# Examining the Determinants of Exchange Rate Behavior in Selected Developing Countries: Stability or Collapse?

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## Abstract

This research thesis investigated the factors affecting exchange rate stability in developing countries, paying particular attention to key macroeconomic variables such as GDP growth, money supply, inflation, and trade balance. The research used panel data for 17 developing countries from less developed transition economies in Europe, selected Middle Eastern, Latin America and Maghreb from 2011 to 2022, allowing the application of a random effect model to analyze the relationship between these variables and the exchange rate fluctuations. The descriptive statistics suggest that exchange rates, GDP growth, money supply, inflation, and trade balance vary significantly among countries. According to the empirical results, the significant determinants of exchange rate fluctuation are money supply and inflation, whereas GDP growth and trade balance do not play a significant role.

In the countries considered, increases in the money supply typically lead to appreciation of the exchange rate in the short run, whereas inflation leads to currency depreciation. Notably, the effects of these variables taper off or reverse after the COVID-19 crisis, further demonstrating the dynamic nature of exchange rate determinants under changing economic conditions. These results were further confirmed by various types of diagnostic tests and the inclusion of a random effects model. The findings isolate the well of necessity for economic policies that are adaptive enough in responsiveness and ensure exchange rate stability in the presence of uncertainty. This provides crucial advice to policymakers in any developing country aiming to achieve greater stability while pursuing economic growth.

*Key Words: Exchange Rate, Gross Domestic Product, Money Supply, Inflation, Trade Balance* 

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## Acronyms

**GDP: Gross Domestic Product** PPP: Purchasing Power Parity **CPI:** Consumer Price Index RER: Real Exchange Rate NEER: Nominal Effective Exchange Rate REER: Real Effective Exchange Rate FX: Foreign Exchange VIF: Variance Inflation Factor FDI: Foreign Direct Investment SAP: Structural Adjustment Program EMU: European Monetary Union ARDL: Auto Regressive Distributed Lag GARCH: Generalized Autoregressive Conditional Heteroskedasticity IMF: International Monetary Fund ECB: European Central Bank OECD: Organization for Economic Co-operation and Development OLS: Ordinary Least Squares

## **Chapter 1: Introduction**

#### 1.1. Background

The real exchange rate, which compares the price levels between a home country and a foreign one and is adjusted by the nominal exchange rate, plays a vital role in international macroeconomics. Emphasizing the importance of exchange rate stability cannot be overstated for achieving macroeconomic objectives in both developed and developing economies. Evaluating an economy's performance relies on various determinants, with the exchange rate being a significant factor. A strong exchange rate is indicative of a robust and sustainable economy (Rapetti, 2019).

Alternatively, a highly devalued currency mirrors a precarious and fragile economic situation. Governments, particularly those in developing countries, have pursued diverse exchange rate management approaches over time to aim for a pragmatic and consistent exchange rate. Consequently, many of these countries have encountered significant fluctuations in their exchange rates, leading to heightened levels of uncertainty and volatility (Mordi, 2006).

Exchange rates in developing countries are determined by multiple factors that may lead to either stable or unstable rates. Among these forces, the most important is the general economic policy framework. Research, for instance that by Sebastian Edwards, emphasizes that governments play a very important role in the determination of exchange rate stability. Based on experience from several developing countries, Edwards' dynamic model of real exchange rate behavior underlines the fact that consistent economic policies lead to stable exchange rates (Edwards, 1989). Another factor to consider is the level of integration of developing countries into the world economy. The higher the integration of developing countries into world trade, the more exposed their exchange rates will be to fluctuations driven by international market forces. A high degree of integration with sound economic policies and proper institutional capacity can, however, impact positively for stable economies. The strong basic economic framework of the country can resist these external effects and sustain the stability of the exchange rate.

Moreover, the other significant determinant of exchange rate behavior is the aggregate external economic environment. The exchange rates of developing countries may be susceptible to very sharp movements that are induced by global economic trends, i.e., capital flows and the prices of commodities. However, in most cases, the countries are very susceptible to foreign economic shocks that may stabilize or shake the exchange rate depending on the nature of the shocks and the readiness of the country to deal with them (Haque, 2001).

Hence, exchange rate behavior in developing countries is depended upon the interaction of economic policy, political stability, and exogenous economic conditions. Sound economic policies and political stability may be important contributors to the stability of exchange rates, but exogenous economic factors are enormous potential sources of volatility. This makes it necessary to clearly understand these determinants to come up with the policies that will encourage economic stability and growth in these countries.

#### 1.2. Statement of the Problem

The problem is that the developing countries' exchange rate is often very susceptible to extreme fluctuations and is prone to moments of potential collapse. This vulnerability usually arises from a mix of internal weaknesses and external shocks. Economic fundamentals characterized by large fiscal deficits, small holding of foreign reserves, and political unstable environments by far contribute to the fragility of exchange rates. The value of a currency can changes at any time through shifting relations between finance, trade relationships, and the sentiments of investors (Essers, 2013).

This presents a real challenge to developing economies, as fluctuating exchange rate might lead to losing confidence among the investors, which is one of the most vital ingredients that ensure the spread of foreign direct investments. More to the point, varying unpredictable exchange rates complicate economic planning and long-term developmental strategies. A devalued currency to the countries that are net importers of essential goods can make such goods very expensive, thereby increasing the inflation rates while at the same time reducing the purchasing power of the population (Memon et al., 2015).

The answer to this issue lies not just in building on the economic fundamentals but also in improving political stability and having a better regulatory framework in place, which can provide a predictable economic environment. In this case, the understanding of what the determinants are that create the potential for stability or collapse within these exchange rates is part of what is needed to craft policies that will promote economic growth and development within a globalized economy. The problem statement insists that strong economic analysis and strategic policy intervention are necessary in averting the risks linked to volatile exchange rates associated with developing countries.

### 1.3. Objective of the Study

The objectives of the study are:

1. To determine significant difference in influence of macroeconomic variables on the exchange rate of developing countries?

2. To recommend policies to developing countries to optimize their macroeconomic strategies to enhance the stability of their exchange rate and prevent economic collapse?

## 1.4. Research Questions

Following are the research questions of the study:

- 1. Is there any significant difference in influence of macroeconomic variables on the exchange rate of developing countries?
- 2. How can developing countries optimize their macroeconomic strategies to enhance the stability of their exchange rate and prevent economic collapse?

## 1.5. Significance of the Study

It is important to study the determinants of exchange rate behavior among developing countries because the findings will be useful in informing and refining monetary and fiscal policies. The knowledge from this research can inform and refine monetary and fiscal policies. With information on what exactly causes the fluctuations in exchange rates be it in differences in inflation or differences in interest rates, political instability, and how these factors are being counteracted with global economic shifting policymakers can be able to frame focused responses. This might involve better management of national foreign reserves, fine-tuning interest rates to a balance between inflation and killing growth or designing frameworks to minimize the risks associated with volatile capital flows and speculative trading.

Furthermore, a relationship between these economic indicators and exchange rates must be known for economic stability, as this attracts foreign direct investments that are vital for development, especially in sectors that are most crucial to sustainable economic growth. Investment and business environments that usually attract investors and businesses are those where economic variables such as inflation and GDP growth are stable since risks associated with financial commitments and operational planning are reduced. A stable exchange rate will make prices for imports and exports more predictable, enabling better strategies for businesses and better economic planning.

Moreover, the knowledge derived from the analysis of these variables can be used to protect economies from external shocks, including sudden changes in global commodity prices or financial crises. By understanding the fundamental nature that underlies exchange rate stability, it is possible for nations to increase their economic resilience to ensure that such shocks do not have a large negative impact on the domestic economy. This can help in avoiding extreme scenarios, such as surging inflation or a recession in the economy that brings general misery among the people. Moreover, to add value to the research findings, the pre (2011-2018) and during and post (2019 - 2022) comparison will also be made.

The findings have implications for regional and international economic policies that transcend national borders. Since most of the developing countries are members of regional economic agreements, where exchange rate stability is also a matter of concern, an understanding of these dynamics can encourage smooth economic relations and work against competitive devaluations, thereby enhancing regional and global economic stability. This research is not only helpful to shape national policies but is also internationally integrated and contributes to international economic cooperation, hence its global significance.

The thesis is structured in a manner that gives a detailed analysis of the determinants that influence stability or collapse of the developing countries. Introduction chapter presented the research question, objectives, and significance of study. Literature Review chapter discusses existing research and theoretical frameworks regarding the topic of the study. The Methodology chapter will be a detailed chapter that outlines the data sources, variables, and techniques. Findings chapter will present the empirical evidence in an understandable manner, and the results interpreted, and discussion brought out in the context of existing literature. The last conclusion has summarized the main insights, study limitations, and suggesting future research works.

