

**THE IMPACT OF PRIVATE EXTERNAL DEBT ON MONETARY POLICY IN
TANZANIA (2010-2020)**

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**A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE
REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN
ECONOMICS (MSC-ECON) DEPARTMENT OF ECONOMICS OF THE OPEN
UNIVERSITY OF TANZANIA**

2021

CERTIFICATION

The undersigned certifies that he has read and hereby recommend for acceptance by the Open University of Tanzania this Dissertation titled, **“The impact of Private External Debt on Monetary Policy in Tanzania (2010-2020)”** in partial fulfilment of the requirements for the award of the degree of Master of Science in Economics of the Open University of Tanzania.

.....

Dr. Felician Mutasa

(Supervisor)

.....

Date

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DECLARATION

I, **Francis Stephen Nyonzu**, declare that the work presented in this dissertation is original. It has never been presented to any other University or Institution. Where other people's works have been used, references have been provided. It is in this regard that I declare this work as original mine. It is hereby presented in partial fulfilment of the requirement for the Degree of Master of Science in Economics

.....

Signature

.....

Date

DEDICATION

This dissertation is dedicated to Haki, Hekima, Mtego, and Shahada, they have always been my inspiration in setting and reaching various life goals

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We depend on one another in getting things done. At this point, I have been economically, academically, and psychologically helped by some people who made me accomplish the program. I give thanks to my supervisor, Dr. Felician Mutasa for his relentless expert advice. He could find time to attend to me, notwithstanding his very tight academic engagements. I appreciate my lecturers at the Open University of Tanzania in the MSc-Economics program for the knowledge they endowed me with. I, therefore, thank Prof. Deus Ngaruko, Dr. Felician Mutasa, Dr. Timothy Lyanga, As well as the course coordinator, Abdul Kilima, who was always there to provide the necessary assistance.

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ABSTRACT

The study aimed to investigate the imported shocks from Private External Debt and how they affect the efficiency of monetary policy. The study used the deliberate sample by collecting monthly data from 2010 to 2020 from Bank of Tanzania's website, reports and publications, which made 132 observations. Because of the cointegration that was found in the variables, the study employed the Vector Error Correction Model (VECM) to capture short term and long-term effects. The model has shown that the Private External Debt imports external shocks through exchange rates, Exchange rates affect Inflation rates and thus affecting the power of the Central Bank in controlling inflation. The study suggests that the country should use fiscal means to finance its activities because the domestic debt increases the amount of Private External Debt and also the number of cross border loans are to be limited. Discount rates are to be well managed to limit the amount of the shocks, which are imported from the financial integration and globalisation because the discount rates have also been shown to affect the Private External Debt

Keywords: Monetary Policy, Macroeconomic Shocks, Imported Shocks, Exchange Rates

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LIST OF ABBREVIATIONS

AIC:	Aike Information Criteria
BOT:	Bank of Tanzania
OECD:	Organisation for Economic Cooperation and Development
GDP:	Gross Domestic Product
MoF:	Ministry of Finance
NBS:	National Bureau of Statistics
OECD:	Organisation for Economic Cooperation and Development
TZS:	Tanzanian Shillings
URT:	United Republic of Tanzania
VAR:	Vector Autoregressive Model
VECM:	Vector Error Correction Model

CHAPTER ONE

1.0. INTRODUCTION

This part gives light to the problem that is going to be discussed. It has covered the background of the problem, Objectives, Significance and the scope of the study

1.1. Background of the study

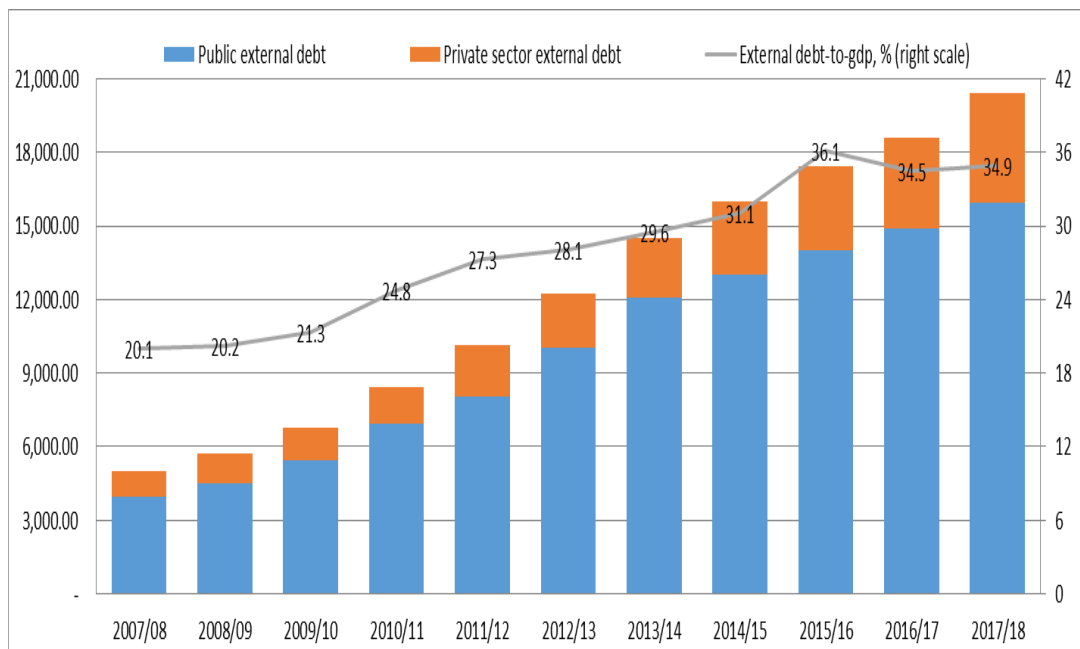
National Debt is composed of Domestic debt and External debt. External debt is composed of Public External debt which is acquired by the government to finance its activities or fund the budget deficit, and the Private External debt which is acquired by the private sectors to finance their activities, together they make up the national external debt

Developing countries, which are middle and low-income countries, are the borrowers. Up to 2012, only a few countries were lenders, while the majority were borrowers. The lender countries were Russia, the Middle East, some Scandinavian countries, and Venezuela, which (Grohe, Uribe, & Woodford, 2016) called them oil-exporting countries, the remaining countries are borrowers

The debt being domestically or externally held has effects on the economy. (Musgrave & Musgrave, 1989) argue that the distribution of the debt affects the liquidity structure, i.e. Domestic debt affects the money that is left to the banks for issuing loans to the private sector. We are in an open economy and developing countries are more open to the world, as (Agénor & Montiel, 2008) argued. There is the rise of financial globalisation, in which

the financial markets are open even to foreigners, private sectors get chance to borrow from other countries and thus affecting the monetary policy

Cross-border lending has been increasing with the increase of financial integration, which is, the outcome of financial globalization. (Cerutti, Hale, et al. 2014) have observed that cross-border lending has increased in the past two decades that is from the 1990s, the same issue has been said by various studies from the Bank of Tanzania, i.e., the study of Kombe, (2015) and (Montiel et al., 2012). They maintain that between 1995 and 2012, total cross-border loans almost tripled, especially in low-and middle-income countries



