TESTING THE RELATIONSHIP BETWEEN VOLATILITY OF THE RATE OF EXCHANGE AND FOREIGN DIRECT INVESTMENT INFLOWS IN ZIMBABWE FROM 1995 TO 2022.

BY

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A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS OF THE MASTERS OF COMMERCE DEGREE IN FINANCIAL ECONOMICS

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DECLARATION

I, Memory Tumbe declare that the dissertation presented here is my own original work that has not been copied, ripped from any source without acknowledgment, or submitted to any institution for the purpose of obtaining any academic or professional certification.

SIGNED **DATE** 27 /12/2023

APPROVAL FORM

The undersigned acknowledges that Memory Tumbe has asked me to oversee her study till completion. The investigation was submitted in partial fulfilment of the requirements of the Masters of Commerce Degree in Financial Economics at Great Zimbabwe University, and is titled "Testing the relationship between Volatility of the rate of exchange and Foreign Direct Investment inflows in Zimbabwe from 1995 to 2022." In this regard, I grant her permission to submit her work for final evaluation.

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DEDICATION

This dissertation is dedicated to the Almighty God, my creator, pillar of strength, source of inspiration, wisdom, knowledge, and understanding. I'm also dedicating it to my loved ones.

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First and foremost, I want to thank the Almighty God for giving me the strength, knowledge, blessings and ability to carry out this research project. Without his blessings, this achievement of finishing my dissertation would not have been possible. I'm grateful to my parents and relatives for their financial hand and unconditional love.

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ABSTRACT

The research examined the relationship between Volatility of the rate of exchange and Foreign Direct Investment inflows in Zimbabwe. The model was stated as Vector Error Correction Model (VECM), and the data was annual time series data from 1995 to 2022. Foreign Direct Investment, Exchange Rate, Inflation Rate, Gross Domestic Product Growth Rate and Interest Rates were the variables used. The empirical findings revealed that in the long run, Volatility of the rate of exchange had a significant negative impact on Foreign Direct Investment inflows in Zimbabwe, whereas Inflation Rate, Gross Domestic Product Growth Rate and Interest Rate had a positive impact that was statistically significant. The main policy recommendations were that the government needs to introduce or strengthen hedging mechanisms to protect investors against rate of exchange fluctuations. For instance, the government can consider establishing currency hedging instruments or providing incentives for investors to use financial derivative products to manage rate of exchange risks. This can help alleviate concerns about volatility and encourage more Foreign Direct Investment inflows.

More so, the government may reduce overreliance on a single sector or industry to enhance Foreign Direct Investment resilience to volatility of the exchange rate. Encouraging diversification of the economy by supporting the growth of various sectors, such as manufacturing, agriculture, tourism, and services, can attract a broader range of investors. This diversification can help reduce the vulnerability of Foreign Direct Investment inflows to rate of exchange fluctuations

The government can also provide information and support to potential investors regarding the impact of volatility of the rate of exchange and the available risk management strategies. The government can organize workshops, seminars, and investment forums to educate investors on the potential risks and rewards of investing in Zimbabwe.

Key words: Foreign Direct Investment inflows, Volatility of the exchange rate, Inflation, Gross Domestic Product Growth and Interest Rate.

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FDI = Foreign Direct Investment

ER = Volatility of the exchange rate

INF = Inflation Rate

GDG = GDP growth

IR = Interest Rate

ECT = Error Correction Term

SADC= Southern African Development Community

IMF =International Monetary Fund

ZIMSTATS=Zimbabwe National Statistical Agency

AIC =Aikake Information Criteria

GARCH= General Auto Regressive Conditional Heteroscedasticity

VECM=Vector Error Correction Model

CLRM=Classical Linnear Regression Model

BLUE=Best Linear Unbiased Estimates

ADF =Augmented Dickey Fuller

CHAPTER 1: INTRODUCTION

1.0 Introduction

Foreign direct investment (FDI) is critical to supporting economic expansion as well as advancement in numerous nations, such as Zimbabwe. Foreign direct investment (FDI) inflows offer cash, technological advances, and knowledge, which may help in creating employment, infrastructure development, and general economic growth. Amongst others, foreign direct investment is seen as the driving force for development in less developed or emerging countries. Most investors search for emerging nations that require greater capital investment and technology advancement to achieve their economic growth objectives. In the Journal of Developing Societies, Onyeiwu (2004) said, "The flow of foreign direct investment from those countries likely to enhance economic performance provided that other macroeconomic variables are generally stable." Furthermore, Masipa (2018) discovered that inflows of foreign direct investment had a long-term favorable impact on most African and Latin American countries, in addition to other developing nations throughout the world. Furthermore, Havi et al. (2013) stated that foreign direct investment inflows into developing nations such as Zimbabwe have a long-term favorable influence on economic performance. It is worth mentioning that the influx of foreign direct investment is impacted by a variety of variables, one of which is volatility of the exchange rate. Because of the adaptable rate of exchange framework, the disintegration of the Bretton Woods Accord caused volatility or uncertainty in the currency rate. As a result, authorities and investors alike must comprehend the link between currency rate unpredictability and incoming foreign direct investment in Zimbabwe.

1.1 Background of the Study

While investors pursue optimal returns on their financial investments, Foreign Direct Investors (FDIs) theoretically expand control over external borders while keeping the long-term potential of profit in mind (Ashwini 2003). This is significant for Zimbabwe, which has adopted currency rate policies that have oscillated between restrictions and liberalization since its independence. Prior to achieving sovereignty in the year 1980, Zimbabwe went through a period of currency rate instability, which had a considerable influence on its economic progress. Zimbabwe was referred to as Rhodesia at that point in time and it was ruled by a white minority government. Rowe (2001) observed that currency rate volatility in Rhodesia was predominantly driven by both economic and political factors. According to Mlambo (2016), the nation suffered sanctions from abroad as a result of its minority rule policy, which limited its accessibility to global markets and source of foreign cash.

As a result, the government followed a fixed rate of exchange strategy, fixing the Rhodesian dollar to the British pound. However, given the country's economic and political issues, this fixed rate of exchange proved unsustainable. Sanctions, limited access to foreign currencies, and the fixed rate of exchange regime all contributed to a serious lack of foreign currency reserves. Due to the scarcity of foreign cash, the Rhodesian dollar exchanged at a considerably lower rate than the official rate of exchange. The black-market currency rate was frequently turbulent and fluctuated frequently. The fluctuation of the rate of exchange harmed Rhodesia's economy. It caused inflationary pressures since the black-market devaluation of the Rhodesian currency made imported commodities more costly.

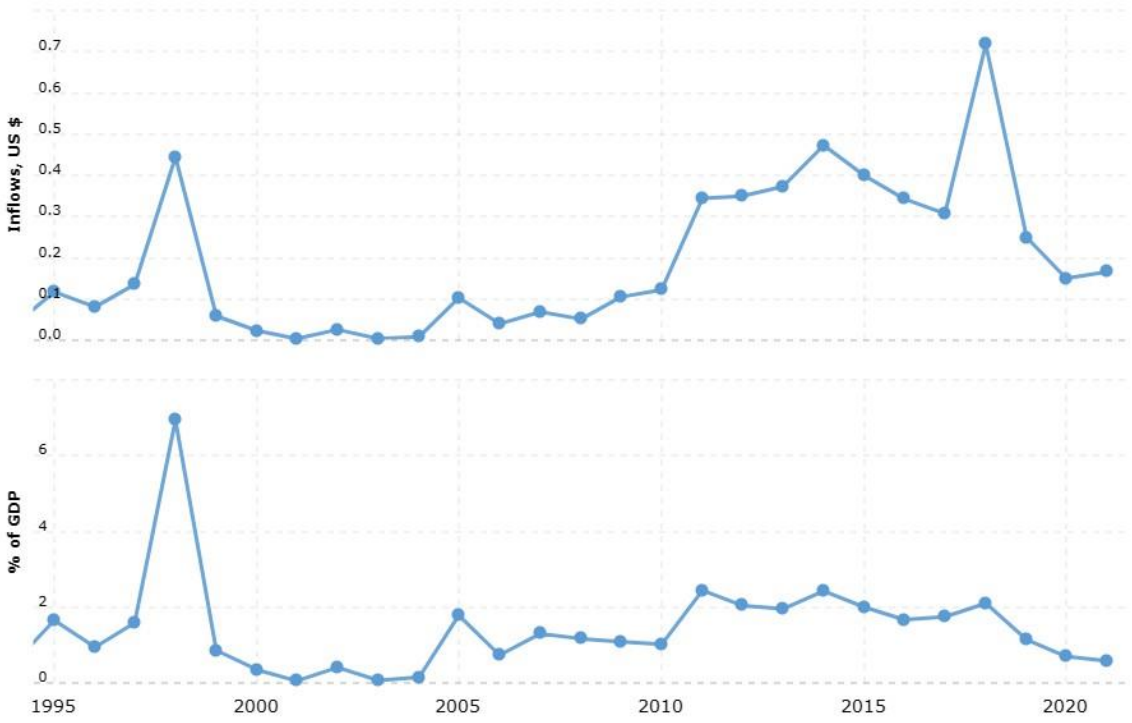
High inflation weakened the population's purchasing power and led to a fall in living standards. Furthermore, volatility of the rate of exchange has an impact on investment and economic growth. Uncertainty over the rate of exchange makes long-term investment choices difficult for corporations. The absence of stable and predictable rate of exchange circumstances hindered both local and international investment, limiting the country's economic progress. It is vital to note that the volatility of the rate of exchange in Rhodesia was just one of the many challenges the country faced during this period.

Political instability, international isolation, and the discriminatory policies of the white minority government also played significant roles in shaping the economic landscape of the country before independence. After Zimbabwe gained independence in 1980, the new government of

Zimbabwean implemented various policies that are economic aimed at stabilizing the rate of exchange and promoting economic growth. These policies included the introduction of a new currency, the Zimbabwean dollar, and efforts to attract foreign investment. However, the subsequent years saw their own economic challenges, including hyperinflation and political instability, which had a profound impact on the country's rate of exchange and overall economic performance.

Figures 1 below shows how foreign direct investment inflows relates to gross domestic product growth for the period under study.