## **Chapter 2: Literature Review**

This chapter reviews the determinants of exchange rates in developing countries on the base of theoretical literature and empirical study. The theoretical literature consists of basic economic theories that explain the interrelations between the main macroeconomic variables, such as growth of GDP, money supply, and inflation, trade balance on impact of one hand, and the exchange rate on the other. This chapter will also go in-depth into some of the long-established theories such as the Balassa-Samuelson effect, Quantity Theory of Money, Purchasing Power Parity, and traditional trade theory. The empirical study section reviews representative findings of research that provide evidence on how these variables impact exchange rates in real contexts, which are based on various case studies and statistical analyses. The main scope of the sections is therefore to give a broader understanding of the forces impacting exchange rates and to bring out the interaction between theoretical insights and empirical evidence.

### 2.1. Theorical Evidence

The study on economic stability or collapse in developing countries is the study that combines several macro-economic variables. Among them are the GDP growth, money supply, inflation, exchange rate, and the trade balance. These key determining factors will shed light on how they exert their influence to promise economic stability. Each of these variables will be discussed with relevant economic theories and their empirical findings to give a full grasp of the theoretical framework. Growth of Gross Domestic Product (GDP) is one of the most fundamental measures of economic health, and in the theory of economics, it has received numerous works. There is a model named Solow-Swan Model (1956), which emphasizes capital accumulation, growth in the labor force, and development in technology as primary determinants of GDP growth rates. The model states that consumer economies can grow continuously if they invest in physical capital and achieve better productivity of the labor force. The GDP growth rates of developing countries must be increased, since they reflect an increase in economic output and an improvement in living standards that results in a reduction of poverty and stimulation of economic development. Endogenous growth theories proposed by Romer (1990) have an argument that policy measures, innovation, and knowledge spillover are applicable in realizing long-run growth. These theories underline the internal elements, particularly human capital, R&D, and improving technology, which drives economic growth.

Devereux (2014) explained Balassa-Samuelson effect which presents the relation of the real exchange rate and GDP. The main point of the theory is that internal price ratio would indicate the difference in productivity growth between a country's non-tradable and tradable goods sectors. If productivity in the tradable sector increases, then there is an increase in wage both in the tradable and non-tradable sectors. The trade balance will improve from this positive shock of increasing productivity, going through a real appreciation of the exchange rate; at the same time, this will keep the balance of payments at equilibrium (Choudhri & Khan, 2005).

According to Choudhri and Khan (2005), the Balassa-Samuelson effect is one of the key sources for identifying the cross-sectional differences in the real exchange rates between countries at different levels of income per capita. According to this theory, differentials associated with labor productivity will result in a substantial influence on real exchange rates that are likely to affect the relative price of non-traded goods. The model is very appropriate to calculate the effects between low- and high-income countries.

Rodrik (2008) points out that the Balassa-Samuelson theory aims to provide allowances for the computation of the Real Exchange rate, which allows compensating the difference in the price level of tradable goods with non-tradable goods and an essential tool for any country's development process. Since the productivity level in the tradable sector rises, the relative prices of non-tradable goods keep increasing. Hence, the developing countries experience their growth more rapidly because their profitability increases for twenty percent of their total income. A raise in the factor productivity in tradables unambiguously raises real appreciation, while a rise in total factor productivity in nontradables results in real depreciation. This is the reason why cross-sectoral productivity differentials matter in explaining a country's real exchange rate and hence long-run rate of economic growth.

The basic idea behind the money supply-exchange rate nexus is rooted in the Quantity Theory of Money, which asserts changes in the money supply as having linear, proportional effects on price levels in the long run. This theory would imply that in the short run, additions to the money stock tend to boost overall economic activity because of the rise in already existing liquidity and the decline in the rate of interest. However, in the long run, the increased money supply will follow higher price levels or inflation, which will ultimately devalue the currency. Inflation will have consequences for the purchasing power of money and thus make the money unattractive both domestically and internationally.

Monetary theory assumes that goods and capital markets are integrated. Therefore, the theory confirms the statement of the PPP doctrine put forward by Gustav Cassel in 1945: fixing the exchange rate of two countries' currencies. According to the PPP, the exchange

rates between two currencies shall equal the ratio of total price levels in two countries. This translates to the sufficient determination of the best exchange rate that works as a prerequisite in executing the programs set for the development in the country, which could be highly impacted by the exchange rate, most especially in the prices, investment, balance of payment, and interest rate of the inflation.

Another important determiner of exchange rates is inflation. The Purchasing Power Parity theory, which was first formulated by Gustav Cassel (1918), have this only once opines that exchange rates will move to equalize the purchasing power of two different nations in terms of prices for a basket of goods and services. According to the PPP, if a country has a relatively high level of inflation as compared to its trading partners, the country's exchange rate should depreciate so that consumers receive purchasing power the same as that of other countries. It is because of such higher inflation that the value of currency goes low while domestic goods cost becomes high, and they are less competitive in the global world economy.

The theoretical underpinning of PPP is from the law of one price, stating that in the absence of transport costs and trade barriers, identical goods should sell at the same price in a common currency. If one country is having higher inflation, then prices for goods and services increase as compared to a country having lower inflation rates. The nominal exchange rate adjusts to restore those goods' and services' relative prices between countries that match up with the consistent price level. The adjustment process ensures that when a common currency is used, the price of a basket of goods costs the same in both countries.

According to traditional trade theory, a country with a trade surplus will experience an appreciation in the value of its home currency because exports will be greater than imports. A country with a trade deficit will experience a devaluation in its home currency as imports are

greater than exports. Again, the relationship is derived from fundamentals based on the basic laws of foreign exchange supply and demand. When the country exports goods and services, buyers in the foreign countries must purchase domestic currency to pay for these exports, which raises demand for the domestic currency and results in its appreciation. On the contrary, with import affairs, a country must swap more of its own currency in the foreign exchange market.

#### 2.2. Empirical Evidence

There are two broad approaches to managing the exchange rate, the fixed and flexible exchange rate regimes. These are specific systems that direct how a country's currency can be exchanged in terms of other national currencies. The fixed exchange rate regime is purposely designed to provide an environment for foreign exchange with a foreign exchange market in which there is a high degree of certainty and stability in international trade transactions according to Obadan (1996). On the other hand, a flexible exchange rate system operates under market forces, where a country's exchange rate is determined through the interplay of the demand and supply of foreign exchange, with varying degrees of influence.

Bahmani-Oskooee and Kara (2000) looked at developing countries and discovered that those with higher GDP growth tend to appreciate the domestic currency. In general, higher GDP growth tends to appreciate the domestic currency. This is because with a strong growth instance, the confidence of the investor is up, and thus more capital flows in, making the currency appreciate. The changing base-years issue has been addressed in the empirical analysis using panel data techniques to provide consistent results in the various developing economies.

Bénassy-Quéré, Fontagné, and Lahrèche-Révil (2021) found that the countries with high and rising GDP growth rates had appreciating currency. They conducted their study using a gravity model approach and established that economic performance was an important factor in the determination of exchange rates. It showed that GDP growth was an important variable in explaining FDI and that this had impacts on the exchange rate.

In another study, Chinn, and Johnston (1996), among the determinants of long-run real exchange rates, was GDP growth. It was his panel-data research that showed rate of economic growth has caused real exchange rate appreciation. This supports the hypothesis that strong economic performance that attracts foreign investment will increase the demand for domestic currency and such appreciation. Engel and West (2005) went further to research and analyze some models of exchange rate regarding the relationship between macroeconomic fundamentals and GDP. They indicated that macroeconomic fundamentals such as GDP growth introduce more determination to the exchange rate; in this case, the rates are explained both in the short and long runs by various factors.

The classic paper on exchange rate overshooting is that of Dornbusch (1976). In his model, money supply expansion results in immediate depreciation in the domestic currency. This is so because the immediate impact of money supply growth is to reduce interest, which reduces investors' interest in domestic assets. As capital flows out, the currency depreciates. But over time prices are adjusting, and the currency comes back to its equilibrium value. Many empirical works have supported the stand taken by Dornbusch's model and, henceforth, have kept the model at the center of exchange rate theories.

Branson and Henderson (1985) have gone ahead to determine that the base money supply is determinant of the exchange rate. In this regard, it suggests that in expansionary monetary policies within a country where the money supply increases, the domestic currency in the country is likely to depreciate. In addition, the study enunciated that monetary policy affects exchange rates through interest rates and movements of capital. Further establishing these empirical facts is a study by Frenkel in 1981 on the relationship of monetary variables with exchange rates for the US dollar. It was shown that high rates of increase in US money supply resulted in a massive depreciation for the dollar. In fact, using the techniques of econometric modeling, it can be vividly shown that both in the shorter run as well as in the long run, monetary expansions leave a significant mark on exchange rates.

