimes show significantly negative growth. Pegged regimes have significantly (-81%) lower growth in BRICS countries. The impact of Pegged regime on growth increases and the positive link between Pegged regimes and GDP growth can occur through a pegged regime's price stability effect. Countries with Pegged regimes have lower real interest rates since pegged regimes act as an anti-inflationary tool for monetary policy makers. Thus, low real interest rates lead to an increase in investment, and in the end, a high level of investment leads to higher levels of economic growth. Moreover, by adopting a pegged regime can promote trade for BRICS countries and lead to an increase in economic growth.

In many developing countries, adopting an exchange rate regime is heavily influenced by macroeconomic conditions and goals. Based on the empirical findings made in the research, a pegged exchange rate regime arrangement should be the preferred policy option for the BRICS countries that chose to sustain price stability as a key macroeconomic goal. Moreover, pegged exchange rate regime may be the optimal policy option for BRICS countries who want to pursue export-oriented strategies to increase economic growth.

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Chapter 9

Policy Implications, Conclusion, and Scope for further Studies

9.1. Introduction

The BRICS countries have maintained different exchange rate regimes for the past 45 years. Many changes occurred during this period. The institutional and macroeconomic structures of the country had undergone several economic changes over this period. The exchange rate system witnessed both easy and stressful conditions. The importance of exchange rate regimes and its effects are not considered in the case of BRICS countries. However, hardly any empirical research was carried out on the exchange rate regimes and its effects on inflation and growth of BRICS countries. The choice of choosing exchange rate regime has a central issue in international macroeconomics for a long time. The exchange rate regimes classification is unquestionably important, it directed to re-assessment of various findings regarding the evaluation and performance of exchange rate regimes. There are mainly two classifications, one is De Jure, and secondly De Facto. De jure classification is well known for adopting of floating exchange rate regime, but does not define a monetary policy strategy. But, it is effortlessly possible that the De Facto monetary policy adopted by floating exchange rate, that country lead to a reasonably stable exchange rate. Even the basic tools for classifying the exchange rate regimes classifications are different from the other classifications. Again this background, this research has provided a comprehensive empirical analysis of the concerns related to the exchange rate regime classifications on BRICS countries. In this light, this research has provided a comprehensive empirical analysis and issues related to pegged and non-pegged exchange rate regime classifications. The study examined the impact of exchange rate regimes on inflation and growth of BRICS countries. This chapter presents the main findings and discusses the limitations of the study. Directions for further areas of research that can be extended from this study are also highlighted in this chapter.

9.2. Summary of Findings

The main purpose of this study is to examine the impact of exchange rate regimes and its effects on inflation and growth of the BRICS countries. Three major issues dealt in this study are: exchange rate regimes classifications like Pegged and Non-Pegged, its effects on inflation and its effect on growth rates of BRICS countries. The analysis of these three issues together with the analytical framework on determinants of the exchange rate regimes and the choice of exchange rate regimes are analyzed in the chapter II. This chapter did a thorough assessment of the appropriateness of the exchange rate regimes on BRICS countries.

The first issue is the classification of exchange rate regime. It is observed that the De Facto classification which is the cornerstone for most of the classification methods is not been studied in the context of BRICS countries. Accordingly pegged and non-pegged regimes were formed.

The second issue is on the classification of exchange rate regimes. This issue has been discussed in various previous studies and observed that the most widely used classification is De Facto classification. It considers the actual behaviour of exchange rate system for classification method which is due to Jay C Shambaugh (2003). It is one of the recently introduced method of exchange rate regime classification. Here, annual classification is used to determine whether the exchange rate stayed within +/-2% bands against the respected base currency. In addition, to prevent breaks in pegs status due to one-time realignments, any exchange rate that had a percentage change of zero in 11 out of 12 months is considered as fixed.

The study also revisits the inter-linkage between exchange rate regimes and macroeconomic performance under recent financial crisis and external shocks. It has included data on BRICS countries from 1993-2012. This time, period has not been covered in previous studies and includes both the past and present financial turbulences in BRICS countries.

It also evaluated the appropriateness of currency regime, based on the methodical framework of determinants and choice of exchange rate regimes of BRICS countries. Evaluation of exchange rate regimes is a complex issue, as it is not easy to quantify the determinants of exchange rate regime choice. However, given the need to evaluate the exchange rate regime of BRICS, this study adopted a quantitative framework developed Jay C. Shambaugh (2003). This framework was developed from a sample of 5 countries of various sizes and at different stages of development to derive quantifiable indicators for the determinants of exchange rate regimes. These indicators are included in analytical framework and determinants of exchange rate regimes, including OCA factors, financial factors, and political factors.