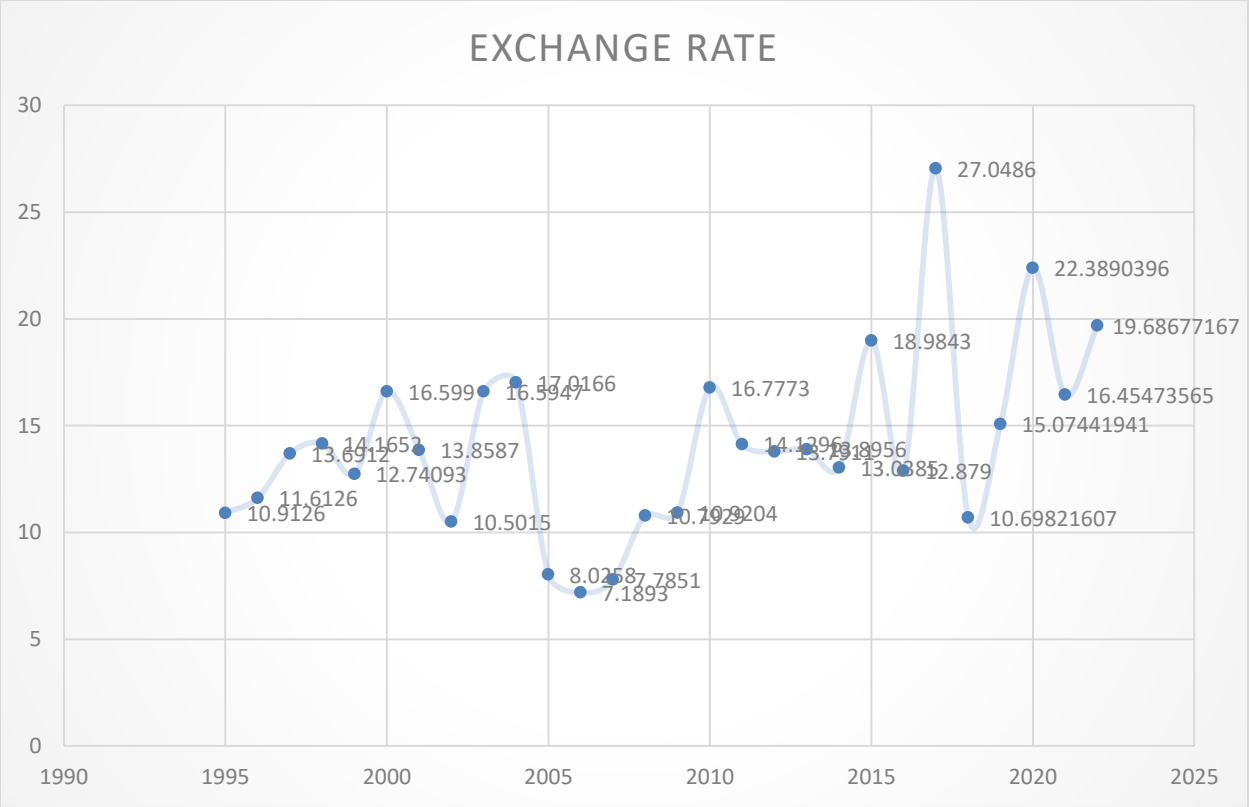
Figure 1: FDI inflows and GDP growth rates 1995-2022



In the same period, Zimbabwe experienced a complex connection between volatility of the rate of exchange and growth of the economic. In the beginning following independence, the country witnessed relatively stable economic growth and a relatively stable rate of exchange (Kanyenze et al 2017) as shown in figure 2 below.

Figure 2 below shows the exchange rate volatility in Zimbabwe for the period under review.

Figure 2: Exchange Rate volatility 1995-2022



. However, as time progressed, Zimbabwe faced a series of economic challenges that led to significant volatility of the rate of exchange and hindered its economic growth. In the 1990s, Zimbabwe underwent a period of economic liberalization and structural adjustment, which included measures such as trade liberalization and fiscal reforms.

These reforms initially contributed to growth of the economy and attracted foreign investment. The rate of exchange was relatively stable during this period, with the Zimbabwean dollar linked to a basket of international currencies. However, starting in the late 1990s, Zimbabwe's economy faced a series of setbacks that resulted in volatility of the rate of exchange and a decline in economic growth. The implementation of land reforms, which involved the seizure of commercial farms from white farmers and its redistribution to the landless black Zimbabweans, disrupted agricultural production, which was a key sector of the economy. This led to a decline in exports and foreign currency earnings. Furthermore, pursuant of unsustainable fiscal policies, including excessive borrowing and money printing to finance government expenditures, contributed to high levels of inflation and loss of confidence in the Zimbabwean dollar.

The combination of economic mismanagement, land reforms, and political instability resulted in hyperinflationary pressures and rapid depreciation of the Zimbabwean dollar. The rate of exchange became highly volatile, with frequent and significant fluctuations. This volatility eroded the value of the currency and made it difficult for businesses to plan and operate effectively. The volatility of the rate of exchange had severe consequences compared to other countries in the region or Zimbabwe's economy. It led to a decline in foreign investment as investors were reluctant to commit capital in an environment of uncertainty. The volatility also undermined domestic businesses, making it difficult for them to acquire necessary products and services and prepare for the future. Overall, volatility of the rate of exchange in Zimbabwe after independence was closely intertwined with the country's economic challenges. The government policies, including land reform, contributed to a decline in economic growth and stability.

However, Madesha et al (2013) alluded to the fact that "Following the implementation of a multiple currencies system back in 2009 ", which replaced the Zimbabwean dollar with a basket of foreign currencies, volatility of the rate of exchange decreased to a certain level." This relative stable rate of exchange provided a more favorable investment climate, leading to a modest increase in foreign direct investment inflows. However, additional variables such as stability in politics, infrastructures and laws and regulations also play vital roles in luring FDI (Muzurura 2016). From Muzurura's point of view, rate of exchange stability alone may not be sufficient to stimulate substantial FDI inflows. This was supported by Mabaya et al (2009) who noted that "In recent years, Zimbabwe has implemented some economic reforms aimed at improving the investment climate.

These reforms included easing foreign exchange controls, liberalizing certain sectors, and improving the ease of doing business." While these efforts have shown some positive impact, In regard to the other nations in the area, total FDI inflows stay comparatively small. Magocha and Mutekwe (2021), in their Journal "Zimbabwe's *Development Trajectory"* cited that, "The ushering in of the second republic in Zimbabwe in 2018 resulted in, her adopting the policy of engagement and re-engagement which opened the door to the international community." The policy thrust was to attract Foreign Direct Investments to achieve Vision 2030. In this regard, it was anticipated that by engagement and reengagement, FDI inflows would make it easier for Zimbabwe to realize its vision of attaining upper middle-income status by 2030. However, it would seem to appear that inadequate attention was given to the impact of volatility of the rate of

exchange on FDI inflows in Zimbabwe. After all, there is very little proof to imply that major FDI inflows occurred in Zimbabwe. Given this context, the researcher decided to conduct a study on the impact of currency rate volatility on FDI in Zimbabwe.

1.3 Problem Statement

Though the policies of involvement and reconnecting were generally judged effectively in bringing the country's finances around, it is questionable if this was adequate to entice FDI inflows into Zimbabwe because of the fluctuation of the currency rate. Given the potential importance of FDI in boosting economic growth, examining its drivers in Zimbabwe is critical in order to correctly place the country within the evolving world's financial and industrial structures. In reality, Zimbabwe now claims to have effectively liberalized its investment climate in order to make it more appealing to FIs; yet, while intensive liberalization is essential for FDI inflows, it is clearly insufficient in current competitive world for FDI.

1.4 Significance of the Study

The role of volatility of the rate of exchange in stimulating or deterring foreign direct investment has been studied in established as well as emerging economies across the world. However, the link between volatility of the rate of exchange and FDI appears to have received insufficient attention. Furthermore, there is no solid evidence on the influence of rate of exchange fluctuations on foreign direct investment. Furthermore, the impact of currency rate fluctuations on foreign direct investment in Zimbabwe hasn't been thoroughly investigated. As a result, the purpose of this article is to look at the influence of currency rate volatility and how it interacts with foreign direct investment in Zimbabwe.

1.4.1 General Research Objective

The study objective of this research is to determine the relationship and causality between volatility in the rate of exchange and foreign direct investment inflows in Zimbabwe from 1995 to 2022.

1.4.2 Specific Research Objectives

- Determine the impact of currency rate fluctuation on foreign direct investment inflows into Zimbabwe.
- To suggest ways to circumvent the effects of volatility in the rate of exchange on foreign direct investment inflows in Zimbabwe.

1.4.3 Research Questions

To guide the study the following questions will be explored.

- To what extent does volatility of the rate of exchange influence foreign direct investment inflows in Zimbabwe?
- Does volatility of the rate of exchange significantly affect the foreign direct investment inflows?

1.5 Statement of Hypothesis

The hypothesis that would guide this research is as follows:

H_0: Volatility of the rate of exchange has no effect on foreign direct investment inflows in Zimbabwe.

H_1: Volatility of the rate of exchange has an effect on foreign direct investment inflows in Zimbabwe.

1.6 Limitations of the Study

❖ Since the study is limited to one country, no cross-country panel data will be collected. Since it will only cover Zimbabwe, time series data will be used.

❖ The utilized data was gathered for different objectives and contains flaws of its own.. It is however useful in this research and sufficient to achieve the intended objective.

❖ Secondary data could have dubious accuracy and dependability, but the primary sources from which it was gathered are respectable and reliable.

❖ Lack of funding will probably have a detrimental impact on doing a thorough and solid study as it will be difficult for the researcher to obtain the data from sources that include the internet.

The majority of data is freely accessible online and on source websites attributable to the internet.

1.7 Delimitations of the Study

The researcher employs the Vector Error Correction Model (VECM) Model to examine the effects of volatility of the rate of exchange on foreign direct investment inflows in Zimbabwe. In addition, the researcher will use time series data while ignoring cross-sectional and panel data.

1.8 Organization of the Study

The following structure or framework will be used for the research: Chapter Two examines the theoretical and empirical literature on the impact of volatility of the rate of exchange on foreign direct investment inflows in Zimbabwe. The methodology is presented in Chapter Three along with an explanation of the variables used. Chapter Four documents and presents the findings and their interpretation, while Chapter Five summarizes all of the study's findings and policymakers' recommendations on the impact of volatility of the rate of exchange on foreign direct investment inflows in Zimbabwe.

1.9 Conclusion

This Chapter has provided a synopsis of the study by highlighting the introduction, background and problem statement. The Chapter also reflected on justification of the study and the benefits it will bring to the policy makers so as to achieve their goal ensuring an influx of foreign direct investment inflows. The following chapter aims to review the major theories and empirical literature in the context of the impact of volatility of the rate of exchange on foreign direct investment inflows in Zimbabwe.

CHAPTER 2: LITERATURE REVIEW

2.0 Introduction

The preceding chapter introduced the topic of study giving the background of study, justification and significance of the study. This chapter aims to review the major theories and empirical literature in the context of foreign direct investment, volatility of the rate of exchange and interest rates. The theories include the production flexibility theory, risk aversions theory, portfolio theory, Mundell-Flemming model and Dornbusch overshooting model. Empirical review includes research done in USA, China, India, UK, Thailand, Japan, Nigeria, Zambia, Zimbabwe and other countries.

2.1 Literature Review

2.1.1 Theoretical Framework

There are various theoretical arguments that link volatility of the rate of exchange to foreign direct investment inflows; that is, production flexibility theory, risk aversion theory, portfolio theory, Mundell-Flemming model, and Dornbusch overshooting model.

2.1.1.1 The Production Flexibility Theory

According to the process flexibility theory, an increase in volatility of the rate of exchange leads to a rise in foreign direct investment. This is because enterprises can vary their usage of one among the variable components in their response to nominal or real rate of exchange shocks. This argument implies that enterprises function in the long run with variable inputs. According to Jayaratnam (2003), the logic of manufacturing mobility argument appears to be more persuasive under long-run variations since enterprises may now alter their variable elements. However, the logic fails when enterprises operate in the short term with all inputs fixed.

2.1.1.2 The Risk Aversion Theory

According to the risk aversion theory, when volatility of the rate of exchange rises, so does foreign direct investment. This is because increasing currency volatility of the rate of exchange

reduces the certainty equivalent predicted exchange rate. According to Goldberg and Kolstad (1995), confidence comparable levels are utilized in the anticipated profit functions of enterprises that make investment decisions now in order to benefit tomorrow. Campa (1993) expanded risk aversion theory to encompass risk-neutral enterprises utilizing the argument of future projected profits to justify this risk aversion theory. It was believed that since investors are concerned about future predicted returns, enterprises may put off entering the overseas market as the currency rate becomes more unpredictable.

It was also emphasized that in the event of significant levels of currency rate volatility, risk-neutral enterprises would be deterred from entering international markets. This theoretical evidence was experimentally corroborated for inbound investment to the US in the wholesale market, particularly when the sunk costs of entrance were assessed to be substantial. Furthermore, Goldberg and Kolstad (1995) added to the preceding points by stating, "When evaluating the risk aversion versus production flexibility argument, it is essential to differentiate among short-term fluctuations in exchange rates and long-term misalignments." He believes that the risk aversion thesis is strong under short-term changes because companies may not adjust variables in the near run. Furthermore, in the near run, production variables are typically constant, thus businesses are merely risk-averse to unpredictability and their future profit.