In the same line of research, Clarida and Gali (1994) have proceeded to examine the influence of monetary policy shocks on exchange rates. From their research using a VAR model, it was established that monetary policy shocks create very significant and very persistent exchange rate changes from unanticipated changes in domestic money supply. The findings are, therefore, clearly highly indicative of the nature of monetary policy on exchange rates.

Frenkel (1976) developed a monetary model of exchange rate and uncovers the thing that would undermine the currency inflation. His model predicts that indeed inflation causes a loss in the real value of money holdings, thus forcing the people to diversify their portfolio holdings away from the domestic currency assets and, hence, causes capital outflows and a further loss of the value of currency. A different period in history and country can be looked at along the same lines, although empirical studies do indeed support Frenkel's findings.

Rogoff (1996) studied persistence in different exchange rate movements and inflation in the PPP. He finds that for countries that are marred by high inflation, their currency persists in depreciation. Research also confirmed a need to keep inflation low and stable, thus helping to sail smoothly with a more robust and stable currency. Froot and Rogoff (1995) covered the prior Bretton Woods period and a strong relationship between inflation differentials and the movements of the exchange rates. Work used a long run perspective and proved that the progressive inflationary pressures led toward the long-term currency downgrading. This research-based evidence supported the theory regarding the relationship between inflation and exchange rates.

Mundell (1968) is among the first to use the Mundell-Fleming model in analyzing the nexus between trade balances and the exchange rate. Mundell found that when the trade balance under the Mundell-Fleming model gets better, an appreciation of the domestic currency takes place. This is because an increase in the export demand for the domestic money starts, whereas a decrease in the import supply starts in other foreign exchange markets. Observe an intertemporal approach in Obstfeld and Rogoff (1995) in the analysis of the current account and its influence on the exchange rate. One of the significant exchange rate determinants found in the study is the correction of trade balances. A country that has a persistent trade surplus sees its currency appreciating. In contrast, a country with a persistent trade deficit would translate to the depreciating of its exchange rate. The paper, using a general equilibrium dynamic model, was credited with generating robust empirical evidence for the linkage between trade balances and exchange rates.

The analysis is done by Goldstein and Khan (1985) elaborately concerning income effect and price effect in foreign trade. The two researchers work is the basis that considers trade balance as an exchange rate determinant in the two groups of econometrists. The relationship between trade balance and exchange rate in different countries is derived using econometrist modeling techniques. The empirical findings suggest that the movements in the balance of trade would have an appreciating effect on the home currency—clearly in line with the prediction from the Mundell-Fleming model.

Baxter and Kouparitsas (2006) further analyzed the decomposition of volatile rates under floating exchange, incorporating the effect of the trade balance. The empirical work considered and highlighted by the SVAR supports the idea that shocks to the trade balance have a very persistent strong influence on exchange rate fluctuations. The dynamics of the trade balance towards variations in exchange rates were also studied.

In another empirical study, Taylor (2002) tested the hypothesis on the influence of inflation targeting on the exchange rates. Taylor showed that countries' credible inflation targeting had a lower rate of more predictable inflation that contributed to forming more robust and more stable exchange rates. Based on the panel data approach, the benefit of inflation targeting lies in the ability to maintain the stability of the exchange rate.

Numerous empirical studies, including those conducted in Nigeria, have sought to identify factors influencing exchange rate volatility and its repercussions. Among these determinants, the inflation rate emerges as a significant variable affecting exchange rates. Honoham and Lane (2003) examined annual inflation differentials across the Eurozone from 1999 to 2001, highlighting the substantial impact of nominal effective exchange rate movements on divergent inflation rates and vice versa. Further research by Honoham and Lane (2004) corroborated the role of exchange rates in explaining inflation variations in the European Monetary Union (EMU) during periods of both Euro appreciation (2002-2003) and depreciation (1999-2001).

This is especially important in emerging markets, where capital tends to move quickly in response to fluctuations in investor sentiment. Research by Kamin and Rogers (2000) ascertained that in such markets, expansionary policies increasing the money supply have often brought in notable depreciation of the currency. That becomes a vital clarion call to the policy makers since they must weigh the short-term benefits of monetary expansion against its possible long-run cost regarding currency depreciation and inflation. Adding to this, Gagnon and Ihrig (2004) gave cross-border statistics regarding the implication of money supply. According to their study, an action of money supply that is appreciating causes currency depreciation because of two principal reasons: firstly, the rise of inflationary effect and, secondly, the fall of real interest rate differentials than other countries. The real value of the currency declines because, as inflation is further raised along with the growth of money supply, the attractiveness of it relative to other currencies goes down. High inflation-induced indebtedness combines with constant nominal interest rates to imply declining real interest rates, enhancing capital outflows, and exerting depreciation pressure on the exchange rate. This complex interaction underlines the importance of maintaining a prudent and balanced monetary policy, particularly in developing countries, where the bad effects from rapid currency depreciation can be more severe and destabilizing.

Chuka (1990) further argues that the exchange rate policy is geared toward an increase in output with optimal distribution. To him, it is a critical condition that should be met for the above goals to be achieved, whereby the exchange rate should be as stable as possible. As he puts it, stability allows the rate to be viable in the face of relative price change, international terms of trade, and growth factor variations. This, in turn, has led some analysts to conclude that the relationship between an inflation-targeting regime and an exchange-rate regime has made it happen that the adoption of the former comes at a cost of exchange rate volatility. The study of Levine et al., (2002) while arguing that the free-floating exchange rate floating, at the same time, other studies like Frankel and Schmukler argue that the adoption of inflation targeting will lead to higher exchange rate volatility or Thomas finds that the lack of credibility of monetary authority can lead to the exchange rate volatility problem.

Seraj and Coskuner (2021) discuss a real exchange rate through an increase in economic growth or factors affecting it. He was firm that there is no systematic link that exists at all between economic development and the real exchange rate. As Husain et al. (2004) remarked concerning the fixed exchange rate regime, "the fixed exchange rate regime has been associated with little access for the weaker and less developed countries to international capital, low inflation rate and a higher level of durability." Husain et al. also did not find a robust relationship in the choice of the exchange rate regime vis-à-vis economic performance in developing economies. They further realized that for the advanced economies, a sustainable, slightly higher level of growth rate appeared without an accompanying higher level of inflation in the flexible exchange rate regime.

Nucu (2011) also analyzed between 2000-2010 to measure the influence of GDP, inflation rate, money supply, interest rates, and balance of payments over the exchange rate of Romania with the most important currencies, namely EUR and USD. The paper found that between the result of the rate of exchange (EUR/RON) and GDP, there is an opposite relation, as well as between the money supply. On the other hand, it was found to exist with the EUR/RON inflation rate and interest rate. While the study has attempted establishing the validation of the relationship between the exchange rate and balance of payment, it is, however, insignificant.

In Nigeria, there is scanty literature available that deals with the determinants of exchange rate volatility. A review is done below. Ajao and Igbokoyi (2013) also considered the extent to which real exchange rate, productivity, trade openness, government expenditure, real interest rate, and money supply had influenced absolute exchange rate volatility in Nigeria between 1981 and 2008. Ajao and Igbokoyi based their empirical study on the GARCH and ECM models. They found that the real exchange rate, trade, government expenditure, and genuine interest rate in Nigeria positively influence the foreign exchange rate volatility. The results reveal that real exchange rate, trade, government expenditure, and genuine interest rate positively influence foreign exchange rate volatility except for money supply and productivity. Exogenous variables on foreign exchange rate volatility.

Others who have tried to estimate the effect of trade openness on the Malaysian exchange rate are Chin and Chee-hong (2013). Using monthly data for estimation purposes, theirs is one of the findings that concurred with the expected signs of all the variables and also conformed to the prediction of the theory that an increase in trade openness would lead to the depreciation of the domestic currency of Malaysia. So, this finding thus supports the claim related to the threshold level that it will open the economy to a particular level, but if it goes above that level, it will lose the value of money.

Obaseki (1991) also adds that the country can also acquire foreign exchange in the form of exports of goods and services, FDI flow, or external loans, aids, and grants commonly available for settling international obligations. This thus tops up the need for adequate management of the country foreign reserves such that when a disequilibrium occurs in the foreign exchange market due to a lack of sufficient supply of foreign services, there will be extra pressure on the foreign exchange reserve. If not enough, the effect will revert the income effect to a deterioration into a balance of payments problem.

In this respect, Imimole and Enoma (2011) have researched the effect of depreciation on the exchange rate of Nigeria from 1986 to 2008 by the ARDL cointegration method on inflation. Interpreting the outcome, he concludes that depreciation in the exchange rate, money supply, and actual gross domestic product determine inflation in Nigeria. Depreciation of the Naira is found in this study to have a significant long-run positive impact on inflation in Nigeria. That establishes the fact that the exchange rate depreciation would be linked to an increased rate of inflation in Nigeria, and inflation in Nigeria has been a lagging and cumulative type of inflation. They support that the depreciation of the Naira policy is assisted by other macroeconomic policies to stabilize the erratic rate of inflation in Nigeria.