The second issue related to exchange rate regimes and its effects on inflation was examined in the case of BRICS countries. The heavy dependence on imports, both local consumption and exchange rate value in the BRICS links the country's inflation to external factors. Therefore, it is important to look at the factors that drive inflation of BRICS and role which is played by exchange rate in prompting of inflation as related to other factors like, foreign prices, trade openness, money supply and investment.

As an a priori test for modelling inflation panel unit root tests was run. Inflation, the rate of growth of money supply and rate of growth of real GDP are found stationary at level. Further the variables namely terms of trade and trade openness are found stationary only at first difference. Therefore a panel regression has been fit by transforming all the variables into stationary series.

The key findings of the analysis are:

Based on the empirical studies, the results suggest that the BRICS countries with Pegged exchange rate regimes experience significantly lower rate of inflation than those non-pegged regimes. Moreover, under a pegged regime it has significantly lower inflation rates. It suggests, exchange rate regime and money supply had much influence on inflation in the case of BRICS countries.

The third issue related to exchange rate regime that was analysed here is the impact of exchange rate regimes on Growth of BRICS countries. Chapter VIII revisits the relationship between exchange rate regimes and

growth outcomes from recent financial crisis and external shocks. This chapter included data from BRICS countries, from 1993-2012. The period covered in this study includes both past and present financial turbulences in BRICS countries.

The econometric results show that Pegged regimes are not associated with better performance in the case of growth. On the growth performance, BRICS countries with Pegged regimes show significantly lower economic growth. Pegged regimes have significantly (-8%) lower growth in BRICS. The impact of Pegged regime on growth increases and the positive link between Pegged regimes and GDP growth can occur through a pegged regime's price stability effect. Countries with Pegged regimes have lower real interest rates since pegged regimes act as an anti-inflationary tool for monetary policy makers. Thus, low real interest rates lead to an increase of investment, at the end, a high level of investment leads to higher levels of economic growth. Moreover, by adopting a pegged regime can promote trade for BRICS countries and lead an increase in economic growth.

In many developing countries, adopting an exchange rate regime is heavily influenced by macroeconomic conditions and goals. Based on our empirical findings, Pegged exchange rate regime arrangements should not be used a preferred policy option for the BRICS countries. It also chooses to sustain price steadiness as a key macroeconomic objective.

An exchange rate regime that provides the most macroeconomic stabilization is one of the important decision factors in choosing an exchange rate regime. This depends on the type of economic conditions to which a country stands to be exposed and the level of capital stability. A country that predominantly faces external (nominal or monetary) shocks and has a high degree of capital mobility is better served by pegged exchange rate regime. In the case of BRICS, the economy faces both external and monetary shocks and has a liberal capital account. Therefore, the current exchange rate regime pegged for the BRICS seems appropriate.

9.3. Limitations and Scope for Future Research

The main limitations of this study are the limited availability of macroeconomic data for BRICS countries and the poor quality of existing of data. As discussed in Chapter I and throughout this study, some of the important macroeconomic data used here had to be constructed especially for this thesis, mainly due to the inadequacy of the existing available data. Therefore, considerable effort and time were spent on constructing data, as the necessary inputs were not easily and readily available at the time of data collection. A large amount of time was also spent in searching for appropriate inputs for the creation of new data series, exchange rate regime classifications and methods, as the inputs normally found in the literature were not available for the BRICS countries. Thus, much of research time went into finding the most appropriate inputs for the BRICS countries and obtaining them from various sources. Moreover, macroeconomic data for the developing countries like BRICS are often plagued with outliers. The majority of data used in this study were sourced from the World Bank and International Financial Statistics (IFS). Since they still maintain their data series in Excel files, errors in the data are common and are expected. Therefore, each of the outliers had to be checked to determine whether it was, in fact, an outlier or an error in the data file. In many instances, the outliers are due to errors and were corrected by returning to the respected sources of the data or crosschecking with data from earlier publications and online resources.

The research on the exchange rate regimes, inflation, and growth on BRICS countries undertaken in this study provides a better understanding of the workings of emerging countries like BRICS economy in relation to exchange rate regime issues and economic development issues. This study has provided a starting point for much-needed research on the important issues related to exchange rate regimes, classification procedure and the importance of exchange rate regimes for BRICS countries.

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