2.1.1.3 Portfolio Theory

Portfolio theory suggests that, the volatility of the exchange rate, affects the risk-return trade-off for investors. Higher volatility may lead to increased risk, reducing the attractiveness of a country for investment. Investors seeking stable returns may seek countries with less volatility of the rate of exchange. Higher volatility of the rate of exchange increases uncertainty and risk for multinational corporations, making them more hesitant to invest in foreign markets Help-man, Melitz, and Yeaple (2004). This was consistent with what they found of Globerman and Storer (2009), who investigated the influence of currency volatility on FDI in a panel of Canadian manufacturing industries. Their discoveries suggested that rate of exchange uncertainty can result in increased risk for multinational companies, thereby reducing their willingness to invest in foreign markets.

2.1.1.4 Mundell-Fleming Model

The Mundell-Fleming Model points out the interrelationship of rates of interest, rates of exchange, and capital flows. Based to the model, changes in exchange rates may have an impact on FDI by changing comparative pricing, productivity, and norms for further rate of exchange movements. Edison and Melvin (1990) and Edison (1993) found out that higher volatility of the rate of exchange leads to increased capital flows, particularly short-term speculative flows. This supports the Mundell-Flemming model's prediction that volatility of the rate of exchange can affect capital flows as investors react to potential gains or losses from currency fluctuations. Milesi Ferretti and Lane (2007) noted that interest rate differentials have a significant impact on capital flows particularly in emerging market economies.

This finding aligns with the Mundell-Fleming model which postulates that interest rate differentials can affect capital flows and exchange rates. Dominguez and Franel (1993) found that changes in monetary policy, such as interest rate adjustment, can influence rate of exchange movements. Central bank actions that affect interest rates can lead to changes in capital flows and subsequently impact on exchange rates, supporting the predictions of the Mundell-Fleming model. It is of paramount importance to note that the link between exchange rate volatility, interest rate volatility, and capital flows should be viewed in the context of individual research and their limitations.

There is no convincing stance based on available theoretical knowledge concerning the influence of currency volatility on FDI inflows. The empirical data on this topic yielded favorable, negative, and ambiguous results. The rationale for the favorable effect of exchange rate volatility on foreign direct investment inflows might be attributed to export replacing FDIs. In this regard, an increase in the rate of exchange between the donating and benefitting countries stimulates multinational corporations to service the benefitting country through a domestic manufacturing facility rather than export, therefore hedging against currency risk.

It also assumes that price levels would react to these discrepancies over time rather than immediately adjusting to short-term changes in equilibrium. Besides, the model included the assumption that price stickiness is compensated for by lags in economic time-series data, including rates of interest and exchange rates. As a result, the sticky-price economic model

permits short-term skyrocketing of nominal currency rates above their long-term equilibrium point (Dornbusch, 1976).

2.2 Empirical Literature

Several empirical studies have been conducted to study the link between fluctuations in exchange rates and FDI in different countries and regions. It is worth noting that the findings of empirical studies may vary depending on the methodology, data, and specific country context. Nevertheless, these studies provide gainful knowledge into the relationship between volatility of the rate of exchange and FDI, suggesting that higher volatility tends to have a negative impact on FDI inflows. Gastanaga, Nugent, and Pashamova (1998) studied on the connection between volatility of the rate of exchange and FDI in Latin American countries. They found that higher volatility of the rate of exchange reduced FDI inflows, indicating that investors were deterred by currency risk.

In line with the same context, Li and Resnick (2003) analyzed the effect of movements in the rate of exchange on FDI in China. They found that volatility of the rate of exchange had a significant negative effect on FDI inflows, indicating that foreign investors were deterred by higher volatility. Furthermore, Chonnikara (2010) examined the impact of currency rate fluctuations on foreign direct investment inflows to Thailand utilizing monthly panel data from 2005 to 2009. The findings revealed a negative relationship between rate of exchange fluctuations and foreign portfolio investment, implying that a high rate of exchange risk reduces each firm's unique portfolio inflow to Thailand. In support of the foregoing, Aggarwail and Bhattacharya (2014) investigated the impact of currency rate changes on FDI in India.

They discovered an inverse link between changes in the rate of exchange and FDI inflows, implying that more volatility decreases FDI. Closer to home, Asiedu and Lien (2018) investigated the influence of currency volatility on FDI inflows to 45 African nations, including Zimbabwe. They discovered that more volatility in the currency rate had a detrimental impact on FDI inflows.

The study accentuated that rate of exchange stability is crucial for attracting FDI. A study by Mlambo and Bonga-Bonga (2019) on the SADC region, which includes Zimbabwe, used panel

data analysis to look into the relationship between rate of exchange movements and FDI inflows. The outcomes indicated that higher volatility of the rate of exchange has a detrimental effect on FDI inflows in SADC countries, including Zimbabwe. In the same vein, Zerihum and Adem (2021) analyzed the impact of volatility of the rate of exchange on FDI inflows in 38 African countries including Zimbabwe. The findings indicated that volatility of the rate of exchange negatively affects FDI inflows.

The study decorated the importance of maintaining rate of exchange stability to attract and sustain FDI. Back home, a study by Ncube and Ndlovu (2020) on the effect of movements in rate of exchange on FDI inflows in Zimbabwe, found a negative relationship. The study employed an autoregressive distributed lag (ARDL) approach and recommended the need for rate of exchange stability to attract more FDI to Zimbabwe.

According to the impulse response functions, currency volatility had a beneficial influence on foreign direct investment. In contrast to Alaba's (2003) results, Osinubi et al (2009) investigated the potential impact of currency fluctuation on FDIs in Nigeria. This study discovered that rate of exchange volatility impacts inbound foreign direct investment positively. Soyoung et al (2013) discovered an advantageous connection between rate of exchange changes and foreign portfolio investment in the Republic of Korea in their research on the drivers of international money flow in South Korea employing push versus pull variables from the year 1980 to 2010.

When looking at FDI inside a customs union such as the EU, the writer claims that such is the case. As a result, disregarding the local export market causes an omitted variable bias, which may skew the findings of the study on the influence of volatile exchange rates on inbound foreign direct investment. Using information gathered from foreign countries to the United States multinational corporations in seventeen European countries from 1983 to 2002, it was discovered that rate of exchange shocks between the United States and the parent country have a major adverse impact on the level of FDI.

Similarly, Guglielmo et al. (2013) investigated the impact of currency rate changes on various portfolios. The nations that took part in the research were Japan, Australia, the United Kingdom, Canada, and Sweden, and the duration of the research spanned from 1988 to 2011. According to the study's findings, a negative relationship occurs in certain nations whereas an advantageous connection exists in others.

However, Alaba's (2003) study on the effect of rate of exchange movements on foreign direct investment inflows in Nigeria was inconclusive. Olubunmi et al (2018) undermined Osinubi's findings. His investigation on the impact of rate of exchange shocks on foreign portfolio investment in Nigeria showed that there was a positive relationship between rate of exchange shocks and foreign direct investment inflows.

The Central Bank of the nation's regular authorized and bureau-de exchange rates were used to measure this impact. The fluctuation between the legal rate of exchange and the bureau-de exchange rate was produced using the General Autoregressive Conditional Heteroscedasticity, or GARCH (1,1) model. The findings from the two-phase least-squares (TSLS) method employed in the African nation of Nigeria displayed that the government's rates of exchange fluctuation had an important beneficial effect on foreign portfolio investment, while bureau-de rate of trade fluctuation had an important adverse effect.

Recent empirical studies include, for example, Latief and Lefen (2018) used GARCH models to analyze examine the nexus between rate of exchange movements, foreign trade and foreign direct investment (FDI). Developing countries like Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka were included, and statistical data was gathered from 1995 to 2016. The findings from the study was a clear demonstration of the individuality of countries. For Bhutan, Maldives, and Nepal, the rate of exchange shocks significantly influenced international trade in a positive way, however for Pakistan, the influence was significant but rather negative.

Recent empirical research employing models based on GARCH encompass the work by Latief and Lefen (2018) to Sekati, Tshoku, and Metsileng (2020), who evaluated the influence of real volatility of the currency rate on FDI inflows in South Africa using GARCH models. Their findings confirmed the hypothesis that exchange rates had a considerable and negative impact on foreign direct investment (FDI) coming to South Africa. Zerihum and Adem (2021) conducted research on the influence of currency volatility on FDI inflows in 38 African nations, including Zimbabwe. The findings revealed that currency fluctuation has a detrimental influence on FDI inflows. The study emphasized the need of maintaining a stable rate of exchange in order to attract and even retain FDI inflows.

Much of the material reviewed above emphasizes the fluctuation of currency rates in wider contexts, such as SADC, Africa, Latin America, and the global economy. As discussed in the preceding literature, volatility of the currency rate in general had particular characteristics that gave them a special disposition in the context of FDI inflows into Zimbabwe. Specific research on the influence of fluctuation of the rates exchange on FDI inflows is still few, creating a gap that this study attempts to address. Furthermore, the influence of rate of exchange volatility upon foreign direct investment (FDI) inflows did not provide the same conclusion as the examined literature. Some associations were unfavorable, while others were positive and indeterministic. This is also a research gap the study will address in existing literature.

2.3 Conclusion

This Chapter has reviewed the major theories and empirical literature in the context of the impact of volatility of the rate of exchange on foreign direct investment inflows in Zimbabwe. The chapter also reflected on the gaps in the existing literature that the study needs to address. For instance, on the scope of the study, most literature is on a global and regional scope. There is limited country-specific literature, particularly for Zimbabwe on the topic under study. Another gap exists in the methodologies used in previous studies. For instance, a study by Ncube and Ndlovu (2020) delved into the same research topic as this one. However, a gap still exists in the methodology. They employed the ARDL technique which is limited to one dependent variable and cannot directly handle multiple dependent variables which can be accommodated by the VECM model. Also, ARDL does not capture the simultaneous feedback effect of variables of which the VECM model allows for simultaneous modeling of multiple variables and their interdependencies. Therefore, this study investigates the impact of volatility of the rate of exchange and its interaction with Foreign Direct Investment. The following chapter delves into the study methodology.

CHAPTER 3: METHODOLOGY

3.0 Introduction

The chapter that preceded offered multiple hypotheses and evidence that proved that rate of exchange volatility influences either advantageously or adversely foreign direct investment inflows into Zimbabwe. This chapter described the study's research methods. It also justifies the variables that were used and the sources whereby the data was gathered. The primary goal is to explore the link between exchange rate swings and FDI inflows in Zimbabwe and establish if exchange rate variations impact FDI inflows. To do this, we will use quarterly time series data from January 2010 to December 2022.

3.1 Theoretical Framework

Various theories are used to supplement the model. The explanatory variable is based on the concept of risk aversion theory as well as the elasticity hypothesis discussed in chapter 2. The volatility of currency rates is thought to be adversely connected to foreign direct investment, as measured by capital inflows. According to theoretical literature, volatility of the rate of exchange creates uncertainty, which can deter foreign investors from making long-term commitments. Increased volatility of the rate of exchange can lead to higher risks and transaction costs, making investment decisions more challenging. On the other hand, stable exchange rates can provide a favorable investment climate, attracting foreign investors. Thus, we expect a undesirable relationship between volatility of the rate of exchange and FDI inflows.

3.2 Model Specification

Vector Error Correction Model (VECM) was capitalized for the research. VECM is a statistical framework that allows analyzing the long-term and short-term dynamic relationships among variables. It is particularly suitable for investigating the relationship between non-stationary time series variables such as FDI, exchange rates, GDP, interest rates, and inflation rate. VECM can capture both short-term deviations from equilibrium and the long-term equilibrium relationship between these variables.

The variable that is dependent is a function of its lags, the lags of the other variables in the model, and the lags of the error correction term. A stochastic process model is the Vector Error Correction Model (VECM). By permitting multivariate time series, the VECM generalizes the

single-variable (univariate) autoregressive model (Brooks, 2008). All of the variables are expressed as logarithms since they aid to translate huge numbers to tiny ones and make taking variations in factors easier (Holden, 1997).