Graph 1.1: External Debt Development

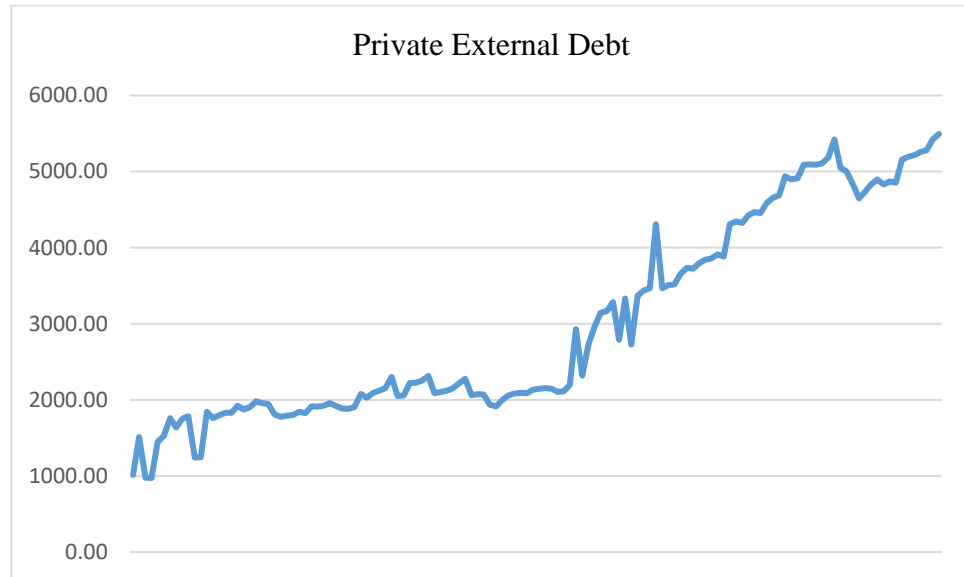
Source: BoT, the Graph is the author's creation

From the graph, it can be seen that the private debt has been increasing. The available data on external debt shows that the percentage change of Private External debt is 73.8% taking January 2010 and January 2018, that is to say, the private external debt has increased by 73.8%

In the year 2020, Tanzania had a public debt of \$18544.5 million and \$5455.6 Million was the Private External Debt which is 22.7% of the external debt as has been reported in the Monetary Policy Statement which is issued by the Central Bank, which is known as the Bank of Tanzania.

Developing countries as it has been said by Ndulu et al (2007) and Agenor & Montiel (2008) that in most African countries, lack of competition is pervasive so that banks do not have to alter their way of doing business or their pricing structures to get a fair share of the business. Ndulu et al (2007) observed that access to finance is limited to a few people leaving out small and medium enterprises, the informal sector, low-income people, and agricultural sectors which becomes a problem to financial inclusion. The incoming of private external debt makes those who were expected to be actors in domestic markets to be the actors in global markets

Assessment of Monetary Transmission Mechanism in Tanzania (Bashagi, Kimolo, et al, 2019) suggested the need for the Bank of Tanzania should continue monitoring the Global developments to constrain the impact of the shocks and safeguard the domestic macroeconomic stability. Private External Debt is the part of the Global developments which comes from the financial integration



Graph 1.2: Private External Debt development (Jan 2010 - Dec 2020)

Source: BoT, the graph is the author's creation

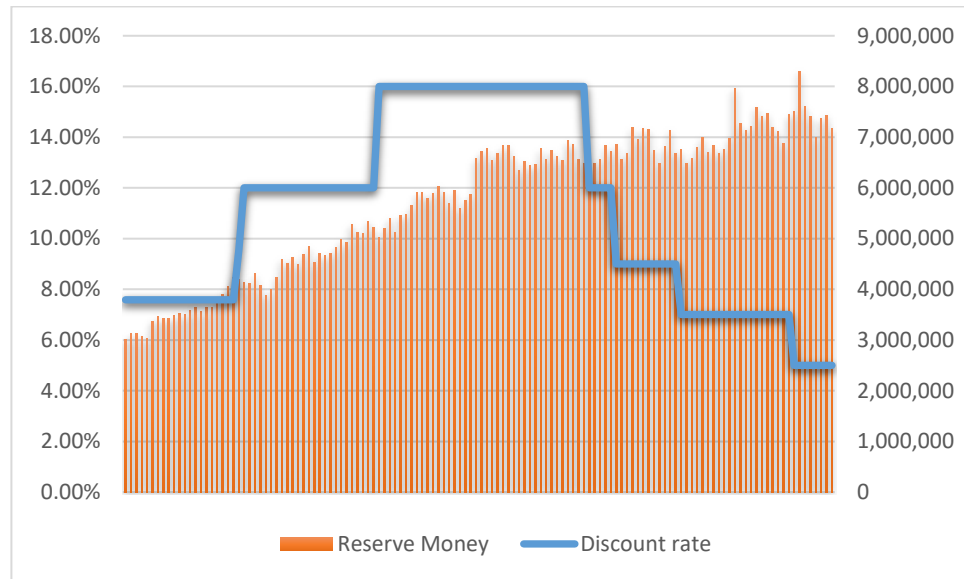
Taking Monthly data from 2010 to 2020, the Private External Debt has been increasing as can be seen in the graph above

Monetary Policy should affect decisions such as whether to consume or save. It is expected that in expansionary monetary policy people to demand more money and in contractionary Monetary Policy people will save more and thus hold less money, but then in a globalised world, people can issue loans from abroad and thus not be affected by the domestic contractionary monetary policy and thus the study around the area is very crucial

In Tanzania, BoT uses various instruments like open market operations which sell or buy debt securities, and the sale and purchase of foreign currency in the inter-bank foreign exchange market, repurchase agreements (REPO) and reverse repurchase agreements

(reverse REPO). The statutory minimum reserve requirement ratio (SMR) and discount rate are also part of monetary policy instruments

In Open Market Operations the BoT uses Discount Rate. Here is developing the Discount rate for the past ten years, the graph will include the Reserve Money



Graph 1.3: Reserve Money and Discount Rate (2010 - 2020)

Source: BOT, graph is author's creation

Taking Reserve Money as one of the instruments that have been used it has been increased in the past ten years while Discount Rate has increased to the maximum and dropped to five per cent

1.2. Statement of the problem

Global Commodity Prices are beyond the Influence of the monetary policy, and thus affecting the monetary policy. Loans are the commodities in the financial market and when they come from other parts of the world, they affect the monetary policy the same way other global prices do

Monetary Policy is the main policy that the Bank of Tanzania use to achieve economic stability, being able to command economic variables without external influences or forces is development (Sen, 2014). Having economic freedom is then essential to financial development, which may come by minimizing the external shocks

The studies which have been made so far have been focusing on financial integration and National Debt at large (Ghosh, 2016; Cerutti, Hale, et al. 2014; Mbowe, Masenya, et al. 2019 and Kombe 2015), there is limited literature on private external debt in Tanzania and thus it has been needed to conduct a study on the relationship between private external debt and Monetary Policy and find the means to limit the effects imported from it

1.3. Objectives

1.3.1 General research objective

The study aims at studying the imported shocks from Private External Debt and how they affect the efficiency of monetary policy

1.3.2. Specific Objectives

- i. Examine responses of Inflation rates, Exchange rates, and discount rates to private external debt
- ii. Explore variables that can be used to minimize the Private External Debt
- iii. Examine macroeconomic shocks which are imported from the private external debt

1.4. Hypothesis

H0: Private Debt does not affect Exchange rates and/or Inflation, Domestic Debt, Discount rates and M3

H1: Private Debt affects Exchange rates and/or Inflation, Domestic Debt, Discount rates and M3

1.5. Significance of the study

The studies of Ndulu et al (2007), Montiel (2008), Kombe (2015), and Ndulu & Adam (2016) have shown that external shocks influence domestic fluctuations i.e depreciation of the currency against the US Dollar, the fall of 20% to 40% from the beginning of 2015 has been observed in African Currencies. Kombe (2015) showed that output, inflation, money stock, and the real exchange rate fluctuations are responding to a strong influence from external sources

When the variables associated with Monetary Policy are affected by the external shocks, BoT's ability to control the economy becomes limited and thus financial sector weakens as well as the economy at large. Recently (Ghosh 2016), (Cerutti, Hale, et al. 2014) and (Mbowe, Masenya, et al. 2019) have shown that global economies have important implications for investors but the adverse effect is increasing vulnerability of the economy against external shocks. The need for the best ways of dealing with external shocks to improve the domestic shocks is the great reason for having this study.