The research by Noer, Arie, and Piter (2010) looked into the relative research on the alliance of inflation rate and the Real Exchange Rate. It was thus found that by using research statistics and the Granger causality test, there was a significant and robust correlation between the movement of the inflation rate and the Real Exchange Rate in most country investigations. Ojo (1990) is quoted as affirming that the opinion developed that international experience has shown that no country leaves its exchange rate determination entirely for the market forces alone and that some level of intervention should be applied occasionally as the situation may demand. The cointegration techniques covered here were applied using data from 1986-2008 with the Auto Regressive Distributed Lag Model (ARDL).

Victor and Samuel (2012) concluded that in Nigeria, the relationship between the real exchange rate and inflation is in the long run. All the same, if the results of the error correction model are further considered, the speed of adjustment would seem to be higher. The autoregressive conditional heteroskedasticity (ARCH) results showed that the real exchange rate appreciated for both imported and domestic inflation. This second result points to the persistence of volatility between the rate of inflation and the real exchange rate, thereby indicating that the real exchange rate appreciates in Nigeria and is volatile to the rate of inflation. They argue that stabilization policies geared toward accurate exchange rates, through the targeting of inflation, should be combined with the simultaneous increase of exports and the production of previously imported inputs to alleviate the problem of imported inflation, thus probably being one of the most significant natural sources of this exchange rate volatility.

According to Rogoff (1996), a country facing high inflation and fast devaluation leads to depreciation in real exchange rates. This is because with high inflation, the real value of domestic money falls, thus making exports cheaper and imports costlier, hence eventually nominal exchange rate devalues. Besides, Choudhri and Khan (2005) have shown that inflation differentials do play an important role in driving the exchange rate, and an increase in the level of inflation does lead to depreciation in the value of the currency.

Further, the role of market expectations is another factor that can influence the link between inflation and exchange rates. For example, if investors consider that a country's inflation is likely to increase vis-a-vis its trading partners, they would, in turn alter the portfolio by reducing the amount of another country's currency held, and this, in fact, causes depreciation even before the actual inflation differential appears. Such anticipatory behavior is motivated by the forward-looking nature of exchange rate markets where expectations about future economic conditions play a significant role. In general, then, inflation is one of the principal factors according to the exchange rates theory suggests and high relative inflation precipitates depreciation to maintain PPP can both be supported theoretically and empirically.

Edison et al., (1987), established that countries with chronic trade surpluses usually witness an increase in the exchange rate of their currency fundamentally due to heightened demand for the currency. This, therefore, means that a trade surplus reflects that a country exports more than it imports, thus meaning that foreign buyers must buy more of the domestic currency to pay for these exports. The demand for the home currency would increase and be appreciated in foreign exchange markets. The trade surplus could also show the prospect of a highly competitive economy with very pronounced production capacities, which may further enhance investors' confidence and demand for the domestic currency in the long run. From another view, a trade deficit puts downward pressure on the exchange rate because the country that has made a trade deficit has to sell off its currency to pay for imports, in case of importing more goods from another country than it is exporting. Thus, when a country imports more than it exports, it means a country must acquire foreign exchange to pay for this lot. This will have the domestic currency being sold, raising its supply in the market for foreign exchange and thus leading to depreciation. Evidence by Bahmani-Oskooee and Ratha (2004) shows that trade balances represent one of the most important determinants for exchange rate movements, if a country registers trade deficits, its currency depreciates. In fact, the said study observed that nations with permanent trade deficits face downward pressure on their currencies because of the permanent necessity to sell domestic currency for the purpose of financing imports, which increases the supply of foreign exchange.

There might also be some other factors related to the trade balances that affect exchange rates, such as capital flows, foreign direct investments, and government policies. For example, in countries that are in a trade deficit, there will most likely be foreign investment influx to serve financing for current account deficits. This would offset some of the depreciation pressures on the currency for only that period. However, in the long term continued trade deficits could eventually erode investor's confidence and therefore result in capital flight that could further exacerbate the depreciation of the currency. In fact, policy actions by governments in terms of corrective tariffs, subsidies, and manipulations of currencies as intervention also impact the equilibrium trade balance and hence affect the exchange rate. These policies can alter the dynamics of supply and demand in the foreign exchange market, changing the degree to which trade balances affect exchange rates.

## **Chapter 3: Methodology**

This chapter outlines the methodology that has been used in this research. It starts with the conceptual model guiding the research, through which the hypotheses have been derived. Sources and procedures for data collection will also be present with descriptions. This is followed by the definition of the variables under study to be able to guarantee clarity and consistency in the operationalization of each variable. It also presents the techniques used to analyze the data.

#### 3.1. Model of the Study

$$EXR_{t,i} = \alpha_0 + X'_{t,i}\beta + \mathcal{E}_t$$

Here, in the above equation EXR represents nominal exchange rate and X vector representing the macroeconomic variables.

The empirical model of the study is given below:

$$EXR_{t,i} = \alpha_0 + GDP_{t,i} + M_{t,i} + INF_{t,i} + TB_{t,i} + \mathcal{E}_t$$

EXR<sub>t</sub>: Nominal exchange rate at time t for country i.

GDPt: Growth rate of real gross domestic product at time t for country i.

Mt: Real money supply at time t for country i.

INF<sub>t</sub>: Inflation rate at time t for country i.

TBt: Trade balance at time t for country i.

### 3.2. Hypothesis of the Study

On the base of the literature review, the following hypothesis has been created:

H<sub>1</sub>: There is significant influence of GDP on the exchange rate.

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H<sub>2</sub>: There is a significant influence of Money Supply on the exchange rate.

H<sub>3</sub>: There is a significant influence of Inflation on the exchange rate.

H<sub>4</sub>: There is a significant influence of the Trade Balance on the exchange rate.

H<sub>5</sub>: There is a significant difference in relationship between macroeconomic variable and exchange rate in the pre and during and post Crisis period.

#### 3.3. Data

This dataset is secondary quantitative panel data obtained from 17 developing countries for the period 2011–2022. The countries were listed as developing by OECD in 2023. It contains main economic indicators, exchange rate, GDP, money supply, inflation, and trade balance. Including countries from diverse regions ensures that various contexts of socio-economic and political determinants are represented. In this way, the findings resulting from the research will be robust and generalizable.

From the year 2011 to 2022, the study can capture world significant occurrences and transitions, including economic fluctuations, technological advancements, and socio-political changes. The countries chosen typically were less developed in their natural settings, i.e., from the transition economies we have chosen Albania, Belarus and Moldova, from Latin American Peru, Guyana, Bolivia. Paraguay, Colombia and the remaining were countries of Middle East and Maghreb as Algeria, Egypt, Iraq, Lebanon, Syria, Tunisia, Libya, Morocco, Iran. This will be a strong basis for in-depth analysis of the secondary current panel data, understanding the complex interplay of the factors determined in the trajectory of developing countries toward stability or collapse. The sources of the data were World Data Bank and Macrotrend. The list of the countries is:

#### **Table 1 List of Countries**

Albania	Algeria	Belarus
Bolivia	Colombia	Libya
Egypt	Guyana	Paraguay
Iraq	Lebanon	Tunisia
Moldova	Morocco	Iran
Peru	Syrian	

## 3.4. Variables of the Study

The dependent variable of the study is the exchange rate. The proxy used to measure the exchange rate is national currency units per US dollar, which discloses the value of national currency within international markets and strongly affects the flow of both trade and investment (Demirhan & Demirhan, 2019).



Figure 1 Average Exchange Rate (Local Currency Unit per US dollar) Across Years

The independent variables include GDP growth rate, money supply growth, inflation, exchange rates, and trade balance. The GDP growth rate is defined as the percentage increase

in gross domestic product on an annual basis, denoting the economic performance of a given country. Money supply growth is the growth of broad money at an annual percentage, indicating evidence of the nature of monetary policy and liquidity in the conduct of the economy. Inflation is expressed in the Consumer Price Index, which accounts for variation in the price level of a basket of consumer goods and services and hence reflects the cost of living and purchasing power (Stylianou et al., 2024).



Figure 2 Average Gross Domestic Growth Rate Product across Years



Figure 3 Average Money Supply % of GDP across Years

Lastly, the trade balance is the difference between the export value and the import value, reflecting the external economic interactions of a country and its ability to sustain its balance of payments. These independent variables are very important because they help in understanding the economic factors that influence the stability or collapse of developing nations.