The model is specified as follows:

$$\ln FDI_t = a + \sum_{k=1}^{k} \beta_i lnFDI_{t-i} + \sum_{j=1}^{k} \pi_j lnER_{t-j} + \sum_{m=1}^{k} \sigma_m lnINF_{t-m} + \sum_{h=1}^{k} \alpha_h lnGDG_{t-h} + \sum_{p=1}^{k} \emptyset_p lnIR_{t-p} + \lambda_1 ECT_{t-1} + \mu_{1t}$$

$$\ln ER_t = a + \sum_{k=1}^{k} \beta_i lnFDI_{t-i} + \sum_{j=1}^{k} \pi_j lnER_{t-j} + \sum_{m=1}^{k} \sigma_m lnINF_{t-m} + \sum_{h=1}^{k} \alpha_h lnGDG_{t-h} + \sum_{p=1}^{k} \emptyset_p lnIR_{t-p} + \lambda_1 ECT_{t-2} + \mu_{2t}$$

$$\ln INF_t = a + \sum_{k=1}^{k} \beta_i lnFDI_{t-i} + \sum_{j=1}^{k} \pi_j lnER_{t-j} + \sum_{m=1}^{k} \sigma_m lnINF_{t-m} + \sum_{h=1}^{k} \alpha_h lnGDG_{t-h} + \sum_{p=1}^{k} \phi_p lnIR_{t-p} + \lambda_1 ECT_{t-5} + \mu_{5t}$$

$$\ln GDG_t = a + \sum_{k=1}^{k} \beta_i lnFDI_{t-i} + \sum_{j=1}^{k} \pi_j lnER_{t-j} + \sum_{m=1}^{k} \sigma_m lnINF_{t-m} + \sum_{h=1}^{k} \alpha_h lnGDG_{t-h} + \sum_{p=1}^{k} \emptyset_p lnIR_{t-p} + \lambda_1 ECT_{t-3} + \mu_{3t}$$

$$\ln IR_t = a + \sum_{k=1}^{k} \beta_i lnFDI_{t-i} + \sum_{j=1}^{k} \pi_j lnER_{t-j} + \sum_{m=1}^{k} \sigma_m lnINF_{t-m} + \sum_{h=1}^{k} \alpha_h lnGDG_{t-h} + \sum_{p=1}^{k} \phi_p lnIR_{t-p} + \lambda_1 ECT_{t-4} + \mu_{4t}$$

FDI = Foreign Direct Investment
ER = Volatility of the exchange rate
INF = Inflation Rate
GDG = GDP growth
IR = Interest Rate
k = optimal lag length
ECT = Error Correction Term
a = intercept

$\beta_i, \pi_{j,} \sigma_m, \alpha_h \ and \ \phi_p$ = short run dynamic model modification coefficients long-term equilibrium

μ_{1t} = residuals in the equation.

3. 3 Definition and justification of variables

3.3.1 Foreign direct investment (FDI)

FDI refers to Investments on the part of foreign entities (such as individuals, companies, or governments) in the domestic economy of another country. FDI typically involves long-term investments in physical assets, such as factories, infrastructure, or acquisitions of local companies. FDI is an important indicator of the confidence and attractiveness of a country's economy to foreign investors. FDI is a critical variable in understanding economic development and the influence of international capital flows on a country's economy. By examining the relationship between volatility of the rate of exchange and FDI inflows, we can ascertain the effect of currency fluctuations on investment decisions.

3.3.2 Exchange Rates

The rates of exchange rates represent the value of a particular currency in relation to another. This means that it is the amount of the local currency required to pay in order to purchase one unit of another currency for example the rate of exchange of Zimbabwe and US is the amount of Zimbabwean RTGS dollar that you need to pay in order to by 1 USD. The rate of exchange system that applies to a country's currency is determined by that government. A currency, for example, can be floating, pegged (fixed), or hybrid. In this case, we are interested in the rate of exchange between the Zimbabwean currency (such as the Zimbabwean dollar) and other major currencies (like the US dollar or the euro). Exchange rates fluctuate because of numerous causes, including market forces, government policies, and economic conditions.

Rate of exchange limitations and regulations can be imposed by governments. A country's currency might be strong or weak. In the economic literature, there is no consensus on the best national rate of exchange (unlike in trade where open trade is considered optimal). Zimbabwe uses a floating rate of exchange that is established though the Dutch auction system which started on 23 June 2020. Prior to that, the currency was pegged by the government.

Rate of exchange of the Zimbabwean dollar against the USD was included in the model because the USD is the currency that is stable and holds more value in Zimbabwe.

Local investors want to measure their gains against the change in value of their investment through the exchange rate. If the local currency is appreciating, short term investors will liquidate their stocks to buy foreign currency, this will drive prices down as well as discouraging FDI inflows. This is so because volatility of the rate of exchange may affect the attractiveness of a country for foreign investors. Fluctuations in exchange rates can impact the profitability and competitiveness of investments, as they influence the conversion of foreign currency earnings back into the investor's home currency.

3.3.3 Rate of Inflation

The rate of inflation represents the proportion of rise or decrease in the overall price level of commodities and amenities over time. It reflects the erosion of purchasing power and can impact investment decisions. Inflation is an important macroeconomic variable that can affect FDI inflows. High inflation rates can erode the value of investments and reduce investor confidence. Stable or moderate inflation rates are generally more favorable for attracting foreign investment.

3.3.4 GDP growth (GDP)

The GDP growth rate is a statistic that quantifies the pace at which a country's economy expands or contracts over a certain time period. It is often employed as a measure of economic success and is significant in studies studying the link between volatility in exchange rates and FDI inflows. GDP growth rate is a widely recognized macroeconomic indicator that reflects the overall health and performance of an economy. It captured the changes in the total value of goods and services produced within a country, providing a comprehensive measure of economic activity. Higher GDP growth rates generally indicate a growing economy with increased economic opportunities. This can attract foreign investors who seek markets with expanding consumer demand and investment prospects. Conversely, lower GDP growth rates may signal weaker economic conditions and potentially deter foreign investors.

3.3.5 Exchange rate volatility

Volatility of the rate of exchange refers to the fluctuations in the value of a country's currency in comparison to other currencies. Changes in exchange rates can impact the profitability and risk

of foreign investments. GDP growth rate is sensitive to rate of exchange movements because it affects a country's export competitiveness, import costs, and overall economic stability. Higher volatility of the rate of exchange may lead to uncertain business conditions, potentially influencing FDI inflows. GDP growth rate can help establish a causal-relationship between instability of the rate of exchange and FDI inflows.

Higher volatility of the rate of exchange may lead to uncertain business conditions, potentially influencing FDI inflows. GDP growth rate can help establish a causal relationship between volatility of the rate of exchange and FDI inflows. A higher degree of volatility of the rate of exchange may result in lower GDP growth rates due to increased uncertainty, reduced trade flows, or decreased investment activities. Consequently, this can affect FDI inflows, as investors may be more cautious or hesitant to invest in countries with unstable exchange rates and lower GDP growth prospects.

Using the GDP growth rate allows for comparative analysis across different countries or time periods. Researchers can assess the correlation between instability of the rate of exchange and FDI inflows in various economic contexts and identify patterns and trends. By considering GDP growth rates, researchers can control for the differences in economic performance between countries and examine how volatility of the rate of exchange influences FDI inflows within specific growth environments.

In conclusion, the GDP growth rate serves as a relevant and justifiable variable in research The growth rate of gross domestic product (GDP) is a metric that measures how quickly a country's economy increases or declines over an amount of time. It is frequently used as an indicator of economic performance and is crucial in research investigating the relationship between the volatility of rates of exchange and FDI inflows. It captures the overall economic performance, reflects potential investment opportunities, and helps establish causal links between volatility of the rate of exchange and FDI inflows.

3.3.5 Interest Rates

Interest rates represent the cost of borrowing or the return on investment. In this context, we are concerned with the interest rates prevailing in Zimbabwe, which can influence the attractiveness of investing in the country. An interest rate (also known as the principal sum) is the quantity of interest due each month stated as a proportion of the amount financed, saved, or lent. The

principal amount, interest rate, compounded frequency, and amount of time it is borrowed, deposited, or lent all contribute to the total rate of interest paid on a loan or loan.

The rate of interest is usually stated as a percentage, either yearly or monthly. The percentage of lent money that the financial institution costs the borrower as interest, generally expressed as an annual percentage, is referred to as interest. Interest rates has been included in the model because as the interest rates goes up, the money is expected to flow from the stock market to banks, stock prices will fall resulting in the falling of the stock market index. Changes in interest rates can impact the flow of FDI by affecting the cost of financing investments and the expected returns. Higher interest rates may deter foreign investors, while lower interest rates can stimulate investment.

3.3.6 The error term

This is a name for a white noise error. It's a haphazard and volatile component. The error term in our model represents the magnitude of some measurement errors or misses. For our estimations to be BLUE, the error term assumptions under the Classical Linear Regression Model (CLRM) should hold.

3.4 Diagnostic Tests

Diagnostic tests were performed to validate the parameters' validity. The researcher performed maximum likelihood tests and test for autocorrelation, stationarity and stability.

3.4.1 Testing for Stationarity

Diagnostic tests were carried out to ensure that the parameters are valid. The researcher performed maximum likelihood tests and test for autocorrelation, stationarity and stability.

3.4.1 Testing for Stationarity

Because the correlation of two periods relies only on the lag among the two periods rather than on the actual duration of the interval that occurs when the correlations is computed, a stochastic process is called stable if its mean and variance remain constant all through time (Gujarati, 2004). Stationarity checking is critical in time series to avoid false regression. In this analysis,

the unit root test was employed. The unit root has become a popular test of stationarity (or non-stationarity) in recent years (Gujarati, 2004).

To avoid spurious regression, it is more usual in statistical regression analysis to avoid working with non-stationary data. Since the variables included in the regression model are not stable, the normal conditions for asymptotic analysis are erroneous, and the research is unable to conduct significant hypothesis testing on the regression parameters. Two common unit root tests are the augmented Dickey-Fuller test and computing Phillips-Perron test.

In this study, the Augmented Dickey Fuller test (ADF) is utilized to assess whether or not variables of the regression equation are stable. Non-stationary parameters will be made stationary using the differencing approach (de-trending method). According to how many times it has been differed, a new variable with fewer observations is created. If a parameter is stationary, it is said to be integrated of order one, or I(1), implying that it achieves stationarity after just one variation. To achieve zero, variables that are constant in levels are integrated of order zero I(0). Differencing will be employed until the variable, after being differenced k times, meets stationarity, I(k). Then, utilizing stationary data, regression analysis will be performed, with spurious regressions avoided and therefore valid policy analysis can be obtained. Testing for the stationary qualities of time series data, according to Kolapo and Ojo (2012), is a critical exercise since the usage of non-stationary time series data will result in erroneous and inappropriate information.

3.4.2 Testing for Normality

The assumption of normality assumption on the Classical Linear Regression Model states that each μi is distributed normally with mean zero, variance s2 and constant covariance that is:μi~N(0,s2). The normality assumption makes the derivation of probability or sampling distributions of estimation parameters and variance possible. There are a number of normality tests namely the Jarque-Bera test, normal probability plot, the graphical device and the histogram of results. The Jarque-Bera test is illustrated below.