1.6. Scope of the study

The study covers the period of 2010 to 2020 focusing on Tanzania because the country has its authoritative body in regulating the economy. The data is monthly taken so the period is enough to give enough representative sample

CHAPTER TWO

LITERATURE REVIEW

This chapter is focused on bringing forward the works of literature, empirical and theoretical on Public Debt and Monetary Policy as they are linked to regulating the economy

2.0. Definitions of terms

Macroeconomic Variables can be defined as indicators or main signposts signalling the trends in the economy, some macroeconomic variables are Balance of Payments, Inflation, Economic Growth, unemployment, public expenditures, taxes, savings and investment, and aggregated price level

Extended broad money (M3). Bank of Tanzania has defined M3 as money that consists of currency in circulation outside banks and the shilling demand deposits of Tanzanian residents with other depository corporations, plus the shilling time and savings deposits of the Tanzanian residents with other depository corporations (banks) in the country plus foreign currency deposits of the Tanzanian residents with other depository corporations in the country

Reserve Money. The Bank of Tanzania has defined Reserve Money as The Bank of Tanzania's liabilities in the form of currency in circulation outside the banking system, cash held by banks in their vaults, and deposits of banks kept with the Bank of Tanzania

in national currency. Reserve money is also called base money, or the monetary base or high-powered money

Inflation Rates. The rate at which the average level of prices of a basket of selected goods and services in an economy is increasing over time. It is often expressed as a percentage. Inflation indicates a decrease in the purchasing power of a nation's currency.

Discount Rate. The rate of interest that the Bank of Tanzania charges on loans extended to banks. It uses the Treasury bills rate as a base plus a loaded factor, which can be changed from time to time depending on the liquidity situation in the market.

Exchange Rate. The price at which one unit of a currency can be purchased with another currency, for instance, TZS per US dollar.

External debt. Kenton (2020) has defined external debt as the portion of a country's debt that is borrowed from foreign lenders, including commercial banks, governments, or international financial institutions. External debt is part of the Public debt. The Public Debt can be domestically or externally issued, in our discussion, we deal with the external debt

Private External Debt. From the definition of External debt, Private External debt is the portion of a private sector's debt that is borrowed from foreign lenders. This is to say that the External debt comprises of public debt which is issued by the government and the private debt which is issued by the Individuals and Private Institutions

2.2 Theoretical Literature Review

2.2.1. Monetary theory

Monetary theory is more attributed to Milton Friedman who led the monetarist school. The school emerged after having sharp changes in real GDP in the 1970s which could hardly be explained by the Keynesian analysis that focused on aggregate demand. Friedman stressed the role of changes in the money supply as the principal determinant in the changes in the nominal value of output in the short run as well as in the long run.

The monetary theory maintains that money supply is the main driver of economic activity and that central banks, which control the levers of monetary policy, can exert power over economic growth rates by tinkering with the amount of currency and other liquid instruments circulating in a country's economy (Liberto, 2021).

This theory is applicable all over the world with some differences in efficiencies of the policy which applies the theory. The theory is carried in Monetary Policy which is controlled by the central banks the difference being the economy affects its efficiency. The studies of (Agénor & Montiel, 2008) and Frankel (2010) showed how financial markets in the developing world differs from the markets in the developed world

The money supply includes credit, cash, checks, and money market mutual funds. The most important of these forms of money is credit. Amadeo (2020) says that credit includes loans, bonds, and mortgages. When the central bank is to control the money supply, the actors are expected to respond to the move, but lack of competition among the financial

institutions has been mentioned to be the challenge that limits the transmission of monetary policy effects. The crowding-out effect is another thing that happens in the developing world as it has been observed by Ndulu et. al (2007)

Away from the emerging markets to be having less developed financial markets, the issue of cross border lending also adds a challenge as it has been observed by Demirgüç-Kunt, et al. (2017) another issue is dollarization, which is not the issue in Tanzania as it has been proven by (Kessy, Nyella, & Yabu, Transaction Dollarization in Tanzania, 2015). The issue on this study will be on cross border lending

2.2.2. Interest Rate Parity Theory

Interest rate parity (IRP) is a theory according to which the interest rate differential between two countries is equal to the differential between the forward exchange rate and the spot exchange rate (Aliber, 1973).

Covered Interest Rate theory maintains that the difference between interest rates in two countries is nullified by the spot/forward currency premiums so that the investors could not earn an arbitrage profit. In Uncovered Interest Rate theory, the expected appreciation (or depreciation) of a particular currency is nullified by lower (or higher) interest. (Du et. al 2018).

In the cross-border lending, interest rates and exchange rates are good determinants and thus the theory is more applicable in this context, even if the private sector will do the cross border lending the arbitrageur's profit should be zero

2.2.3. Monetary Theory of Inflation

There are many theories explaining Inflation that is Demand Pull, Cost-Push, Monetary Inflation theories, Keynesian Inflation Theories, new political macroeconomics of inflation, the new neoclassical synthesis, rational expectations revolution, and structural inflation theory as they have been explained by (Frisch, 1983; Kibritçioğlu, 2018; Totonchi, 2011). This study is more related to the monetary issues so, the Monetary Theory of Inflation will be explained amongst the available inflation theories

In the Monetary Theory of Inflation only money matters. The theory emphasizes that monetary policy is a more powerful instrument than fiscal policy in stabilising the economy. That is money supply is the best determinant of output level and prices in the short run and the price levels in the long run

As (Totonchi, 2011) maintains that Modern quantity theory holds that inflation is always and everywhere a monetary phenomenon that arises from a more rapid expansion in the quantity of money than in total output. This theoretically gives the Monetary Policy power to influence the general price levels

2.2.4. The Balance of Payments Theory

The balance of payments theory of exchange rate maintains the rate of exchange is influenced, by the balance of payments position of a country rather than internal prices and money supply (Stern, 2017). A deficit in the balance of payments implies that the demand for foreign currency exceeds the supply of it at a given rate of exchange.

The demand for foreign exchange arises from the demand for foreign goods and services. I have shown area that the private external debt has been increasing, so the demand for foreign currency has been increasing according to the Balance of Payments Theory.

(Chipman, 1984) maintain that the deficit in the Balance of Payments leads to an appreciation in the exchange value of the foreign currency. As a consequence, the exchange rate of domestic currency to the foreign currency undergoes depreciation.