Figure 4 Average Inflation (Consumer Price Index) across Years



Figure 5 Average Trade Balance Across Years

#### 3.5. Estimation Strategy

As the p-value > 0.05 of the Hausman test, the best approach for this analysis was the random effect method. This method controls the time-invariant attributes of each country and hence produces more accurate estimations of how the independent variables affect the dependent variable. Different assumptions were tested to ensure robustness of this model, multicollinearity using Variance Inflation Factor (VIF), which assumes that independent variables should not being highly correlated with each other; and it was also tested for heteroskedasticity, which it is assumed that the variance of errors is constant across observations. Linearity of relationship as well as normality of data was also tested, which showed that all necessary assumptions required for the analysis of panel data are met.

Along with-it descriptive statistics and correlation analysis have also been performed. Descriptive statistics summarize the central tendency of variables, dispersion, and form of the distribution of what general features the data set has in its characteristics. The correlation analysis tests how the independent variables correlate with the dependent variable. For the robustness analysis Fixed effect has been used. All the analysis has been performed using Stata.

## Chapter 4: Findings

This chapter presents the results of the empirical analysis. An elaboration on the descriptive statistics is first provided, offering insights into the economic conditions of the 17 developing countries of this study. Then, the results of panel data analysis are presented, explaining the relationship between the dependent variable exchange rates and independent variables like GDP growth, Money supply, inflation, and trade balance. Further, the outcomes of several diagnostic checks were included to ensure the robustness of the findings.

# 4.1. Descriptive Statistics

Table 2 Descriptive Statistics						
Countries		Exchange Rate	GDP	Money Supply	Inflation	Trade Balance
Albania	Mean	111.040	2.720	4.534	2.334	-0.155
	Standard Deviation	8.018	2.838	3.412	1.483	0.027
Algeria	Mean	105.943	2.067	9.039	5.124	-0.024
	Standard Deviation	23.714	2.466	6.350	2.423	0.091
Belarus	Mean	1.707	0.636	26.929	18.414	0.013
	Standard Deviation	0.729	2.998	32.282	18.343	0.029
Bolivia	Mean	6.912	3.610	9.446	3.662	-0.016
	Standard Deviation	0.008	4.065	7.257	2.592	0.060
Colombia	Mean	2849.633	3.639	11.030	4.273	-0.050
	Standard Deviation	828.121	4.365	3.991	2.337	0.024
Egypt	Mean	12.212	3.859	18.666	11.510	-0.082
	Standard Deviation	5.332	1.485	8.316	6.461	0.021
Guyana	Mean	206.786	13.395	9.003	2.281	0.007
	Standard Deviation	1.609	19.780	5.579	2.077	0.025
Iran	Mean	29742.270	1.619	27.935	25.827	0.017
	Standard Deviation	11856.050	3.868	5.736	13.298	0.054
Iraq	Mean	1221.521	4.225	7.875	2.493	0.042
	Standard Deviation	107.082	7.037	8.258	2.503	0.123
Lebanon	Mean	1507.500	-2.231	6.077	36.494	-0.239
	Standard Deviation	0.000	7.316	1.252	63.715	0.092
Libya	Mean	1.890	1.892	8.573	9.043	0.046
	Standard Deviation	1.299	35.682	13.663	9.343	0.140
Moldova	Mean	16.332	3.002	10.981	7.502	-0.277
	Standard Deviation	2.910	5.946	7.959	6.925	0.039
Morocco	Mean	9.204	2.784	5.456	1.611	-0.103
	Standard Deviation	0.675	3.707	1.602	1.675	0.024
Paraguay	Mean	5531.397	2.940	11.854	4.460	0.010
	Standard Deviation	1024.051	2.850	5.132	2.331	0.021
Peru	Mean	3.216	3.489	10.537	3.457	0.022
	Standard Deviation	0.416	5.480	4.487	1.720	0.028
Syrian	Mean	223.671	-6.152	20.728	20.728	-0.030

	Standard Deviation	183.751	10.713	22.591	22.591	0.018
Tunisia	Mean	2.259	1.188	8.620	5.404	-0.102
	Standard Deviation	0.601	3.570	1.906	1.475	0.016

The relative stability in the exchange rate in Albania signifies economic conditions that are equally stable. This can help in its international trade investment, especially where risks are low based on the type of stability that can attract foreign investors for whom certainty in the returns is a must.

On the contrary, Algeria's exchange rate is of significant volatility. High volatility would incorporate the idea that it is a currency of the country that is highly susceptible to economic shocks and external variables. Moreover, the variables are likely to change, such as the oil price alteration, political instability, or a change in the economic conditions across the world. High volatility in exchange rates will scare away foreign investment and complicate international trading because of the potential for uncertainty and risk.

This further indicates that Belarus's currency may exhibit relative stability of behavior. In absolute terms, though, with the currency having a low value, small changes can be pronounced in percentage terms. This could be due to the tight monetary policies it follows or its lesser integration into the international financial system, which buffers the economy from external shocks.

The excessive volatility in the Iranian currency specifies tough business conditions, likely triggered by international sanctions and internal economic instability. This might affect trading to and from the country, reduce foreign investments, and cause shortages in foreign currency, leading to depreciation and further volatility. Such conditions make it very difficult for businesses to plan and operate on an international front effectively. High growth and high volatility in the GDP of Guyana may suggest changes very likely to occur at a high rate, majorly propelled by new developments in the extraction process of the natural resources: oil and minerals. High growth levels can point to a country on the boom, while the associated volatility shows the challenges and quandaries of managing the new wealth. These possibly may involve pressures from inflation, inequalities in the distribution of income, or concerns regarding the environment.

Indeed, the negative GDP growth and high variability in the GDP of Lebanon point out big problems, including crashes and political instabilities in the Arab country. Directly, the negative growth in GDP indicates that the said country is in decline, probably leading to high rates of unemployment, low levels of income, and fewer public services. Again, the variability in the country might mean that it is undergoing frequent shocks, probably emanating from political upheavals, conflicts, or even structural economic challenges.

Syria highly negative GDP growth indicates an economy bedeviled by the consequences of prolonged conflict and instability. Elevated variability in the growth rate signals that uncertainty and challenges to attain any form of sustained economic recovery envisioned have continued.

Meanwhile, Iran boasts a vast money supply as part of the countering of the effects of the economic sanction. The hike in the money supply would boost domestic economic activities in the short term, but any such enhancement would cause hyperinflation if not matched by economic productivity. Further, this devalues the currency, making the economic difficulties much heavier. The controlled money supply in Lebanon indicates a relatively conservative posture in monetary policy. However, even under such control, the country still must face massive economic instability, which may suggest that some other factors of influence are dominant in affecting the general economy. Belarus has already maintained a tight, aggressive monetary policy with a high money supply. Either way, the efforts can stimulate an economy or contain inflation. The effect of uncareful management of such policies can lead to more inflationary pressure. High money supply may reflect attempts at the support of economic growth. Still, if not accompanied by a corresponding amount of economic output, it can lead toward the depreciation of a currency.

This very high rate of inflation in Lebanon can be termed as hyperinflation, which reflects a severe economic crisis and loss of confidence in currency. Arising from excessively high growth rates of the money supply, loss of faith in monetary policy, and very severe disruptions to the natural economy- in another ways, it erodes savings. It reduces real earned income value and could produce social unrest.

The high levels of inflation in Iran further indicate many economic challenges that could be due to foreign sanctions as well as internal economic policies. Such high inflation rates erode economic stability, diminish the power of purchasing, and result in capital flight as investors try to hold wealth in more stabilized currencies.

The high trade deficit in Lebanon reflects huge economic problems intensified by other accompanying macroeconomic issues. A sustained trade deficit may lead to an improvement in foreign indebtedness and, at the same time, deplete the stock of foreign exchange in the process of putting downward pressure on the domestic currency. This implies that a country consumes more than its production levels would have indicated in the long term. Though the fact is that Moldova has been running a continuous trade deficit, it only shows the level of its imports as opposed to its exports put the economy at risk of external shocks, with much emphasis laid on the inflationary pressures that would arise from increases in prices for global commodities. The countries like Albania or Belarus, with a relatively stable exchange rate and slow but steady economic growth, thus enjoy a more predictable economic environment, creating the potential for foreign investment and long-run economic development. In contrast, countries like Iran and Lebanon continue to have serious economic problems with such vital features as high inflation, fluctuating exchange rates, and large trade deficits. This makes it a callous environment to provide and develop growth, as businesses and consumers are constantly at risk from falling purchasing power. Very wide economic reforms and stabilization policies could bring that sense of confidence and stability.

The high rate of growth for GDP, and even the fluctuation, within Guyana, speaks to the bright opportunities, for that matter, the cost that comes with rapid economic development within resource-rich nations. It must be managed purposefully without risk, ensuring sustainable growth, and safeguarding the nation's ecological environment from degradation and income inequality.