The Jarque-Bera (JB) Test. The JB test is an asymptotic test based on Ordinary Least Squares (OLS), which computes the skewness and kurtosis measures of OLS residuals (Gujarati 2004). The test statistic is as follows:

$$JB = n\left[\frac{s^2}{6} + {(k-3)^2}/{24}\right]$$

Where:

n = sample size

s = skewness coefficient

k = kurtosis coefficient

According to the above test, s=0 and k=3 for a normally distributed variable. As a result, the JB test is a joint hypothesis in which s and k are 0 and 3, respectively, which means that this statistic asynchronously approaches the Chi-square distribution with 2 degrees of freedom. If the estimated p value of the JB statistic is low, that is, different from zero, then reject the notion that the residuals are normally distributed; but, if it is high, that is, closer to zero, we can accept the hypothesis.

3.4.3 Descriptive Statistics

Descriptive statistics offer a preliminary indication of variables used in regression analysis by providing several summary statistics on a variable such as the median, standard deviation, mean, and, in numerous situations, the difference between the smallest and highest observation (Johansen, 2011). The Jarque-Bera test indicates that the data points are normally distributed if the means and medians are not far apart (Kiganda, 2014). The standard deviation, according to University of Reading (2011), is the amount of variance from the mean; fewer deviations lead to more accurate results.

When a collection of data deviates from the symmetrical bell curve, also known as the normal distribution, it is said to be skew, or asymmetric. When a curve is extended to the left or right, it is said to be skewed. Negative kurtosis suggests that there are too many instances in the tails, whereas positive kurtosis shows that there are not enough cases in the tails (Musau & Musau, 2011).

3.4.4 Optimal Lag length Test

Whenever the time is nonstationary in level form, cointegration must be tested. Prior to determining cointegration, optimal lag length has to be test first since choosing a higher order lag length than the genuine lag length increases the model's associated mistakes are typically

generated by mean squared prediction errors and underfitting the lag duration.. The optimal lag length test is carried out using the selection order criteria. The rule of thumb is that whatever criteria you use, you select the lag length with the smallest value.

3.4.5 Testing for Cointegration

Cointegration tests identify circumstances whereby multiple time series with non-stationary parameters are integrated so that they cannot deviate from equilibrium over time. The tests are intended to examine the sensitivity of both variables to the same average price over a specific time period. The trace and max statistics were used to perform the cointegration test.

For Rank Zero

H_0 : There no cointegration amongst equations

H_1: At least one equation is cointegrated.

Decision Rule: Reject null hypothesis when the Max or the Trace statistics is higher than 5% critical value.

3.4.6 Testing for Autocorrelation

Mankiw (1990) described autocorrelation as a relationship between the participants in an assortment of data ordered in time (as in series of data) or space (as in space series data). The typical regression line model in regression assumes that the disturbances have no autocorrelation. The Durbin Watson (DW) test is used to detect autocorrelation. In a more mathematical sense, the D-W test statistic evaluates the linear connection between surrounding residuals from a regression model. If there is no serial relationship, the D-W statistic will be about 2. If there is a positive serial correlation, it will be less than two, and it will be nearly zero in the worst-case scenario. The D-W statistic will be between 2 and 4 if there is a negative correlation.

The most prevalent type of dependence is positive serial correlation. A D-W statistic of less than 1.5 is a strong sign of first order positive serial correlation when there are more than 49 observations and a few independent variables. According to Chen (2016), The Durbin Watson statistic must be 1.7 to 3 in order to accept that there is no autocorrelation between variables.

3.5 Sources of data and Time Domain

The study used secondary data for analysis. Secondary data, according to Malhotra (2016), is data that has already been obtained for purposes other than the situation at hand. The study used quarterly time series analysis for empirical testing for the period from January 2010 to December 2022. Secondary data from the International Monetary Fund (IMF), World Bank, and ZIMSTAT databases were utilized in the study. These institutions are typically regarded as reputable and official sources of statistics at the national level. Interest rates and Capital Inflows (FDI) were obtained from World bank. Exchange rates, GDP and inflation were collected from the IMF and ZIMSTATS websites respectively.

3.6 Conclusion

The preceding chapter has outlined the methodological aspect of the study that was used in the study. Diagnostic tests were to be performed before interpretation and this will ensure the researcher to obtain estimates which are efficient. In the following Chapter, the study is going to present the results.

CHAPTER 4: RESULTS PRESENTATION AND INTERPRETATION

4.0 Introduction

This chapter seeks to give the estimated Vector Error Correction Model (VECM) equation for examining the association between currency rate fluctuation and foreign direct investment inflows in Zimbabwe from 1995 to 2022. This chapter gives the empirical findings from the estimations described in the previous chapter. In that a particular order, statistical data on descriptive variables are going to be provided first, then stationarity, cointegration test, and predictive findings. Furthermore, this chapter will provide an explanation of the results acquired.

4.1 Descriptive Statistics

Summary of descriptive statistic is provided below for all the variables presented individually in tables beginning with Foreign Direct Investment, Exchange Rate, Inflation, GDP growth and Interest Rate respectively. The sample consists of 28 observations (1995 to 2022). These descriptive statistics were obtained using the following STATA command: summarize y er inf gdg ir, detail.

Table 4.1 Variables Descriptive Statistics

Variable	**Mean**	**Standard Deviation**	**Skewness**	**Kurtosis**
FDI	3.99	8.62	3.94	18.70
ER	14.19	4.38	0.89	4.17
INF	47.33	124.24	3.56	15.85
GDG	10.22	3.86	-0.45	2.17
IR	12.84	2.76	-0.13	1.72

Source: student's STATA computations

Foreign Direct Investment had a mean of 3.99 and a standard deviation of 8.62, as seen in Table 4.1. It is positively skewed, which means that the majority of the findings are to the right of the mean. This might be due to outliers. A skewness rating of 0 shows that the observations are not skewed in any direction. Kurtosis characterizes the distribution's shape and peakiness. A kurtosis value of 3 implies a normal distribution, and the closer the kurtosis value is to 3, the more normal the data is. The value of the kurtosis for Foreign Direct Investment in the preceding table is 18.70, which is far from 3, suggesting that the variances are not normal.

Rate of exchange had a mean of 14.19 and a standard deviation of 4.38, according to Table 4.1. It is positively skewed, which means that the majority of the findings are to the correct side of the mean. This might be due to outliers. With a skewness of 0.89, the observations are favorably skewed.

From table 4.1 above, the kurtosis value of Rate of exchanges 4.17 which is above 3, however it is within a close range to 3 indicating that the distributions are almost normal.

According to Table 4.1, inflation had a mean of 47.33 and a standard deviation of 124.24. It is positively skewed, which means that the majority of the findings are to the correct direction of the mean. This might be due to outliers.

From table 4.1 above, the kurtosis value of Inflation is 15.85 which is well above 3 indicating that the distributions are not normal.

In Table 4.1, the GDP growth has a mean of 10.22 and a standard deviation of 3.86. It is negatively skewed meaning that most of the observations are on the left of the mean. This may be attributed to outliers.

The kurtosis value of Gross Domestic Product is 2.17, as shown in the table 4.1 above. Comparing to the kurtosis of other variables it is it is below 3, however it is within a close range to 3 indicating that the distributions are almost normal.

Table 4.1 shows that the Interest Rate had an average of 12.84 and a standard deviation of 2.76. It is negatively skewed, which means that the majority of the findings are far to the left of the mean. This might be due to outliers. A skewness rating of 0 shows that the observations are not skewed in any direction.

In table 4.1 above, the kurtosis value of Interest Rate is 1.72. It is distant from 3 compared against the kurtosis of additional factors, showing that the distributions of variables do not appear normal.

4.2 Diagnostic Tests

4.2.1 Stationarity tests

Variables ought to be stationary at the five percent threshold of significant prior running the model. An Augmented Dickey Fuller test was employed to determine variable stationarity. The test is necessary because performing regressions on non-stationary data might result in erroneous regressions. Following the tests, all variables, including Foreign Direct Investment, Exchange Rate, Inflation, GDP growth, and Interest Rate, were non-stationary initially but turned stationary following the first difference, indicating that they are integrated of order 1. At a minimum predicted level of 1%, these variables became stationary.

H_0 : Variable has a unit root.

H_1 : Variable is Stationary

Below is a table which summarizes the results of the stationarity tests for all variables.

Table 4.2 Unit Root Tests for all Variables

Variable	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value	P-Value
FDI	3.17	3.75	3.00	2.63	0.02
ER	5.33	3.75	3.00	2.63	0.00
INF	3.86	3.75	3.00	2.63	0.00
GDG	5.17	3.75	3.00	2.63	0.00
IR	5.20	3.75	3.00	2.63	0.00

Source: student's STATA computations

The p-value in every variable in table 4.2 is 0.00, with the exception of Foreign Direct Investment, which has a p-value of 0.02; hence, we reject the null hypothesis and concluded that the data remained stationary at first difference.

Because all of the variables are stable at the initial difference, a cointegration test was required to determine if to continue with Vector Auto Regression or utilize the Vector Error Correction Model, as illustrated below..

Table 4.3 Optimal lag test

Lag	**FPE**	**AIC**	**HQIC**	**SBIC**
0	0.0019	7.93178	7.9969	8.1772
1	0.0013	7.49484	7.8855	8.9674
2	0.0005	6.29059	7.0068	8.9903
3	0.0006	5.40763	6.4494	9.3345
4	1.900	-75.1786	-73.8112	-70.0246

Source: student's STATA computations

The Akaike Information Criterion (AIC) was utilized by the researcher, and the latency with the minimum AIC figure was 3. As a result, the best lag length is three lags.

4.2.2 Johansen Cointegration Test

Table 4.4 Cointegration Test

Maximum Rank	Trace Statistic	5% Critical Value	Max Statistic	5% Critical Value
0	85.82	68.521	42.29	33.460
1	43.53	47.213	30.02	27.072
2	13.52	29.682	8.32	20.974
3	5.19	15.414	5.11	14.071
4	0.08	3.76	0.08	3.762

Source: STATA computations by students

As demonstrated in Table 4.4 above, utilizing the trace data, we reject the null hypothesis of no cointegration since the trace statistic (85.82) is larger than the 5% critical value (68.52). We do not reject the null assumption for a maximum rank of one cointegrated equation since the trace statistic (43.53) is smaller than the 5% critical value (47.21) and infer that there is only one cointegrated equation in the model.

4.3 VECM Results

The variables in the VECM equation were estimated in their log form only, since they were not stationary at level, the output expresses the depended variables in their first difference form which will be on the far left.

4.3.1 Foreign Direct Investment

The VECM findings for Foreign Direct Investment in the short term are shown in Table 4.5 below.

Table 4.5 Foreign Direct Investment short run VECM Results.

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	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
D_logy						
_ce1						
L1.	-.4200976	.1366168	-3.08	0.002	-.6878616	-.1523337
logy						
LD.	-.1712082	.1920433	-0.89	0.373	-.5476061	.2051898
L2D.	.2168899	.2087608	1.04	0.299	-.1922737	.6260535
loger						
LD.	-.1257401	.7624352	-0.16	0.869	-1.620085	1.368605
L2D.	.4250221	.692666	0.61	0.539	-.9325782	1.782622
loginf						
LD.	-.427904	.1316815	-3.25	0.001	-.685995	-.169813
L2D.	-.317708	.13752	-2.31	0.021	-.5872422	-.0481737
loggdg						
LD.	-3.425036	1.287614	-2.66	0.008	-5.948713	-.9013587
L2D.	-2.429577	.9613419	-2.53	0.011	-4.313772	-.5453811
logir						
LD.	-4.854558	2.831751	-1.71	0.086	-10.40469	.6955712
L2D.	.5690159	2.653811	0.21	0.830	-4.632357	5.770389
_cons	-.0649624	.1996708	-0.33	0.745	-.4563101	.3263852

Source: student's STATA computations

Table 4.5 shows that _ce1 is an error correction term with a coefficient of -0.42. At the 1% level of significance, the error term of correlation is significant statistically. Save for the rate of exchange and interest rate, inflation and GDP growth are statistically significant, indicating that the Foreign Direct Investment Equation has a short run causal impact.