2.2.5. General Theory of Public Debt

The primary real burden of public debt is borne by members of the current generation (Sharp, 1959), this has been well theorised by James Buchanan that when the debt is created to finance government spending, the real cost of the society reduces private production. The theory has considered the crowding-out effect which happens when increased government spending leads to a fall in private sector spending which occurs because of the increase in interest rates associated with the growth of the public sector

(Spencer & Yohe, 1970). The crowding out has been of much debate, Economists like David Ricardo challenged it by posing the Ricardian Equivalence. While other studies confirmed the crowding-out effect i.e., Bacon and Eltis (1978), showed that the deindustrialization of the economy of the United Kingdom in the 1960s to 1970s was the result of the excessive growth of the public sector.

Because private sector has access to finance across the borders from other institutions because of the financial globalization which then can make the private investment not being affected by the financial crowding out because Demirgüç-Kunt, et al. (2017) showed that the expansion of monetary policy of other countries have effects to weaker firms in other countries

2.3 Empirical Literature review

Cross-border lending has been increasing as it has been observed in various studies including (Ghosh 2016) and (Cerutti, Hale, et al. 2014) which put clear that the increase is remarkably seen in low-income countries and emerging markets. While Kombe (2015) observed it in the Tanzania context. Financial depth, access, and efficiency are needed in African financial sectors because the financial market influences private sector activity, economic growth, and poverty alleviation. In achieving depth access and efficiency the studies around the area are necessary to improve the performance of the financial markets and the monetary policy in the long run. Domestic Financial Institutions can be at risk if

the global financial market is not analyzed and know the way forward of benefiting from it while losing less to it

The effects of external debt are still debated amongst scholars as Mabula & Mutasa (2019) cited (Herndon et al. 2014; B. C. M. Reinhart & Rogoff 2010; Krugman 1988). But then I agree with the Tanzanian Ministry of Finance and Planning which puts that allocation of the loan determines if the external borrowing is good or bad, that is if the funds are allocated in development projects the effects will not be as same as when the funds are allocated in recurrent expenditure

Domestic borrowing affects private investments by what is known in economics as the crowding-out effect, which is the case in most developing countries including Tanzania as it has been observed by Ndulu et al. (2007). With the existing financial integration, the openness of the economy the crowding out can be a myth as the private sectors can borrow from abroad and invest

Tanzanian economy is no shortage of studies, there are several studies in public debt, External debt, and crowding out effect. The study of Mwakalila, E. (2020) has covered the Crowding out effect, public debt and external debt have been covered in the studies of (Jilenga, et al. 2016; Kasidi & Said 2013; Mabula & Mutasa 2019; Marobhe 2019 and Yusuf & Said 2018). The existing studies on cross border lending are in other countries especially developed ones as has been seen in the studies of (Cerutti et al. 2014; Fidrmuc & Hainz 2013; Avdjiev et al. 2012)

As long as the country continues having the deficit budget borrowing continues and the debt is paid the amount borrowed with the interest, the debt servicing. This means the government will be using the revenue collected from the public to pay back the debt, in the balance sheet it will be recorded in Payments, and if the private borrowers also service their debt that is also payment in the balance sheet which may lead to unbalanced balance of payments. Theoretically, as Grohe et al, (2016) affirms that it should add up to zero globally, that is the difference between the payments and receipts

Tanzanian Ministry of Finance and various studies in public finance such as (Musgrave & Musgrave, 1989) (Bailey, 2004) and (Ulbrich, 2003) confirmed that debt servicing is more severe for external debt than domestic debt because the external debt is normally paid in foreign currency and that is burdensome when the currency is depreciating. The issue is the same when the private sector is paying back the loans taken from abroad

Albrizio, et al (2020) say despite the importance of understanding cross-border spillovers of monetary policy, there has been a lack of empirical consensus on that issue. The studies of cross-border lending in developed countries can help in paving the way to a conclusion about cross-border lending which has been proved to increase in developing countries. Bankers without Borders (2017) found that developing economies in the South has increased from 28 per cent of the world's cross-border bank claims in 2001 to 33 per cent in 2014

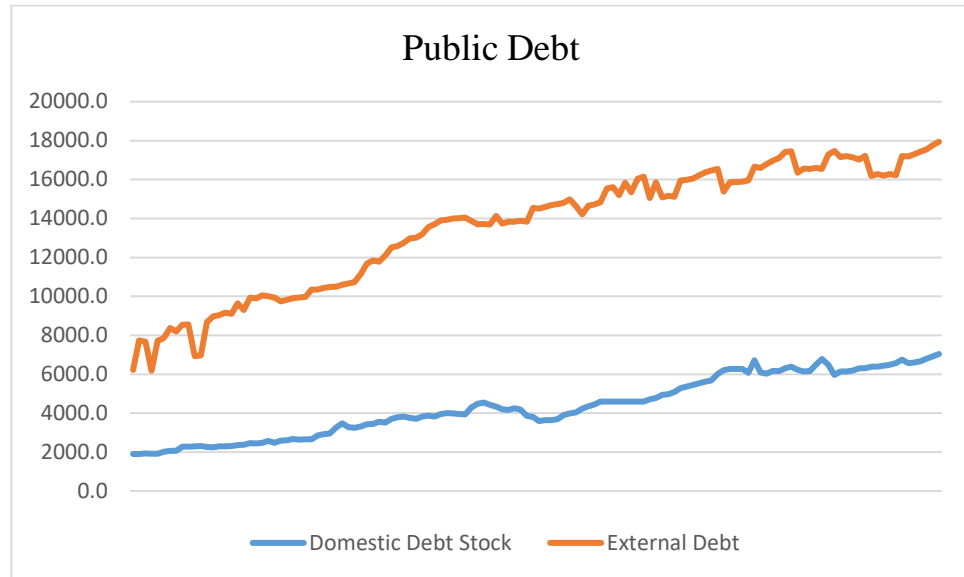
Demirgüç-Kunt, et al. (2017) found that an expansion of monetary policy through a lower policy interest rate increases cross-border credit supply especially to weaker firms as

measured by the equity to assets ratio, these findings align with the study of Barrell, & Nahhas. (2020) who used a model based on the gravity approach to international financial transaction and found that lender country gets advantages when the markets with which they are trading are small in size and less competitive and thus they become more competitive customers to the external market.

Barrell, & Nahhas. (2020) also found that the domestic country has the role in deriving the scale of cross-border lending, emphasizing capabilities as measured by GDP and Financial freedom. This gives light that even though the countries respond to the expansionary monetary policy of the host countries the domestic environment plays a part in determining the size of the cross-border credits which means developing countries still have the chance to develop their domestic financial markets and thus to be having efficient monetary policy

The available literature about Tanzania, taking Mabula & Mutasa (2019) as an example have found that the external debt in Tanzania is positive on privatively related to investment before declining when reaching a threshold of 40.89 per cent and recommended to regulate external debt policies because it is more responsive to private investment than domestic debt. They have used an Autoregressive Distributed Lag (ARDL)

The study of (Yusuf & Said, 2018) has shown that there is a negative relationship between public debt and economic growth in Tanzania. The public debt of Tanzania is having high external debt than the domestic debt



Graph 2.0: Domestic and External Debt Stock (2010-2020)

Source: BoT, Graph is author's creation

The combined effect of domestic and external debt on private investment is statistically significant both in the long run and short run (Mabula & Mutasa, 2019) and thus the effects on Private Investments may reflect what (Yusuf & Said, 2018) found in their study. All these do show that Tanzania is not exceptional from the effects of external debt which made the private sector issue loans abroad and bring in more shocks to the economy although it is by the good intention of financing private investments which are affected by the public debt