Table 3 Correlation Coefficient Analysis							
	Exchange Rate	GDP	Money Supply	Inflation	Trade Balance		
Exchange Rate	1						
GDP	-0.0172	1					
Money Supply	0.2251	-0.0031	1				
Inflation	0.2018	-0.013	0.6827	1			
Trade Balance	0.1327	0.1762	0.1552	0.0814	1		

#### 4.2. Correlation Coefficient Analysis

The correlation matrix presents the relationship of the exchange rate with economic variables such as GDP, money supply, inflation, and balance of trade. There is a weak negative relationship between the exchange rate and GDP, indicated by a correlation coefficient of -0.0172. This suggests that an increase or decrease in GDP has a very small inverse effect on the exchange rate. Similarly, there is a weak positive relationship, with a

correlation coefficient of 0.2251, between exchange rates and money supply. This implies that the money supply may be increasing due to an increase in the exchange rate in some way.

Table 4 Random Effect to determine the factor influencing the exchange rate		
	Exchange Rate	
GDP	2.653	
	(12.120)	
Money Supply	42.086***	
	(15.488)	
Inflation	-76.869***	
	(25.469)	
Trade Balance	607.100	
	(2232.158)	
Constant	1166.827	
	(1129.824)	
Observations	175	
Year Effect	Yes	
R-square	0.234	
***p < 0.01 **	p < 0.05 * p < 0.10	

### 4.3. Random Effect Model

The p value > 0.05 of the GDP indicates that there is insignificant influence of the variable on the exchange rate. The Standard error is relatively large (11.2) which shows that the estimate is not statistically significant indicating that the first hypothesis of the study is not accepted. The p value < 0.05 of the money supply provides evidence to accept the second hypothesis of the study which states that there is significant influence of the money supply on exchange rate at 1% significance level. The beta coefficient is positive, which indicates the positive influence of the money supply on the exchange rate. With an increase in money supply, the exchange rate increases.

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Inflation p value < 0.05 which also provides evidence in favor of the third hypothesis. The third hypothesis states that there is a significant influence of inflation on the exchange rate at 1% significance level. The beta coefficient is negative which means that the direction of influence is negative. With the increase in inflation, the exchange rate decreases. The last variable, Trade Balance with the p value > 0.05 which means that forth hypothesis is also rejected which shows non-significant influence of the trade balance on the exchange rate. The year effect was substantial.

	Exchange Rate	Exchange Rate			
	Pre Crisis	During/Post Crisis			
GDP	12.108	0.935			
	(17.458)	(2.203)			
Money Supply	43.216**	1.874			
	(19.039)	(4.352)			
Inflation	-112.957***	9.908*			
	(31.896)	(5.286)			
Trade Balance	-2647.041	-500.865			
	(3174.485)	(400.588)			
Constant	2057.482	780.894			
	(1370.425)	(589.788)			
Observations	124	51			
R-squared	0.125	0.123			
***p<0.01 **p<0.05 *p<0.10					

 Table 5 Random Effect Model to determine the factor influencing the exchange rate in pre vs during and post Crisis

 period

Table (5) represents the results of the comparison between the pre, during and post crisis period. Column (1) showing the influence of the independent variables on the exchange rate before the Covid 19 (2011-2018). The influence of the GDP and Trade Balance was insignificant in the pre-crisis period. Whereas, both the money supply, which was statistically significant at the 5% level, and inflation, which was statistically significant at the 1% level,

had a significant influence on the exchange rate. Column (2) showing the influence of the independent variables on the exchange rate during and post the Covid 19 (2019-2022) period. The influence of the independent variable changed from pre-crisis Covid 19 period. The GDP, Money Supply and Trade Balance lead to insignificant influence while Inflation exhibited the significant influence at 10% significance level. Additionally, the direction of Inflation's influence also changed as it became positive in the during and post crisis period.

### 4.4. Robustness Check

For the robustness check, a fixed effect model has been used. The results are presented in the table below (6):

Table 6 Fixed Effect to determine the factor influencing the exchange rate			
	Exchange Rate		
GDP	3.787		
	(11.663)		
Money Supply	41.562***		
	(14.882)		
Inflation	-84.204***		
	(24.579)		
Trade Balance	67.043		
	(2198.285)		
Constant	633.594		
	(468.485)		
Observations	175		
Year Effect	Yes		
R-squared	0.159		
***p <	< 0.01 **p < 0.05 *p < 0.10		

The robustness test also provided the same results. The p value > 0.05 of the GDP indicating that there is insignificant influence of the variable on the exchange rate. This

shows that the first hypothesis of the study is not accepted. The p value < 0.05 of the money supply provides evidence to accept the second hypothesis of the study which states that there is significant influence of the money supply on exchange rate. The beta coefficient is positive, which indicates the positive influence of the money supply on the exchange rate. With an increase in money supply, the exchange rate increases.

Inflation p value < 0.05 which also provides evidence in favor of the third hypothesis. The third hypothesis states that there is a significant influence of inflation on the exchange rate. The beta coefficient is negative which means that the direction of influence is negative. With the increase in inflation, the exchange rate decreases. The last variable trade variable p value > 0.05 which means that forth hypothesis is also rejected which states significant influence of the trade balance on the exchange rate. The year effect was substantial.

	period	
	Exchange Rate	Exchange Rate
	Pre Crisis	During/Post Crisis
GDP	14.319	0.946
	(17.421)	(2.288)
Money Supply	43.099**	1.906
	(18.940)	(4.520)
Inflation	-120.486***	9.945*
	(31.875)	(5.488)
Trade Balance	2488 200	517 630
Trade Daranee	-5468.509	-517:050
	(3251.282)	(416.536)
Constant	1758.459***	857.905***
	(326.520)	(71.035)
Observations	124	51
R-squared	0.125	0.123
	*** $p < 0.01$ ** $p < 0.05$ * $p < 0$	0.10

 Table 7 Fixed Effect Model to determine the factor influencing the exchange rate in pre vs during and post Crisis

 period

The results were similar after using the different panel data analysis indicating the results are robust. Column (1) showing the influence of the independent variables on the exchange rate before the Covid 19 (2011-2018). The influence of the GDP and trade balance was insignificant in the pre-crisis period. Whereas the money supply and inflation exhibited a significant influence on the exchange rate. Column (2) showing the influence of the independent variables on the exchange rate during and post the Covid 19 (2019-2022) period. The influence of the independent variables on the exchange rate during and post the Covid 19 period. The GDP, money supply and trade balance lead to insignificant influence while inflation exhibited the significant influence at 10% significance level. The direction of influence of inflation also changed as it became positive in the during and post crisis period.

#### 4.5. Discussion

The findings from the random effect model indicate that the exchange rate does not change significantly with GDP growth. This suggests that in the sample of developing countries analyzed, changes in GDP growth do not lead to significant changes in the exchange rate. According to theoretical logic, strong GDP growth attracts foreign investment, resulting in an appreciation (Balassa, 1964; Samuelson, 1964). However, the lack of a definite relationship in the sample in this paper may be attributed to other dominant variables, namely political instability, economic policies, or market perceptions, which are more dominant than GDP growth and its influence on exchange rates on these countries. This result, indeed, is consistent with Seraj and Coskuner (2021), who also found no definite correlation between economic growth and real exchange rates empirically.

The findings support the second hypothesis that there exists a statistically significant positive association between money supply and exchange rates. These findings are in line with the Quantity Theory of Money, which states that an increase in money supply leads towards inflation. Consequently, this inflationary pressure can be reflected in the devaluation of a currency, as the opportunity cost of holding money is effectively reduced. The positive association indicates that an increase in the money supply will appreciate the exchange rate in the short run, possibly because of increased activity and monetary liquidity.

The immediate effect of an increase in the money supply is often a reduction in interest rates, making the currency less attractive to foreign investors. This directly drives capital outflows, depressing the exchange rate as demand for foreign currency rises relative to the local one. Lower interest rates reduce returns on investments denominated in that currency, prompting investors to seek higher returns elsewhere. Additionally, a higher money supply can boost domestic consumption and investment through increased credit availability, stimulating economic activity at least in the short run. This aligns with Kamin and Rogers (2000), which found that expansionary monetary policies generally depreciate the currency in the long run while elevating economic activity and the value of the currency in the short term.

The evidence regarding the money supply in the pre-crisis period gives a hint that monetary expansion was among the most important motives of exchange rate movements. Most developing countries use monetary expansion to spur economic growth by increasing liquidity and lowering the cost of borrowing. However, throughout and after the Covid-19 crisis, the impact of money supply proved to be insignificant because it merely reflected the complex economic dynamics and policy responses during this period of crisis. The global pandemic locked in the monetary authorities to such unprecedented monetary actions as quantitative easing and fiscal stimulus packaging that deviated from the normally stable robust relationships among money-supply changes and exchange-rate movements. The measured approaches of the money supply might have likely dampened the direct impact of money supply on exchange rates since nations across the world were taking aggressive policies to keep their economies stable. The effect of inflation on the exchange rate is rather remarkably significant and negative, at a p-value less than 0.01, supporting hypothesis three. According to the Purchasing Power Parity Theory, higher inflation will result in depreciation of the currency to keep the parity of purchasing power across countries. Hence, according to the negative beta coefficient, a higher rate of inflation degrades the value of currency, thereby resulting in a depreciation of the exchange rate. The result of this study also coincides in its inclination with the other empirical studies undertaken by Rogoff (1996) and Choudhri and Khan (2005), which suggest that differentials of inflation do have a bearing on exchange rates.