4.3.2 Exchange Rate

Table 4.6 below shows the VECM results for Rate of Exchange in the short run.

Table 4.6 Rate of Exchange short run VECM Results

D_loger						
_ce1						
L1.	-.0205769	.0389684	-0.53	0.597	-.0969536	.0557998
logy						
LD.	-.015769	.0547782	-0.29	0.773	-.1231323	.0915943
L2D.	-.0403714	.0595467	-0.68	0.498	-.1570808	.0763379
loger						
LD.	-.2302857	.2174761	-1.06	0.290	-.6565311	.1959597
L2D.	-.1483967	.1975752	-0.75	0.453	-.535637	.2388437
loginf						
LD.	.0574608	.0375607	1.53	0.126	-.0161568	.1310784
L2D.	-.0453942	.039226	-1.16	0.247	-.1222759	.0314874
loggdg						
LD.	-.451451	.3672775	-1.23	0.219	-1.171302	.2683998
L2D.	.3342113	.2742121	1.22	0.223	-.2032345	.871657
logir						
LD.	-1.609358	.8077254	-1.99	0.046	-3.192471	-.0262458
L2D.	-.0205206	.7569699	-0.03	0.978	-1.504154	1.463113
_cons	.0400123	.0569539	0.70	0.482	-.0716152	.1516399

Source: student's STATA computations

As shown in Table 4.6, _ce1 is the error correction term with a coefficient of -0.02. The error correction term is statistically insignificant. This means in the short run there is no causality in the rate of exchange equation because all variables are statistically insignificant in the Rate of Exchange Equation.

4.3.3 Inflation

Table 4.7 below shows the VECM results for Inflation in the short run.

Table 4.7 Inflation short run VECM Results

D_loginf						
_ce1						
L1.	.6891783	.2645041	2.61	0.009	.1707598	1.207597
logy						
LD.	-.5415309	.3718156	-1.46	0.145	-1.270276	.1872142
L2D.	.1895227	.4041823	0.47	0.639	-.60266	.9817055
loger						
LD.	1.246122	1.476153	0.84	0.399	-1.647085	4.139328
L2D.	-.8246972	1.341072	-0.61	0.539	-3.453151	1.803757
loginf						
LD.	.2695716	.2549489	1.06	0.290	-.2301191	.7692624
L2D.	-.2237647	.2662528	-0.84	0.401	-.7456106	.2980813
loggdg						
LD.	3.792802	2.492953	1.52	0.128	-1.093296	8.6789
L2D.	2.22064	1.861257	1.19	0.233	-1.427356	5.868636
logir						
LD.	10.15288	5.482561	1.85	0.064	-.5927412	20.8985
L2D.	4.496764	5.13805	0.88	0.381	-5.573629	14.56716
_cons	-.0384183	.3865833	-0.10	0.921	-.7961076	.719271

Source: student's STATA computations

Table 4.7 above illustrates that, the error correction term _ce1 has a coefficient of 0.69 and it is statistically significant at 1% level of significance. All other variables are statistically insignificant therefore we cannot infer the causativeness in the short run for the Inflation Equation.

4.3.4 GDP growth

Table 4.8 below shows the VECM results for GDP growth in the short run.

Table 4.8 GDP growth short run VECM Results

D_loggdg						
_ce1						
L1.	.0077222	.0458846	0.17	0.866	-.08221	.0976544
logy						
LD.	.1210637	.0645004	1.88	0.061	-.0053547	.2474821
L2D.	-.1102392	.0701152	-1.57	0.116	-.2476624	.0271839
loger						
LD.	.0976009	.2560743	0.38	0.703	-.4042955	.5994972
L2D.	-.0579776	.2326413	-0.25	0.803	-.5139462	.397991
loginf						
LD.	-.0296206	.044227	-0.67	0.503	-.116304	.0570628
L2D.	.0554499	.046188	1.20	0.230	-.0350768	.1459767
loggdg						
LD.	-.0631675	.4324628	-0.15	0.884	-.9107789	.784444
L2D.	-.2304433	.3228798	-0.71	0.475	-.8632761	.4023896
logir						
LD.	-.2928071	.9510822	-0.31	0.758	-2.156894	1.57128
L2D.	.5702064	.8913186	0.64	0.522	-1.176746	2.317159
_cons	-.0698029	.0670622	-1.04	0.298	-.2012423	.0616366

Source: student's STATA computations

Table 4.8 above shows that all variables are statistically insignificant therefore we cannot infer the causality in the short run for the GDP growth equation.

4.3.5 Interest Rate

Table 4.9 below shows the VECM results for Interest Rate in the short run.

Table 4.9 Interest Rate short run VECM Results

D_logir						
_ce1						
L1.	.0161979	.0175999	0.92	0.357	-.0182973	.050693
logy						
LD.	-.0223109	.0247403	-0.90	0.367	-.070801	.0261792
L2D.	-.0028357	.026894	-0.11	0.916	-.055547	.0498755
loger						
LD.	-.0025818	.0982221	-0.03	0.979	-.1950935	.1899299
L2D.	.0194666	.0892339	0.22	0.827	-.1554287	.1943619
loginf						
LD.	-.0091634	.0169641	-0.54	0.589	-.0424124	.0240856
L2D.	-.0130923	.0177163	-0.74	0.460	-.0478155	.021631
loggdg						
LD.	.0736604	.1658792	0.44	0.657	-.2514568	.3987776
L2D.	.0737204	.1238466	0.60	0.552	-.1690145	.3164552
logir						
LD.	-.2695297	.3648053	-0.74	0.460	-.984535	.4454757
L2D.	-.0266687	.3418819	-0.08	0.938	-.6967449	.6434075
_cons	.0339004	.025723	1.32	0.188	-.0165156	.0843165

Source: student's STATA computations

From Table 4.9 above, all variables are statistically insignificant therefore we cannot determine the interest rate equation's short-term causality.

The short run VECM results are in tandem with the specifications of the model. It is a requirement that for us to proceed with VECM, there must be at least 1 cointegrating equation in the model. This is evidenced by the stata output on cointegration test appendix 5 and table 4.4 and also from the short run VECM results as illustrated in table 4.5 above. There is at least 1 cointegrating equation in the foreign direct investment equation.

4.3.5 Long Run Relationship

Table 4.10 demonstrates how exchange rates, inflation, GDP growth, and interest rates impact foreign direct investment inflows over time.

Table 4.10 Long Run VECM Results for Foreign Direct Investment

Cointegrating equations

Equation	Parms	chi2	P>chi2
_ce1	4	66.37687	0.0000

Identification: beta is exactly identified

Johansen normalization restriction imposed

beta	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
_ce1						
logy	1	.	.	.	.	.
loger	2.216111	1.058923	2.09	0.036	.1406604	4.291562
loginf	-.9084015	.2281488	-3.98	0.000	-1.355565	-.4612382
loggdg	-8.172963	1.377288	-5.93	0.000	-10.8724	-5.473529
logir	-16.2485	2.314476	-7.02	0.000	-20.78479	-11.71221
_cons	38.82417	.	.	.	.	.

Source: student's STATA computations

Table 4.10 above shows the long-run connection between variables. _ce is the error correction term. Since Foreign Direct Investment was listed first in our VECM equation, it is treated as the dependent variable. All variables are in log form so interpretation will be in elasticity form and the signs will be reversed. Rate of exchange has a coefficient of -2.22 meaning that in the long run, a 1% increase in Rate of exchange will lead to a 2.22% decrease in Foreign Direct Investment. On the other hand, Inflation, GDP growth and Interest Rate has impacted positively on Foreign Direct Investment. Inflation has a coefficient of 0.91 meaning that in the long run, a 1% increase in Inflation will lead to a 0.91% increase in Foreign Direct Investment. GDP growth has a correlation of 8.17, which means that a one percentage point improvement in GDP leads to a 8.17 percent increase in Foreign Direct Investment in the long term. Interest Rate has a coefficient of 16.25, which means that a 1% increase in interest rates will result in a 16.25% rise in foreign direct investment in the long term. Except for the rate of exchange, which is

statistically significant at the 5% level of significance, all variables are statistically significant at the 1% level of significance.

The long run VECM results in this model resonates well with economic theory, for instance the risk aversion theory. The theory outlines that significant movements in the rate of exchange impacted negatively on FDI inflows. Apart from economic theory, the results speaks to the findings by Mlambo and Bonga-Bonga(2019). Though Moyo and Bonga-Bonga (2019) used panel data analysis, their results are similar to those in this study. Furthermore Ncube and Ndlovu(2020) used autoregressive distributed lag(ARDL) and they also find similar results to this study.

4.4 Post Estimation Tests

4.4.1 Autocorrelation Test

The autocorrelation test is carried out by employing the Lagrange-multiplier test and the findings are shown in Table 4.10 below:

Table 4.11 Autocorrelation Test

Lagrange-multiplier test			
lag	Chi2	Df	Prob>chi
1	14.22	25	0.96
2	23.70	25	0.54
3	30.43	25	0.21

Source: student's STATA computations

From the table 4.11, the probability values at lag one, two and three are greater than 0.10, it implies that the errors are not serially correlated at 10% level of significance at all lags.

4.4.2 Normality Test

Normality Test was carried out to check if variables are normally distributed.

Table 4.12 Jarque Bera Test

Equation	**Chi2**	**Df**	**Prop > Chi2**
D_logy	2.45	2.00	0.29
D_loger	0.68	2.00	0.71
D_loginf	0.52	2.00	0.77
D_loggdg	3.03	2.00	0.22
D_logir	0.03	2.00	0.99
ALL	6.71	10.00	0.75

Source: Student's STATA computation

Table 4.12 above shows that the probability value for all variables (variable ALL) is equal to 0.75 which means overally the errors from all equations are not normally distributed.

4.4.3 Model Stability

Model stability is tested using Eigenvalue stability as shown in Table 4.13

Table 4.13 Eigenvalue Stability Test

Eigenvalue Stability Condition	
Eigenvalue	Modulus
1	1
1	1

1	1
1	1
0.76	0.82
0.76	0.82
0.57	0.76
0.57	0.76
0.14	0.76
0.14	0.76
0.11	0.69
0.11	0.69
0.51	0.50
0.51	0.50
0.34	0.34

Source: Student's STATA computation

As shown in Figure 4.13, the VECM specification imposes 4-unit moduli, that are equal to the total amount of endogenous variables in our model (4), implying that the model is stable.

4.5 Conclusion

The Vector Error Correction Model Regression outcomes have been laid out and addressed in this chapter. The study's conclusion and policy suggestions based on the data gathered in this chapter were presented in the next chapter, which also highlighted important areas that needed more research.

CHAPTER 5: SUMMARY, CONCLUSION AND POLICY RECOMMENDATION

5.0 Introduction

The preceding chapter has interpreted the results from the Vector Error Correction Model (VECM). Over the long run, the data reveal that exchange rate, inflation, GDP growth, and the rate of interest had a major impact on foreign direct investment inflows. This chapter contains a synopsis, findings, and policy suggestions. This chapter also highlights areas for additional research. The primary goal of this study was to look at the link between rate of volatility on rate of exchange with foreign direct investment inflows in Zimbabwe from 1995 to 2022. The findings indicate that there is evidence to reject the null hypothesis that exchange rate volatility has no effect on FDI inflows. Furthermore, the study's findings reveal that inflation, GDP growth, and interest rates all have a long-term impact on foreign direct investment.

5.1 Summary and Conclusion

The study began by taking a look at the foundation of the investigation. The background of the study attempted to find out what has been happening in the past concerning FDI flows before and after the ushering in of the Second Republic in Zimbabwe. Furthermore, how volatility of the rate of exchange has impacted on FDI inflows during these different episodes has been the significant inspiration of the study. This introductory chapter went on to discuss the problem statement, research objectives and questions.