As long as the empirical studies have shown the responsiveness of domestic monetary policy and Private investment to the external debt, without categorizing the debt and to study in parts, the need for this study is crucial as it will add value to the existing studies

with the detailed material on the relationship between cross border lending and the monetary policy

From the illustration below, theoretically, Interest Rates affect expectations which is also the channel that causes Money Market Interest rates to change, all together makes changes to Credits, asset prices, bank rate, and exchange rates and these as well causes a change in fiscal policy that is wage and price setting, supply and demand in Goods and Labour Markets

As well, there are shocks outside the control of the central bank that changes in risk premia, changes in capital, changes in the global economy, changes in fiscal policy, and changes in commodity prices which can all lead to the changes more or less than the official interest rates

2.4. Conceptual and Theoretical Framework

players of the financial market are having and thus affect the Interest rates in the money market, the effects can also be transmitted from the Money Market to expectations. Expectations and Money Market Interest Rates affect Money Credit, Asset Prices, Bank Rates, Exchange rates which transmit effects to supply and demand in goods and labour markets and thus affect the domestic price and Price developments

On the other hand, Shocks outside the control of the Central Bank leads to the change in the variables which are also affected by the official interest rates. The Shocks outside the control of the central bank are Changes in risk premia, Changes in Bank Capital, changes in the global economy, changes in fiscal policy and changes in the commodity prices

2.5. Summary

The theoretical works of the literature suggested the existence of a relationship between External debt and monetary policy and thus the empirical studies have proven the existence of the imported shocks from the external debt. Studies from developed nations have shown the effects of cross-border lending which are then been discussed in this study

CHAPTER THREE

3.0. RESEARCH METHODOLOGY

This chapter explains the methodology employed including the sample, sampling technique specified econometric model and the tests that have been taken

3.1 Research Design

The study aimed at examining the effects of Private External debt on monetary Policy. The monetary theory maintains that money supply is the main driver of economic activity and that central banks, which control the levers of monetary policy, can exert power over economic growth rates by tinkering with the amount of currency and other liquid instruments circulating in a country's economy (Liberto, 2021). Several variables are used in transmitting the effects of monetary policy to the economy, but in this study Reserve Money, Inflation rates, exchange rates, M3, and Discount Rates have been examined on the basis that they have been mentioned in the monetary policy of Tanzania

The data is Time series. Gujarati (2008) defines time series as a set of observations on the values that a variable takes at different times. Such data may be collected at regular time intervals, such as daily, weekly, monthly, quarterly, annually, etc., which will enable drawing inferences about them. As Mwamkonko (2019) argues this design uses statistical

techniques to identify the behaviour of variables regarding statistical regularities in their past behaviour to estimate a pattern in the variable's evolution over time

The time-series data that have been used in this study are on monthly basis and they have been limited from 2010 to 2020 as it aimed at studying the different regimes that are 2010 to 2015 and 2016 to 2020. That is the pre-lower middle-income country regime and the regime during which the country got promoted to the lower-middle-income country.

3.2 Sampling Technique

The data used are secondary data taken from reports of the Bank of Tanzania. The study requires Deliberate sampling (non-probability) because the sample represents the universe (Kothari 2014). The sample included the amount of Private external debt, Discount rate, Inflation rates, exchange rates, extended broad money(M3), and Domestic Debt which cannot be sampled in this study rather be taken as they are reported

3.3 Model Specification

Vector autoregressive (VAR) models are capable of capturing the dynamic structure of many time series variables. Impulse response functions are typically used to investigate the relationships between the variables included in such models (Lütkepohl, 2006). VAR has been used extensively for macro-econometric analysis when Sims (1980) advocated vector autoregressive (VAR) models as alternatives.

In this study, the variables are examined relative to their effects on Private External Debt in this context the relevant impulses or shocks are to be traced out. Considering the cointegration structure of the variables offers interesting possibilities for imposing identifying restrictions.

As (Lütkepohl, 2006) concludes that specification, estimation, and validation of reduced form Vector Error Correction Models (VECM) which explicitly consider the cointegration structure of the variables are briefly outlined and imposed structural short and long-run restrictions within these models.

Because of the Cointegration that was in the variables, the VAR method was of no good as the literature suggest once the variables are congregated one should estimate using VECM(Gujarati, 2008) and thus the model employed way VECM to capture short term and long-term effects of the Private External Debt to the Exchange Rates, Inflation Rates, Discount Rates, Reserve Money, Domestic Debt and M3

3.4 Methods of Estimation and Tests

In time series analysis, it is very important to consider the stationarity of the data. Dissanayake (2020) defines Stationarity as a statistical property of a time series which are mean, variance and covariance do not change over time. The variables in this model have been checked if they are stationary

3.4.1 Unit Root Test

The stationarity of the model has been checked by using Augmented Dickey-Fuller (ADF) test as a unit root test for determining characteristics of data and helps to overcome the spurious effect that may arise due to the presence of non-stationary data (Newbold & Granger, 1974; Phillips, 1986).

In the ADF test, the null hypothesis which the time series is considered as non-stationary. If the p-value of the test is less than the significance level then the null hypothesis will be rejected and considers that the time series is stationary

$$\Delta Y_t = \alpha + (\beta - 1)Y_{t-1} + \varepsilon_t \dots\dots\dots (1)$$

3.4.2 Johansen Cointegration Test

To ascertain whether variables of interest are bound together in the long run, the study will employ the Johansen (1988) co-integration approach. Within Johansen's framework, both trace and maximum Eigen-value statistics were used to ensure the robustness of the results

The trace statistic tests the null hypothesis that there are at most r co-integrating relationships against the alternative of K co-integrating relations. Following Verbeek (2004), λ_{trace} and λ_{max} statistics are defined as presented in the following equations:

$$J_{trace} = -n \sum_{i=r+1}^k \ln (1 - \hat{\lambda}_i) \dots\dots\dots (2)$$

$$J_{max} = -n \ln (1 - \hat{\lambda}) \dots\dots\dots (3)$$

λ : Eigen-value

n: Observations

r = 1, 2, 3... n.

Johansen's co-integration method has been used in this study because this approach enables testing for more than one co-integrating vector and hence exploiting all dynamic interactions of the variables included in the co-integration regression (Verbeek, 2017).

3.4.3 Error Correlation Model

Because of the existence of the co-integration, the vector error correction model (VECM) was used to capture both short-run and long-run information. All terms in VECM are stationary, so the standard regression techniques with their associated statistical inferences are valid (Green, 2003).