The link between inflation and foreign exchange also is market-expectation-based. For example, if investors expect that a country's inflation will increase relative to its trading partners, then they are likely to adjust their portfolios away from that country's currency well before this inflation differential shows up. Anticipatory behavior testifies to the forwardlooking character of exchange rate markets, in which expectations about future economic conditions play a crucial role.

During the pre-crisis, inflation heavily detriment of the values of the exchange rate and supported a general principle that price stability must be held up as one of the steps necessary to prevent some type of depreciation in currency. High levels of inflation lead to the reduction in the value of money since it loses its purchasing power; thus, its value becomes less compared to other currencies. This implies the law of one price, if shipping costs and terms and tariffs were zero, then similar goods would sell for a common price. If this is higher than elsewhere in the country, the prices of the goods and services produced go up depending on the other country. To restore the equilibrium, the nominally posted exchange rate must adjust such that the relative prices of goods and services between countries are consistent with their respective price levels. The process thus leads to ensuring a basket of goods, when priced in a common currency, costs the same in both countries.

However, inflation showed a considerable positive relationship with exchange rates during and after the Covid-19 crisis. This reversal of direction indicates that during the crisis period, macroeconomic policy adjustments related to interest rates or fiscal policies may have been associated with inflationary pressures reinforcing the temporary departure from the normal relationship between general inflation and exchange rates. Such a period has been marked by huge fiscal and monetary injections; those might have disturbed the normal relationship existing between inflation and exchange rates. For instance, most governments of the world put in place badly inflated stimulus packages to support their economies such that most people expect inflation to rise. In this context, higher inflation could be seen as a sign of economic reflation and stabilization; it tends to indicate appreciation of the currency.

The results indicate that the trade balance does not significantly affect exchange rates. Traditional trade theory tends to argue that a trade surplus would result in the appreciation of a currency, and on the other hand, a trade deficit would depreciate it (Edison, et al., 1987; Bahmani-Oskooee and Ratha, 2004). Therefore, this weak relationship found here might not be that significant because of the other related facts, such as capital flows, foreign direct investment, and government policies which seem to lessen the straight effect which the trade balances have on the exchange rates.

Similarly, the insignificant trade balance in the pre-crisis period suggests that other micro-economic variables and external factors played a more dominant role in influencing the exchange rates. The structural problems of less developed countries always involve identifications with very few export commodities that result in volatile trade balances, not able to predict much about exchange rate movements. In addition, outside factors, namely global commodity prices, geopolitical events, and international trade policies, determine trade balances and exchange rates to a great extent.

### **Chapter 5: Conclusion**

The findings revealed that macroeconomic variables have varying degrees of influence on exchange rate stability in developing countries. Among the significant determinants affecting the exchange rate are money supply and inflation. The study established that an increase in the money supply tends to raise the exchange rate in the short run due to increased economic activity and liquidity. However, over a longer period, inflation is likely to be a result of the excessive money supply because it will lead to the devaluation of the currency due to its value destruction. Inflation has the most significant negative impact on exchange rates because it supports the Purchasing Power Parity theory. More inflation leads to the depreciation of the currency because it reduces the value of money; exports are cheaper while imports are more expensive.

The study highlights the effect of macroeconomic variables on exchange rates, which can be highly variant across economic context and time horizon. For example, in the pre-Covid-19 period, the most influencing factors for changes in money supply and inflation were major determinants of exchange rate changes. In this context, traditional relationships between these variables show monetary expansion and inflation as the key determinants for currency valuation. Importantly, the influence of these variables varies greatly both throughout and from the times of this crisis. The influence of money supply becomes insignificant, which is a revelation of the extraordinary monetary measures and policy responses during the pandemic. These are unconventional monetary measures such as quantitative easing and large fiscal stimulus packages probably disrupted the way money supply typically influences exchange rate dynamics. On the contrary, inflation has a significantly positive influence on the exchange rate throughout the period of the crisis. This 'breakdown' suggests that the inflationary pressures, combined with the policy changes in the macroeconomic environment, had caused a temporary departure from the usual negative association between both inflation and exchange rates.

Overall, the outcomes capture how various macroeconomic variables under varying economic conditions influence exchange rates. This means that policymakers in developing countries must be wise regarding the overall economic context and allow policy shifts to handle adequate stability in the exchange rate. This realization helps policymakers deal with the complexities associated with the management of both macro and micro-economic factors toward adequate stability of the economies.

The overall finding is that the exchange rates in developing countries are dominantly unstable and even tend to collapse. Economic stabilizing exchange rates, which developing countries cannot boast of without sound monetary policies, political stability, and measures to hedge against external shocks, would put them on a path toward economic instability and possible collapse.

#### 5.1. Policy Recommendations

- Policymakers in underdeveloped nations must take special care in managing the money supply that fosters economic growth without endangering currency stability. In this case, policymakers should strive to practice expansionary monetary policy sparingly, especially in those moments when the economy is in crisis, in such a manner that it will not, in the latter moment, translate into long-term devaluation of the currency. However, clarity and transparency in preparing monetary policies will stabilize investor expectations and reduce exchange rate volatility.
- It is important to have price stability to overcome the issue of currency depreciating.
   Policymakers need to initiate measures against inflation through prudent fiscal policies and effective monetary policy tools along with supply-side interventions to

deal with structural inflation. Credible inflation targets can also underpin inflation expectations to achieve the stability of a currency.

- 3. By exporting into global markets, developing countries can limit the amount of shock to the balance of trade when it occurs. This spread of export commodities across a wide spectrum, coupled with markets previously untapped, would ensure that countries experience more stable trade balances and indirectly support more stable exchange rates.
- 4. Direct Foreign Investment (FDI) can also establish foreign exchange inflows continuously. Therefore, it bestows the stability of currency. The policymakers should provide an amiable environment for investment by improving regulatory framework and property rights and ensure political stability. Incentives, tax holidays, development of infrastructure shall attract FDIs.
- 5. Developing countries should build resilience in their economic responses to the external shocks. These should include establishment of robust fiscal policy, adequacy of foreign exchange reserves, and structural reforms that increase productivity and competitiveness. Adequate institutional and governance arrangements can also help maintain economic stability and enhance investor confidence.
- 6. Policymakers should be very well prepared to undertake flexible and adaptive policy measures in such times of economic turbulence, like the Covid-19 crisis. Such enhancing measures may include prompt fiscal stimuli, targeted monetary interventions, and coordination with international financial institutions could always bring additional support and resources to better manage a crisis like this.
- 7. The developing economies should continue to invest in economic monitoring while continuously improving their capabilities for economic forecasting. With more advanced methods of data analytics and modeling, policymakers will be better placed

to predict the near-term dynamics of an economy for decision-making toward maintaining exchange rate stability. Economic indicators and external factors shall have to be submitted for frequent appraisal for detecting any possible risks and opportunities on a regular basis.

Developing countries can strengthen their capacity to manage exchange rate dynamics in support of higher economic stability and sustainable growth through the policy recommendations above. A strong economy under an increased globalization is attainable with a good understanding of interaction between various macroeconomic variables and exchange rates, which will inform effective policy responses.

#### 5.2. Limitations and Future Research Recommendations

It is very important to note that this study is subject to several limitations. The random effect model applied may again not be so constrained to accommodate the potential endogeneity issues or dynamic interactions between the variables over time. The study also focuses on a specific time frame and therefore could possibly exclude the long-term trends and the structural changes in the world economy.

Future research could consider these limitations by use of more advanced econometrics such as instrumental variables or dynamic panel models and extending the analysis over a longer period to capture structural changes. In addition, it is suggested that future research brings in other factors like political stability, institutional quality, and global economic environments to have a more robust picture regarding the determinants of the exchange rates in developing economies. It is perhaps useful to look at how these variables impact different regions or individual countries differently to provide focused and useful policy insight.