The study examined literature review where the production the risk aversion theory, flexibility theory, , portfolio theory was explained as well as the Mundell Fleming Model with regards to Foreign Direct Investment inflows. Empirical literature went on to discuss the tests which were done by the various authors about the subject matter. The empirical evidence consists of studies done globally, regionally and locally.

Methodology was specified, equations formulated, variables were stated and justified as well as stating the data sources. Secondary annual time series data covering the period from 1995 to 2022 was used and the model was specified as Vector Error Correction Model. After finding out that the data was not stationary at levels but after first differencing, and there was one cointegrated equation in the model, the Vector Error Correction Model was used in data analysis.

Results from the estimations done were presented as follows: Descriptive statistics were presented first followed by stationarity test, optimal lag length settings, Johannsen cointegration test, regression results and post estimation test (Autocorrelation, normality and model stability test) in that order.

The findings demonstrated that in the long run, negatively strong relationship between currency volatility with foreign direct investment inflows into Zimbabwe. All other factors, such as inflation, GDP growth, and interest rates, showed positive effects that were statistically significant.

5.2 Policy Recommendations

The findings of this analysis strongly support the notion that currency rate fluctuation had a major negative influence on foreign direct investment flows into Zimbabwe, thereby supporting the study's main point. These findings are consistent with previous theoretical literature, such as the Risk Aversion Theory and the concept of Portfolio Balance Theory.

The study recommends that the government needs to introduce or strengthen hedging mechanisms to protect investors against rate of exchange fluctuations. For instance, the government can consider establishing currency hedging instruments or providing incentives for investors to use financial derivative products to manage rate of exchange risks. This can help alleviate concerns about volatility and encourage more Foreign Direct Investment inflows.

Moreso, the government may reduce overreliance on a single sector or industry to enhance Foreign Direct Investment resilience to volatility of the exchange rate. Encouraging diversification of the economy by supporting the growth of various sectors, such as manufacturing, agriculture, tourism, and services, can attract a broader range of investors. This diversification can help reduce the vulnerability of Foreign Direct Investment inflows to rate of exchange fluctuations

Governments can also give investors in consideration with information and assistance about the impact of currency volatility and risk management techniques. The government can organize

workshops, seminars, and investment forums to educate investors on the potential risks and rewards of investing in Zimbabwe.

The study also discovered that inflation has a long-term beneficial link to foreign direct investment inflows. While the positive relationship between inflation and FDI inflows may seem counterintuitive, it suggests that investors may perceive higher inflation as a sign of economic activity and potential profit opportunities. As a consequence, the report suggests that the government maintain an emphasis on maintaining price stability by enacting effective monetary policies such as limiting the money supply, managing inflation expectations, and developing inflation targeting frameworks.

This includes providing clear communication about policy objectives, decisions, and their rationale. By establishing a transparent and credible monetary policy framework, the government can foster investor confidence and attract long-term FDI inflows.

Alongside monetary policy, sound fiscal policy is critical for maintaining macroeconomic stability. The government should aim for prudent fiscal management, including controlling budget deficits, reducing public debt, and ensuring fiscal discipline. These measures can help contain inflationary pressures and create a favorable investment climate, encouraging FDI inflows.

The government should actively engage in investment promotion activities, including marketing the country's investment opportunities, participating in international investment forums, and establishing investment promotion agencies. These initiatives can help attract FDI inflows despite the potential positive relationship with inflation

The positive relationship between GDP growth and FDI inflows highlights the importance of maintaining a stable and growing economy. The government should focus on policies that promote sustainable economic growth, such as investing in infrastructure development, improving productivity, attracting private investment, and diversifying the economy. By fostering a favorable economic climate, Zimbabwe can attract more FDI inflows.

Sound macroeconomic policies are crucial for attracting FDI. The government should prioritize policies that maintain price stability, control inflation, and manage fiscal deficits. This can be achieved through prudent fiscal management, effective monetary policies, and maintaining a stable exchange rate. A stable macroeconomic environment instills confidence in investors and makes Zimbabwe an attractive destination for FDI.

Investing in human capital is crucial for sustainable economic growth and attracting FDI. The government should prioritize education and skills development initiatives to enhance the quality and productivity of the workforce. This can be achieved through investing in education infrastructure, vocational training programs, and promoting partnership between the private and public sectors.

Upgrading infrastructure, such as transportation, electricity, and telecommunications, is critical for attracting foreign direct investment. The government should prioritize infrastructure development projects and seek partnerships with international investors and development organizations. Upgrading infrastructure can reduce the cost of doing business, enhance connectivity, and create a more favorable investment environment.

Given the positive correlation between rates of interest and foreign direct investment inflows, the central bank should maintain a flexible monetary policy framework. This would involve adjusting interest rates in response to changing economic conditions, such as inflation, rate of exchange stability, and investor sentiment. Flexibility in monetary policy can help attract FDI by offering competitive interest rates that incentivize investment.

The government can aim to create an investor-friendly interest rate regime by implementing policies that ensure a stable and predictable interest rate environment. This includes avoiding sudden and drastic interest rate changes, providing long-term interest rate guidance, and minimizing interest rate volatility. Interest rate certainty can boost investor confidence and promote long-term investment commitments.

The government can consider offering targeted investment incentives to offset the impact of higher interest rates on FDI inflows. These incentives could include tax breaks, reduced regulatory burdens, streamlined administrative procedures, and specific sectoral incentives to attract investment. By providing attractive investment conditions, Zimbabwe can offset the potential negative effects of higher interest rates.

Promoting economic diversification can reduce the vulnerability of FDI inflows to interest rate fluctuations. By expanding and developing various sectors of the economy, such as manufacturing, agriculture, tourism, and services, Zimbabwe can attract investors with diverse interests and investment preferences. Economic diversification can help mitigate the impact of interest rate changes on FDI inflows.

5.3 Areas for further study

Utilizing VECM assessment, the research examined the link between exchange rate volatility and foreign direct investment inflows into Zimbabwe. There are also other variables such as political stability, occurrence of natural disasters such as drought, floods and epidemics like Covid-19. Their prospective influence on foreign direct investment inflows may also be analyzed. The study employed secondary yearly data from 1995 to 2022, although using panel data for different nations may yield more trustworthy results for comparison. Areas of further study may also include using a different model, maybe (ARDL) analysis is foreseeable in the future.

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APPENDIX

Appendix 1: Raw Data

YEAR	FDI	EXCHANGE RATE	INFLATION	%GDP	INTEREST RATE
1995	10180763	10.9126	2.7120003	10	10.21746323
1996	13036821	11.6126	5.7129639	13	12.21006325
1997	14403622	13.6912	4.7864303	14	9.331163227
1998	14826332	14.1652	7.7732103	14	10.21076323
1999	1549690	12.74093	8.0068133	16	8.063796834
2000	3546065	16.599	0.6279	15	9.148239739
2001	841285	13.8587	0.1308902	16	10.23011578
2002	2074322	10.5015	2.7129503	14	10.19768854
2003	2488197	16.5947	8.8012756	12	10.02107406
2004	2848609	17.0166	7.6115243	11	10.74255023
2005	7445128	8.0258	5.1366011	10	11.60986327
2006	30506684	7.1893	2.0176787	10	11.66586517
2007	18033622	7.7851	0.8948868	10	11.04451753
2008	10180763	10.7929	1.3492225	10	13.14447945
2009	12205848	10.9204	95.40866	8	14.74530423
2010	2790486	16.7773	2.575536	9	12.2842469
2011	14949900	14.1296	2.171761	11	12.87398582
2012	27955135	13.7911	4.8559455	12	14.34096887
2013	34648880	13.8956	8.0911402	12	14.52095504

2014	1.18E+08	13.0385	0.6249745	13	12.14365709
2015	80900000	18.9843	0.3674197	13	15.59666667
2016	1.35E+08	12.879	2.0140947	4	15.74
2017	4.44E+08	27.0486	3.0569051	4	16.4675
2018	59000000	10.69822	200.76958	8	15.54177134
2019	23200000	15.07442	225.39465	3	17.11333333
2020	3800000	22.38904	604.94586	4	16.91416667
2021	25900000	16.45474	113.29498	4	17.13166667
2022	3800000	19.68677	3.4	6.00	16.18166667

Appendix 2: Descriptive Statistics

```
. summarize y er inf gdg ir,detail

                  Foreign Direct Investment
-------------------------------------------------------------

      Percentiles      Smallest
 1%       841285         841285
 5%      1549690        1549690
10%      2074322        2074322       Obs                  28
25%      3673032        2488197       Sum of Wgt.          28

50%     1.37e+07                      Mean           3.99e+07
                        Largest       Std. Dev.      8.62e+07
75%     2.92e+07       8.09e+07
90%     1.18e+08       1.18e+08       Variance       7.43e+15
95%     1.35e+08       1.35e+08       Skewness       3.937018
99%     4.44e+08       4.44e+08       Kurtosis       18.69858
                       Exchange Rate
-------------------------------------------------------------

      Percentiles      Smallest
 1%       7.1893         7.1893
 5%       7.7851         7.7851
10%       8.0258         8.0258       Obs                  28
25%      10.9165        10.5015       Sum of Wgt.          28

50%      13.8249                      Mean           14.18763
                        Largest       Std. Dev.      4.376469
75%     16.59685        18.9843
90%     19.68677       19.68677       Variance       19.15348
95%     22.38904       22.38904       Skewness       .8868145
99%      27.0486        27.0486       Kurtosis       4.166819
```

Inflation

	Percentiles	Smallest		
1%	.1308902	.1308902		
5%	.3674197	.3674197		
10%	.6249745	.6249745	Obs	28
25%	2.015887	.6279	Sum of Wgt.	28
50%	4.093215		Mean	47.33021
		Largest	Std. Dev.	124.2421
75%	8.048977	113.295		
90%	200.7696	200.7696	Variance	15436.1
95%	225.3946	225.3946	Skewness	3.561766
99%	604.9459	604.9459	Kurtosis	15.85364

Gross Domestic Product Growth

	Percentiles	Smallest		
1%	3	3		
5%	4	4		
10%	4	4	Obs	28
25%	8	4	Sum of Wgt.	28
50%	10.5		Mean	10.21722
		Largest	Std. Dev.	3.864376
75%	13	14		
90%	15.29964	15.29964	Variance	14.9334
95%	15.78245	15.78245	Skewness	-.4534774
99%	16	16	Kurtosis	2.174684

Interest Rate

	Percentiles	Smallest		
1%	8.063797	8.063797		
5%	9.14824	9.14824		
10%	9.331163	9.331163	Obs	28
25%	10.22379	10.02107	Sum of Wgt.	28
50%	12.24716		Mean	12.83691
		Largest	Std. Dev.	2.760193
75%	15.56922	16.4675		
90%	16.91417	16.91417	Variance	7.618667
95%	17.11333	17.11333	Skewness	.1349377
99%	17.13167	17.13167	Kurtosis	1.720822

Appendix 3: Stationarity Tests

```
. dfuller dlogy, lags(1)

Augmented Dickey-Fuller test for unit root         Number of obs   =        25
```

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
		Interpolated Dickey-Fuller		
Z(t)	-3.169	-3.750	-3.000	-2.630