The Granger representation theorem (Granger, 1983; Engle and Granger, 1987) states that if a set of variables such as Y_t and X_t are co-integrated, then there exists a valid error correction representation of the data of the form expressed in the equation that follows

$$\begin{aligned}\Delta \log PED_t &= \alpha + \sum_{h=1}^{k-1} \vartheta_h \Delta \log PED_{t-h} + \sum_{i=1}^{k-1} \beta_i \Delta \log IFL_{t-i} + \sum_{j=1}^{k-1} \delta_j \Delta \log EXR_{t-j} + \\ &\sum_{r=1}^{k-1} \omega_r \Delta \log DD_{t-r} + \sum_{l=1}^{k-1} \theta_l \Delta \log DR_{t-l} + \sum_{m=1}^{k-1} \xi_m \Delta \log RM_{t-m} + \\ &\sum_{o=1}^{k-1} \phi_o \Delta \log M3_{t-o} + \lambda_1 ECT_{t-1} + u_{1t} \dots \dots \dots (4)\end{aligned}$$

$$\begin{aligned}\Delta \log IFL_t &= \varpi + \sum_{h=1}^{k-1} \vartheta_h \Delta \log PED_{t-h} + \sum_{i=1}^{k-1} \beta_i \Delta \log IFL_{t-i} + \sum_{j=1}^{k-1} \delta_j \Delta \log EXR_{t-j} + \\ &\sum_{r=1}^{k-1} \omega_r \Delta \log DD_{t-r} + \sum_{l=1}^{k-1} \theta_l \Delta \log DR_{t-l} + \sum_{m=1}^{k-1} \xi_m \Delta \log RM_{t-m} + \\ &\sum_{o=1}^{k-1} \phi_o \Delta \log M3_{t-o} + \lambda_2 ECT_{t-1} + u_{2t} \dots \dots \dots (5)\end{aligned}$$

$$\begin{aligned}\Delta \log EXR_t &= \rho + \sum_{h=1}^{k-1} \vartheta_h \Delta \log PED_{t-h} + \sum_{i=1}^{k-1} \beta_i \Delta \log IFL_{t-i} + \sum_{j=1}^{k-1} \delta_j \Delta \log EXR_{t-j} + \\ &\sum_{r=1}^{k-1} \omega_r \Delta \log DD_{t-r} + \sum_{l=1}^{k-1} \theta_l \Delta \log DR_{t-l} + \sum_{m=1}^{k-1} \xi_m \Delta \log RM_{t-m} + \\ &\sum_{o=1}^{k-1} \phi_o \Delta \log M3_{t-o} + \lambda_3 ECT_{t-1} + u_{3t} \dots \dots \dots (6)\end{aligned}$$

$$\begin{aligned}\Delta \log DD_t &= \rho + \sum_{h=1}^{k-1} \vartheta_h \Delta \log PED_{t-h} + \sum_{i=1}^{k-1} \beta_i \Delta \log IFL_{t-i} + \sum_{j=1}^{k-1} \delta_j \Delta \log EXR_{t-j} + \\ &\sum_{r=1}^{k-1} \omega_r \Delta \log DD_{t-r} + \sum_{l=1}^{k-1} \theta_l \Delta \log DR_{t-l} + \sum_{m=1}^{k-1} \xi_m \Delta \log RM_{t-m} + \\ &\sum_{o=1}^{k-1} \phi_o \Delta \log M3_{t-o} + \lambda_3 ECT_{t-1} + u_{4t} \dots \dots \dots (7)\end{aligned}$$

$$\begin{aligned}\Delta \log DR_t &= \sigma + \sum_{h=1}^{k-1} \vartheta_h \Delta \log PED_{t-h} + \sum_{i=1}^{k-1} \beta_i \Delta \log IFL_{t-i} + \sum_{j=1}^{k-1} \delta_j \Delta \log EXR_{t-j} + \\ &\sum_{r=1}^{k-1} \omega_r \Delta \log DD_{t-r} + \sum_{l=1}^{k-1} \theta_l \Delta \log DR_{t-l} + \sum_{m=1}^{k-1} \xi_m \Delta \log RM_{t-m} + \\ &\sum_{o=1}^{k-1} \delta_o \Delta \log M3_{t-o} + \lambda_{14} ECT_{t-1} + u_{5t} \dots \dots \dots (8)\end{aligned}$$

$$\begin{aligned}\Delta \log RM_t = & \varsigma + \sum_{h=1}^{k-1} \vartheta_h \Delta \log PED_{t-h} + \sum_{i=1}^{k-1} \beta_i \Delta \log IFL_{t-i} + \sum_{j=1}^{k-1} \delta_j \Delta \log EXR_{t-j} + \\ & \sum_{r=1}^{k-1} \omega_r \Delta \log DD_{t-r} + \sum_{l=1}^{k-1} \theta_l \Delta \log DR_{t-l} + \sum_{m=1}^{k-1} \xi_m \Delta \log RM_{t-m} + \\ & \sum_{o=1}^{k-1} \phi_o \Delta \log M3_{t-o} + \lambda_5 ECT_{t-1} + u_{6t} \dots \dots \dots (9)\end{aligned}$$

$$\begin{aligned}\Delta \log M3_t = & \tau + \sum_{h=1}^{k-1} \vartheta_h \Delta \log PED_{t-h} + \sum_{i=1}^{k-1} \beta_i \Delta \log IFL_{t-i} + \sum_{j=1}^{k-1} \delta_j \Delta \log EXR_{t-j} + \\ & \sum_{r=1}^{k-1} \omega_r \Delta \log DD_{t-r} + \sum_{l=1}^{k-1} \theta_l \Delta \log DR_{t-l} + \sum_{m=1}^{k-1} \xi_m \Delta \log RM_{t-m} + \\ & \sum_{o=1}^{k-1} \phi_o \Delta \log M3_{t-o} + \lambda_6 ECT_{t-1} + u_{7t} \dots \dots \dots (10)\end{aligned}$$

Where

$\log IFL$ = logarithm of Inflation

$\log EXR$ = logarithm of Exchange rate

$\log DR$ = Logarithm of Discount rate

$\log RM$ = Logarithm of Reserve Money

$\log M3$ = Logarithm of Extended Broad Money

$\log DD$ = Logarithm of Domestic Debt

t = Time dimension

u = impulses or innovations or shocks

$k-1$ is the lag length reduced by one

$\vartheta, \delta, \beta, \theta, \xi, \phi$ are the short-run dynamics coefficients of the model's adjustment long-run equilibrium

u is the residuals

λ is the speed of adjustment parameter with a negative sign

ECT_{t-1} is the error correction term (it is the lagged value of the residuals obtained from cointegration regression of the dependent variables on the regressor. Contain long-run information derived from the long-run cointegrating relationship)

3.4.4 Granger Causality Test

Although regression deals with the dependence of one variable on other variables, it does not necessarily prove or imply causation (Gujarati, 2004). To nurture causality between variables granger causality test has to be done. This test was developed by Toda and Yamamoto (1995) and it is widely used to examine the direction of causality between two series. This approach goes beyond the conventional F-test because recent studies have shown that the F-test for determining the joint significance of regression-derived parameters, used as a test of causality, is not valid if variables are non-stationary and the test statistic does not have a standard distribution (Gujarati, 1995).

The granger causality test was implemented by estimating the following bivariate system expressed in the following equation

$$Y_t = \alpha_0 + \sum_{t=1}^{k+d} \alpha_{11} Y_{t-1} + \sum_{t=1}^{k+d} \alpha_{12} X_{t-1} + \mu_{1t} \dots \dots \dots (11)$$

$$X_t = \alpha_0 + \sum_{t=1}^{k+d} \alpha_{21} X_{t-1} + \sum_{t=1}^{k+d} \alpha_{22} Y_{t-1} + \mu_{2t} \dots \dots \dots (12)$$

If $\alpha_{12} \neq 0$ and $\alpha_{22} = 0$ granger causality runs from X to Y. Conversely, if $\alpha_{12} = 0$ and $\alpha_{22} \neq 0$ granger causality runs from Y to X. Bilateral granger causality is suggested when sets

of X and Y coefficients are statistically significantly different from zero in both regressions.