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# Appendix

. correlate exchange rate gdp  $\verb"aoneysupply" inflation tradebalance (obs=175)$ 

	exchan~e	gdp	moneys∼y	$inflat^n$	tradeb~e
exchangerate gdp moneysupply inflation	1.0000 -0.0172 0.2251 0.2018	1.0000 -0.0031 -0.0130	1.0000 0.6827	1.0000	
tradebalance	0.1327	0.1762	0.1552	0.0814	1.0000

Fixed-effects (within) regression	Number of obs	=	175
Group variable: <b>country</b>	Number of groups		16
R-squared: Within = 0.1592 Between = 0.3038	Obs per group: min avg	= =	6 10.9
Overall = 0.0000	max	=	12
corr(u_i, Xb) = -0.1568	F( <b>15</b> , <b>144</b> )	=	1.82
	Prob > F	=	0.0372

exchangerate	Coefficient	Std. err.	t	P> t	[95% conf.	interval]
gdp moneysupply inflation tradebalance	3.787473 41.56175 -84.20435 67.04269	11.6633 14.88246 24.57869 2198.285	0.32 2.79 -3.43 0.03	0.746 0.006 0.001 0.976	-19.26592 12.14546 -132.786 -4278.034	26.84086 70.97805 -35.62273 4412.119
Year 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022	253.7126 493.9955 988.1024 1328.901 1516.986 1059.385 1022.154 853.728 713.042 1037.626 1614.346	552.7786 550.3698 564.7532 571.0638 565.7224 584.9532 595.8183 594.0214 586.2466 608.661 654.8838	0.46 0.90 1.75 2.33 2.68 1.81 1.72 1.44 1.22 1.70 2.47	0.647 0.371 0.082 0.021 0.008 0.072 0.088 0.153 0.226 0.090 0.015	-838.8958 -593.8517 -128.1748 200.1508 398.7934 -96.81851 -155.5256 -320.3999 -445.7184 -165.4384 319.9186	1346.321 1581.843 2104.38 2457.652 2635.179 215.589 2199.834 2027.856 1871.802 2240.69 2908.773
	633.594	468.4848	1.35	0.178	-292.4014	1559.589
sigma_u sigma_e rho	5468.1018 1524.9775 .92783533	(fraction )	of variar	nce due to	u_i)	
F test that a	ll u i=0: F(15	. 144) = 73	06		Prob >	F = 0.0000
Fixed-effects Group variable	(within) regr e: <b>country</b>	ession		Number o: Number o:	f obs = f groups =	124 16
R-squared: Within = Between = Overall =	= 0.1252 = 0.1913 = 0.0288			Obs per 9	group: min = avg = max =	6 7.8 8
corr(u_i, Xb)	= -0.3543			F( <b>4</b> , <b>104</b> ) Prob > F	=	3.72 0.0072
exchangerate	Coefficient	Std. err.	t	P> t	[95% conf.	interval]
gdp moneysupply inflation tradebalance _cons	14.31911 43.09864 -120.4864 -3488.309 1758.459	17.42056 18.93977 31.87456 3251.282 326.52	0.82 2.28 -3.78 -1.07 5.39	0.413 0.025 0.000 0.286 0.000	-20.22651 5.54036 -183.6949 -9935.724 1110.957	48.86472 80.65691 -57.27795 2959.105 2405.96
sigma_u sigma_e rho	5623.2305 1798.4274 .90720599	(fraction o	of variar	ice due to	u_i)	

F test that all  $u_i=0$ : F(15, 104) = 50.47

 $\texttt{Prob} \ > \ \texttt{F} \ \texttt{=} \ \textbf{0.0000}$ 

Fixed-effects Group variable	(within) regr e: <b>country</b>	ression		Number o Number o	f obs = f groups =	51 14	
R-souared:				Obs per	group:		
Within	= 0.1231			obo por	min =	2	
Between	= 0.0163				avg =	3.6	
Overall	= 0.0162				max =	4	
corr(u_i, Xb)	= -0.1682			F( <b>4</b> , <b>33</b> ) Prob > F	=	1.16 0.3469	
exchangerate	Coefficient	Std. err.	t	P> t	[95% conf	. interval]	
gdp	.9457047	2.287872	0.41	0.682	-3.709006	5.600416	
moneysupply	1.906463	4.520396	0.42	0.676	-7.290351	11.10328	
inflation	9.944814	5.488196	1.81	0.079	-1.221004	21.11063	
radebalance		416.5362	-1.24 12.08	0.223 0.000	-1365.079	329.8192	
_cons	037.3043	/1.034/5	12.00	0.000	713.3032	1002.427	
sigma_u	1968.7979						
sıgma_e rho	150.24018	(fraction	of varia	nce due to	u i)		
		(			,		
'test that a	11 u i=0: F( <b>1</b> 3	3. 33) = 644	1.61		Prob >	F = 0.0000	
					<i>.</i> .	175	
andom-effect: Group variable	s GLS regressi ∋: <b>country</b>	on		Number o Number o	f groups =	1/5	
-squared				Obs per ·	group.		
Within *	= 0.1581			ope per .	min =	6	
Between	= 0.2120				avg =	10.9	
Overall :	= 0.0016				max =	12	
				Wald chi	2(15) =	23.91	
orr(u_i, X) =	= <b>0</b> (assumed)			Prob > c	hi2 =	0.0666	
xchangerate	Coefficient	Std. err.	z	P> z	[95% conf.	interval]	
gdp	2.653283	12.12021	0.22	0.827	-21.10189	26.40846	
moneysupply	42.08553	15.48756	2.72	0.007	11.73048	72.44059	
inflation	-76.86852	25.46941	-3.02	0.003	-126.7876	-26.94939	
radebalance	607.0999	2232.158	0.27	0.786	-3767.849	4982.049	
Year							
2012	265.3926	575.6056	0.46	0.645	-862.7736	1393.559	
2013	535.4762	572.887	0.93	0.350	-587.3616	1658.314	
2014	1054.693	587.2816	1.80	0.073	-96.3574	2205.744	
2015	1400.427	593.7067	2.36	0.018	236.7835	2564.071	
2016	1579.482	588.3181	2.68	0.007	426.3993	2732.564	
2017	1070.334	608.6457	1.76	0.079	-122.5896	2263.258	
2018	1051.672	619.8055	1.70	0.090	-163.1244	2266.468	
2019	898.9493	617.5596	1.46	0.145	-311.4452	2109.344	
2020	/46.8465	609.8453	1.22	0.221	-448.4284	1942.121	
2021	1608.862	681.3368	2.36	0.090	273.4667	2944.258	
0070	1166 927	1129 024	1 02	0 202	_1047 597	2201 242	
	1100.027	1127.024	1.05	0.302	-1047.307	JJU1.242	
sigma_u sigma e	3911.2333 1524.9775						
rho	.86804082	(fraction	of varia	nce due to	u_i)		
eststo: xtre	eg exchangerat	e gdp noney	supply in	flation t	radebalance	if Year < 2	019
andom-effects	s GLS regressi	on		Number of	fobs =	124	
roup variable	country			Number of	f groups =	16	
-squared:	0 1345			Obs per 9	group:	,	
Within =	· U.1245				min =	6 7 0	
Overall =	= 0.0242				avg = max =	7.8	
· <b>- · · - </b>							
orr(u_i, X) =	• O (assumed)			Wald chi: Prob > cl	2( <b>4</b> ) = ni2 =	12.96 0.0115	
xchangerate	Coefficient	Std. err.	z	P> z	[95% conf.	interval]	
gdp	12.10774	17.45785	0.69	0.488	-22.10902	46.3245	
moneysupply	43.21607	19.03949	2.27	0.023	5.899357	80.53279	
inflation	-112.957	31.89591	-3.54	0.000	-175.4718	-50.44215	
radebalance	-2647.041	3174.485	-0.83	0.404	-8868.917	3574.834	
_cons	2057.482	1370.425	1.50	0.133	-628.502	4743.466	
sigma u	5284.5558						
sigma_e	1798.4274						
rho	.89620505	(fraction	of varian	ice due to	u_i)		

-

eststo: xtreg exchan	ngerate gdp moneysu	pply inflation	tradebalance if	Year >	2018,	re
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Random-effects Group variable	s GLS regressi e: <b>country</b>	on		Number ( Number (	of obs of groups	= 51 = 14
R-squared: Within = Between = Overall =	0.1231 0.0159 0.0158			Obs per	group: min avg max	= 2 = 3.6 = 4
corr(u_i, X) =	• O (assumed)			Wald ch: Prob > (	i2( <b>4</b> ) ⊃hi2	= 4.88 = 0.2996
exchangerate	Coefficient	Std. err.	z	P> z	[95% com	nf. interval]
gdp moneysupply inflation tradebalance _cons	.934695 1.873526 9.907527 -500.8648 780.894	2.202948 4.351561 5.286421 400.5882 589.7883	0.42 0.43 1.87 -1.25 1.32	0.671 0.667 0.061 0.211 0.185	-3.383003 -6.655377 4536689 -1286.003 -375.03	3         5.252393           7         10.40243           5         20.26872           3         284.2736           7         1936.858
sigma_u sigma_e rho	2275.608 150.24018 .99566001	(fraction d	of varian	ice due to	⊃ u_i)	