MacKinnon approximate p-value for Z(t) = 0.0219

```
. dfuller dloger, lags(1)

Augmented Dickey-Fuller test for unit root         Number of obs   =        25

                                 ———— Interpolated Dickey-Fuller ————
                    Test         1% Critical       5% Critical      10% Critical
                Statistic           Value             Value             Value
——————————————————————————————————————————————————————————————————————————————
 Z(t)             -5.331            -3.750            -3.000            -2.630
——————————————————————————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.0000
. dfuller dloginf, lags(1)

Augmented Dickey-Fuller test for unit root         Number of obs   =        25

                                 ———— Interpolated Dickey-Fuller ————
                    Test         1% Critical       5% Critical      10% Critical
                Statistic           Value             Value             Value
——————————————————————————————————————————————————————————————————————————————
 Z(t)             -3.858            -3.750            -3.000            -2.630
——————————————————————————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.0024

. dfuller dloggdg, lags(1)

Augmented Dickey-Fuller test for unit root         Number of obs   =        25

                                 ———— Interpolated Dickey-Fuller ————
                    Test         1% Critical       5% Critical      10% Critical
                Statistic           Value             Value             Value
——————————————————————————————————————————————————————————————————————————————
 Z(t)             -5.174            -3.750            -3.000            -2.630
——————————————————————————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.0000
. dfuller dlogir, lags(1)

Augmented Dickey-Fuller test for unit root         Number of obs   =        25

                                 ———— Interpolated Dickey-Fuller ————
                    Test         1% Critical       5% Critical      10% Critical
                Statistic           Value             Value             Value
——————————————————————————————————————————————————————————————————————————————
 Z(t)             -5.204            -3.750            -3.000            -2.630
——————————————————————————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.0000
```

Appendix 4: Optimal Lag Length Setting

```
. varsoc logy loger loginf loggdg logir

   Selection-order criteria
   Sample:  1999 - 2022                        Number of obs      =        24
```

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-90.1813				.001916	7.93178	7.99689	8.17721
1	-59.9381	60.487	25	0.000	.001306	7.49484	7.88551	8.96741
2	-20.4871	78.902	25	0.000	.000537	6.29059	7.00682	8.9903
3	15.1085	71.191	25	0.000	.00061	5.40763	6.44942	9.33447
4	1007.14	1984.1*	25	0.000	1.9e-37*	-75.1786*	-73.8112*	-70.0246*

```
   Endogenous:  logy loger loginf loggdg logir
    Exogenous:  _cons
```

Appendix5: Johansen Cointegration Test

```
. vecrank logy loger loginf loggdg logir, trend(constant) lags(3) max

                    Johansen tests for cointegration
Trend: constant                                      Number of obs =      25
Sample:  1998 - 2022                                       Lags =       3
```

maximum rank	parms	LL	eigenvalue	trace statistic	5% critical value
0	55	-38.53817	.	85.8213	68.52
1	64	-17.394458	0.81576	43.5338*	47.21
2	71	-2.3859996	0.69901	13.5169	29.68
3	76	1.7765798	0.28323	5.1918	15.41
4	79	4.3322749	0.18491	0.0804	3.76
5	80	4.3724554	0.00321		

maximum rank	parms	LL	eigenvalue	max statistic	5% critical value
0	55	-38.53817	.	42.2874	33.46
1	64	-17.394458	0.81576	30.0169	27.07
2	71	-2.3859996	0.69901	8.3252	20.97
3	76	1.7765798	0.28323	5.1114	14.07
4	79	4.3322749	0.18491	0.0804	3.76
5	80	4.3724554	0.00321		

Appendix 6: VECM Results

```
. vec logy loger loginf loggdg logir, trend(constant) lags(3)

Vector error-correction model

Sample:  1998 - 2022                            Number of obs     =         25
                                                AIC               =   6.511557
Log likelihood = -17.39446                      HQIC              =   7.377001
Det(Sigma_ml)  =  2.77e-06                      SBIC              =   9.631879

Equation           Parms      RMSE     R-sq      chi2     P>chi2
------------------------------------------------------------------
D_logy                12     .933121   0.6908   29.04201   0.0039
D_loger               12     .266162   0.7303   35.19579   0.0004
D_loginf              12     1.80662   0.5637   16.79827   0.1573
D_loggdg              12     .313401   0.6098   20.31648   0.0613
D_logir               12     .120211   0.3944    8.46582   0.7478
------------------------------------------------------------------
```

Foreign Direct Investment

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
D_logy						
_ce1						
L1.	-.4200976	.1366168	-3.08	0.002	-.6878616	-.1523337
logy						
LD.	-.1712082	.1920433	-0.89	0.373	-.5476061	.2051898
L2D.	.2168899	.2087608	1.04	0.299	-.1922737	.6260535
loger						
LD.	-.1257401	.7624352	-0.16	0.869	-1.620085	1.368605
L2D.	.4250221	.692666	0.61	0.539	-.9325782	1.782622
loginf						
LD.	-.427904	.1316815	-3.25	0.001	-.685995	-.169813
L2D.	-.317708	.13752	-2.31	0.021	-.5872422	-.0481737
loggdg						
LD.	-3.425036	1.287614	-2.66	0.008	-5.948713	-.9013587
L2D.	-2.429577	.9613419	-2.53	0.011	-4.313772	-.5453811
logir						
LD.	-4.854558	2.831751	-1.71	0.086	-10.40469	.6955712
L2D.	.5690159	2.653811	0.21	0.830	-4.632357	5.770389
_cons	-.0649624	.1996708	-0.33	0.745	-.4563101	.3263852

Exchange Rate

```
.
------------------------------------------------------------------------------
D_loger      |
        _ce1 |
         L1. |   -.0205769   .0389684    -0.53   0.597    -.0969536    .0557998
             |
        logy |
         LD. |    -.015769   .0547782    -0.29   0.773    -.1231323    .0915943
        L2D. |   -.0403714   .0595467    -0.68   0.498    -.1570808    .0763379
             |
       loger |
         LD. |   -.2302857   .2174761    -1.06   0.290    -.6565311    .1959597
        L2D. |   -.1483967   .1975752    -0.75   0.453     -.535637    .2388437
             |
      loginf |
         LD. |    .0574608   .0375607     1.53   0.126    -.0161568    .1310784
        L2D. |   -.0453942    .039226    -1.16   0.247    -.1222759    .0314874
             |
      loggdg |
         LD. |    -.451451   .3672775    -1.23   0.219    -1.171302    .2683998
        L2D. |    .3342113   .2742121     1.22   0.223    -.2032345     .871657
             |
       logir |
         LD. |   -1.609358   .8077254    -1.99   0.046    -3.192471   -.0262458
        L2D. |   -.0205206   .7569699    -0.03   0.978    -1.504154    1.463113
             |
       _cons |    .0400123   .0569539     0.70   0.482    -.0716152    .1516399
------------------------------------------------------------------------------
```

Inflation

```
.
------------------------------------------------------------------------------
D_loginf     |
        _ce1 |
         L1. |    .6891783   .2645041     2.61   0.009     .1707598    1.207597
             |
        logy |
         LD. |   -.5415309   .3718156    -1.46   0.145    -1.270276    .1872142
        L2D. |    .1895227   .4041823     0.47   0.639      -.60266    .9817055
             |
       loger |
         LD. |    1.246122   1.476153     0.84   0.399    -1.647085    4.139328
        L2D. |   -.8246972   1.341072    -0.61   0.539    -3.453151    1.803757
             |
      loginf |
         LD. |    .2695716   .2549489     1.06   0.290    -.2301191    .7692624
        L2D. |   -.2237647   .2662528    -0.84   0.401    -.7456106    .2980813
             |
      loggdg |
         LD. |    3.792802   2.492953     1.52   0.128    -1.093296      8.6789
        L2D. |     2.22064   1.861257     1.19   0.233    -1.427356    5.868636
             |
       logir |
         LD. |    10.15288   5.482561     1.85   0.064    -.5927412     20.8985
        L2D. |    4.496764    5.13805     0.88   0.381    -5.573629    14.56716
             |
       _cons |   -.0384183   .3865833    -0.10   0.921    -.7961076     .719271
------------------------------------------------------------------------------
```

Gross Domestic Product Growth

```
  .
-------------------------------------------------------------------------------
D_loggdg    |
        _ce1 |
         L1. |   .0077222   .0458846     0.17   0.866      -.08221    .0976544
             |
        logy |
         LD. |   .1210637   .0645004     1.88   0.061    -.0053547    .2474821
        L2D. |  -.1102392   .0701152    -1.57   0.116    -.2476624    .0271839
             |
       loger |
         LD. |   .0976009   .2560743     0.38   0.703    -.4042955    .5994972
        L2D. |  -.0579776   .2326413    -0.25   0.803    -.5139462     .397991
             |
      loginf |
         LD. |  -.0296206    .044227    -0.67   0.503     -.116304    .0570628
        L2D. |   .0554499    .046188     1.20   0.230    -.0350768    .1459767
             |
      loggdg |
         LD. |  -.0631675   .4324628    -0.15   0.884    -.9107789     .784444
        L2D. |  -.2304433   .3228798    -0.71   0.475    -.8632761    .4023896
             |
       logir |
         LD. |  -.2928071   .9510822    -0.31   0.758    -2.156894     1.57128
        L2D. |   .5702064   .8913186     0.64   0.522    -1.176746    2.317159
             |
       _cons |  -.0698029   .0670622    -1.04   0.298    -.2012423    .0616366
-------------------------------------------------------------------------------
```

Interest Rate

```
  .
```

D_logir						
_ce1						
L1.	.0161979	.0175999	0.92	0.357	-.0182973	.050693
logy						
LD.	-.0223109	.0247403	-0.90	0.367	-.070801	.0261792
L2D.	-.0028357	.026894	-0.11	0.916	-.055547	.0498755
loger						
LD.	-.0025818	.0982221	-0.03	0.979	-.1950935	.1899299
L2D.	.0194666	.0892339	0.22	0.827	-.1554287	.1943619
loginf						
LD.	-.0091634	.0169641	-0.54	0.589	-.0424124	.0240856
L2D.	-.0130923	.0177163	-0.74	0.460	-.0478155	.021631
loggdg						
LD.	.0736604	.1658792	0.44	0.657	-.2514568	.3987776
L2D.	.0737204	.1238466	0.60	0.552	-.1690145	.3164552
logir						
LD.	-.2695297	.3648053	-0.74	0.460	-.984535	.4454757
L2D.	-.0266687	.3418819	-0.08	0.938	-.6967449	.6434075
_cons	.0339004	.025723	1.32	0.188	-.0165156	.0843165

VECM Long Run Equation

Cointegrating equations

Equation	Parms	chi2	P>chi2
_ce1	4	66.37687	0.0000

Identification: beta is exactly identified

Johansen normalization restriction imposed

beta	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
_ce1						
logy	1	.	.	.	.	.
loger	2.216111	1.058923	2.09	0.036	.1406604	4.291562
loginf	-.9084015	.2281488	-3.98	0.000	-1.355565	-.4612382
loggdg	-8.172963	1.377288	-5.93	0.000	-10.8724	-5.473529
logir	-16.2485	2.314476	-7.02	0.000	-20.78479	-11.71221
_cons	38.82417	.	.	.	.	.

Appendix 7: Post Estimation Tests

Autocorrelation Test

```
. veclmar, mlag(3)
```

Lagrange-multiplier test

lag	chi2	df	Prob > chi2
1	14.2248	25	0.95767
2	23.7033	25	0.53657
3	30.4329	25	0.20849

H0: no autocorrelation at lag order

Normality Test

```
. vecnorm, jbera
```

Jarque-Bera test

Equation	chi2	df	Prob > chi2
D_logy	2.446	2	0.29430
D_loger	0.680	2	0.71188
D_loginf	0.519	2	0.77152
D_loggdg	3.034	2	0.21937
D_logir	0.027	2	0.98653
ALL	6.706	10	0.75288

Stability Test

```
. vecstable
```

Eigenvalue stability condition

Eigenvalue	Modulus
1	1
1	1
1	1
1	1
-.7633585 + .3095417*i*	.823731
-.7633585 - .3095417*i*	.823731
.5689565 + .509174*i*	.763525
.5689565 - .509174*i*	.763525
-.1361448 + .7504256*i*	.762676
-.1361448 - .7504256*i*	.762676
.1111006 + .6806413*i*	.689649
.1111006 - .6806413*i*	.689649
-.05118323 + .4971048*i*	.499733
-.05118323 - .4971048*i*	.499733
-.3414137	.341414

The VECM specification imposes 4 unit moduli.