Finally, the granger independence is suggested when sets of estimated X and Y coefficients are not statistically significant in both regressions (Gujarati, 2004).

3.4.4 Validity and Reliability

Lagrange Multiplier (LM) test was used to determine the presence of autocorrelation instead of Durbin Watson (DW) test, this is because DW is biased towards accepting null hypothesis of no autocorrelation when regressors include lagged dependent variable LM test takes this form:

$$LM = \sum_{t=1}^K X\beta_t + \sum_{i=1}^{\rho} \varepsilon_{t-t\rho} + n_t \dots \dots \dots (13)$$

In establishing whether residuals are normally distributed, Jarque – Bera (JB) test was used. The absence of non-normality problems implies that no structural breaks are originating from the exogenous shocks such as wars, terrorism, financial crises, etc (Green, 1995). Following Gujarati (2004), the JB test takes the following form:

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

Where;

n = the sample size

S = skewness coefficient

k = kurtosis coefficient

CHAPTER FOUR

4.0 RESULTS, DISCUSSION AND RECOMMENDATIONS

4.1. Estimation Results

This section discusses the results of Private External Debt and the causative effects, that is from Private External debt to Inflation, Exchange rates, Reserve Ratio, M3, and Discount rates. The results are presented in steps; unit root test, co-integration test, error correction model, and granger causality test.

4.2. Unit Root

By using the Augmented Dickey-Fuller test all variables which were used in this analysis showed the problem of a unit root. They were differenced and the variables became stationary from one per cent critical value

4.3. Co-Integration Analysis

The Co-integration test is very sensitive to the lag length. Before running the co-integration test the test for establishing was done. Akaike Information Criteria (AIC) was used to determine the optimal lag which picked up four lags that were used in the analysis

4.4. Vector Error Correction Model (VECM)

The Error Correction Model (VECM) was run to capture the short run and the long-run relationship of the variables that is Private External Debt, Discount Rate, Exchange Rate, Inflation Rate, Reserve Money, M3, and Domestic Debt

4.4.1. Short Run Relations

Recalling that the results are log-log regression the results become easy to interpret and discuss. Under *ceteris paribus*, in the Short-Run, Private External Debt is affected positively by Exchange rates, Domestic Debt the unit change in Private External Debt affects Exchange rate and domestic debt by 2.12% and 0.45% respectively. A unit change in Private External debt affects negatively the Inflation rate by 0.25%, Reserve money by 0.69% and M3 by 1.57%. The discount rates are statistically insignificant which means it is not affected by the private external debt. One Percent Change in Inflation causes negative change to Exchange rate by 1.26%

Other factors remain constant Discount Rates affects positively Reserve Money. One percent change in Discount rate affects Reserve money by 0.55%. The discount rate has shown to be having a negative relation with M3 in which 1% change in Discount rates the M3 will change by 1.36%

Exchange rates affect negatively the Private External Debt and M3. One percent change in Exchange rates decreases Private External Debt and M3 by 0.05% and 0.36%

respectively. Discount rates, Domestic Debt, Inflation rates and Reserve money are not statistically significantly changed by the exchange rates. Domestic Debt affects positively Reserve money and negatively M3. An Increase in Domestic Debt reduces money supply and increase reserve money

A change in reserve money causes a change in Inflation by 0.08% and M3 by 0.6% negatively. Other variables which have been used in the analysis are having no statistical significance. M3 is proved to have significant relation with the Exchange rate, a one percent change in M3 causes a change of 0.29% of the Exchange rate negatively

4.4.2. Long-run relations

In the long run, Private External Debt affects positively Exchange rates, Domestic Debt, and M3 under *ceteris paribus*. It affects Reserve Money negatively. One percent change in Private external debt changes positively exchanges rates by 1.11%, domestic debt by 1.03% and M3 by 1.99%. One percent change in Private external Debt changes negatively reserve money by 3.21%.

This does mean that the increase in the Private External Debt increases the money supply, exchange rates and Domestic debt. The effects are relatively higher in M3 than in exchange rates and domestic debt. The increase is higher in M3 because the private debt is the inflows that add up to the money in circulation, and they give more room for the government to issue loans domestically thus there is an increase in Domestic debt

Table 4.3: Long-Run Johansen Normalization Restriction

Johansen normalization restriction imposed						
beta	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
_cel						
logPED	1	.	.	.	.	.
logIFL	.1950188	.113014	1.73	0.084	-.0264846	.4165222
logEXR	.1110212	.684699	0.16	0.871	-1.230964	1.453007
logDR	-1.218133	.2145453	-5.68	0.000	-1.638634	-.7976315
logRM	12.90294	1.814476	7.11	0.000	9.346629	16.45925
logM3	-11.41498	1.594495	-7.16	0.000	-14.54013	-8.289826
_cons	-20.29056	.	.	.	.	.

4.5. Granger Causality test

Granger Causality shows the direction of causality which can give room to discuss the effects after knowing the direction. The granger Causality has shown that Inflation rates, Exchange Rate, Domestic Debt, and M3 Granger cause Private External Debt. Reserve Ratio and M3 Granger cause Discount Rates. Private External Debt and M3 Granger cause Exchange Rate. Private External Debt Grange causes Domestic Debt. Discount Rate and M3 Granger cause Reserve Money. Discount Rate and Exchange Rates Granger cause M3

There exists bi-causality between Private External Debt with Exchange Rates and Domestic Debt, another bi-causality is between Discount rates versus Reserve money and M3 the last one is M3 with Exchange rates. Taking Private External Debt and Exchange rates the bi-causality means the change in private external debt Granger causes the change in Exchange rates and also the change in Exchange rates Granger causes the change in Private external debt

4.6. Diagnostics tests

Diagnostics and tests have shown that there was no autocorrelation at the selected lag order, this was by using the Lagrange-Multiplier test. And Jarque Bera test showed that the data were normally distributed and the test for stability showed that all the eigenvalues lie inside the unit circle and thus Stability was there

4.7. Discussion of the Findings

The above findings show that Private External Debt affects Exchange rates in the short run. This means the macroeconomic shocks are imported through exchange rates in the short run. There is two-way causality between Private External Debt and the Exchange rates, but the unit change in Exchange rates causes a greater change in Private External Debt than the private external debt does to exchange rates

Either way, the effects from Private External Debt to Exchange rates are transmitted to inflation rates and M3 as the findings have shown that Exchange rates significantly affect Inflation Rates and M3 positively. From Inflation Rates the effects are transmitted to Reserve Money and Private External Debt again positively, Reserve Money affects Discount rates Negatively, Private External debt positively and Domestic Debt positively. An increase in Domestic debt decreases private external debt and exchange rate which then creates a vicious circle.

In the long run, Private External Debt is affected Positively by Exchange rates, Domestic Debt, and M3. While Reserve Money affects Private External Debt Negatively. On the other hand, Private External Debt has been shown to have a positive relation to Exchange rates, Discount Rates, Domestic Debt, and M3. It has a negative relation to Inflation and reserve money

That being the case, Granger causality shows the direction in which effects are transmitted. Private External debt granger causes Exchange Rates and Domestic debt in which the long-run relation has shown to positive, that is the increase in Private External Debt increases the Amount left for the Government to get from the public that is Domestic Debt while the value of money goes down as the exchange rates increases. Inflation Rates, Exchange Rates and Domestic Debt Granger causes Private External Debt. This proves the bi-causality between Private External Debt and Exchange rates, Private External Debt and Domestic Debt

On the other hand, the Private External Debt has proved to affect the Monetary Policy as it affects in the short-run and long-run the variables which are used as tools by the Bank of Tanzania in achieving the economic goals. The Private External Debt has been proved to granger cause Exchange rates though exchange rates do cause the Private External Debt. The Private external Debt affects the Exchange rate less than the exchange rate affects the private external debt in the short run while in the long run, the causation disappears

Private External Debt in the short run affects Exchange rates. Exchange rates affect Inflation and M3. Inflation affects Discount Rates and Private External Debt. In this causality, it can be seen that the Private External debt in some ways affects the Monetary Policy by affecting the variables which are used by the central banks in regulating the economy

In the long run, as well the analysis then shows that there exist the effects which are from Private External Debt to the Monetary Policy as the Private External debt affects inflation and Exchange rates which then spreads the effects to other variables which are used in Monetary Policy, as some recent studies have shown that the External Debt imports shock from other countries this study which has expounded the Private External Debt agrees with the studies which have shown the importation of international shocks, the studies of (Ghosh 2016); (Cerutti, Hale, et al. 2014); (Mbowe, Masenya, et al. 2019) and (Kombe, 2015)

The effects of Private External Debt are in series, and the magnitude lowers as it spreads, such that the Private External Debt causes the changes in Exchange rates while exchange rates affect Inflation and Reserve money, the reserve money affects Discount Rates and M3 in the meantime the Monetary Policy also manages the money supply especially the extended broad money supply(M3) which is also affected directly by the Private External Debt and thus affecting the monetary policy

4.8 Conclusion

From the results, Private External Debt affects the efficiency of monetary policy as it affects the variables which are used in regulating the economy, that is Exchange rates which transmit the effects to other variables up to the M3. Inflation rates, Reserve Money, and Discount rates have significant effects on Private External Debt as they are all positively related to Private External Debt.

The study agrees on the studies of the studies which have shown the importation of international shocks, the studies of (Ghosh 2016); (Cerutti, Hale, et al. 2014); (Mbowe, Masenya, et al. 2019) and (Kombe, 2015). With all the positive benefits of cross border lending, including economic growth by expanding the domestic firms, there is a need to limit the long-run effects which can make the country lose the power to regulate the economy

The BoT needs the ability to command the economic variables that is the freedom to command as Amartya Sen (2014) has been insisting in his concepts of development as freedom. Thus, the external effects which affect the efficiency of the monetary policy limit the ability to command and thus take away the freedom of BoT. As the Central Bank which is the Bank of Tanzania in this context has to be free in commanding the variables to achieve the objective and goals of the Monetary Policy. The imported shocks which come from Private External Debt and External Debt as other studies have shown minimize the ability of the Bank of Tanzania to command the variables to regulate the economy

4.9. Recommendations

From the results of this study, it is recommended that the central bank should consider exchange rate for being used as an operational target in addition to reserve money which is recently used to minimize the shocks which are imported from Private External Debt through Exchange rates

The Private External Debt has been shown to affect the M3 more than Reserve money and discount rate, the Bank of Tanzania should monitor the effects to keep the efficiency of the monetary policy

The shocks which are imported so far do not exceed one percent but the amalgamation of all global commodity prices can have a catastrophic effect on the monetary policy, this study rings the alarm for the Bank of Tanzania to play part monetarily in maintaining power over M3 and domestic financial market

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APPENDIX – I

Stata Results

Johansen tests for cointegration

```
Trend: constant                                Number of obs =    128
Sample: 2010m5 - 2020m12                      Lags =           4
```

					5%
maximum				trace	critical
rank	parms	LL	eigenvalue	statistic	value
0	154	1828.2695	.	206.6159	124.24
1	167	1865.6406	0.44229	131.8736	94.15
2	178	1891.329	0.33060	80.4969	68.52
3	187	1906.4627	0.21059	50.2295	47.21
4	194	1916.5088	0.14527	30.1372	29.68
5	199	1925.9188	0.13673	11.3173*	15.41
6	202	1931.4151	0.08230	0.3245	3.76
7	203	1931.5774	0.00253		

Vector error-correction model

Sample: 2010m5 - 2020m12	No. of obs	=	128
	AIC	=	-26.54126
Log likelihood = 1865.641	HQIC	=	-25.0294
Det(Sigma_ml) = 5.16e-22	SBIC	=	-22.82025

Equation	Parms	RMSE	R-sq	chi2	P>chi2
D_logPED	23	.070572	0.4817	97.57285	0.0000
D_logIFL	23	.080163	0.2828	41.40288	0.0106
D_logDR	23	.06471	0.1708	21.62401	0.5430
D_logEXR	23	.012151	0.3778	63.75017	0.0000
D_logDD	23	.030692	0.2830	41.44441	0.0105
D_logRM	23	.037542	0.3062	46.34141	0.0027
D_logM3	23	.014581	0.4609	89.76698	0.0000

Cointegrating equations

Equation	Parms	chi2	P>chi2
_cel	6	1659.076	0.0000

Identification: beta is exactly identified

Johansen normalization restriction imposed

beta	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
_cel						
logPED	1	.	.	.	.	.
logIFL	.0002437	.0340007	0.01	0.994	-.0663964	.0668838
logDR	-.1047567	.059267	-1.77	0.077	-.2209178	.0114044
logEXR	-1.107857	.2275269	-4.87	0.000	-1.553802	-.6619128
logDD	-1.034687	.1483639	-6.97	0.000	-1.325475	-.7438994
logRM	3.210394	.5022875	6.39	0.000	2.225929	4.19486
logM3	-1.986624	.5033183	-3.95	0.000	-2.97311	-1.000138
_cons	-7.813638	.	.	.	.	.

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
D_logPED						
_cel						
L1.	-.4567844	.0815301	-5.60	0.000	-.6165805	-.2969883
logPED						
LD.	-.0025562	.101351	-0.03	0.980	-.2012006	.1960882
L2D.	.0495755	.0907943	0.55	0.585	-.1283781	.2275291
L3D.	.1549065	.075818	2.04	0.041	.006306	.3035071
logIFL						
LD.	-.0695816	.0890601	-0.78	0.435	-.2441363	.104973
L2D.	.2542846	.0929466	2.74	0.006	.0721127	.4364566
L3D.	-.0880396	.0919716	-0.96	0.338	-.2683005	.0922214
logDR						
LD.	-.0579758	.1062502	-0.55	0.585	-.2662224	.1502708
L2D.	-.0405647	.1052488	-0.39	0.700	-.2468485	.1657191
L3D.	-.0624748	.1021059	-0.61	0.541	-.2625986	.1376491
logEXR						
LD.	-.3915187	.6184676	-0.63	0.527	-1.603693	.8206555
L2D.	-1.429853	.6157134	-2.32	0.020	-2.636629	-.2230771
L3D.	-2.11814	.5501721	-3.85	0.000	-3.196457	-1.039822
logDD						
LD.	-.254377	.221118	-1.15	0.250	-.6877602	.1790062
L2D.	-.131611	.2243554	-0.59	0.557	-.5713395	.3081176
L3D.	-.4539587	.2253749	-2.01	0.044	-.8956854	-.0122319
logRM						
LD.	1.0259	.2847246	3.60	0.000	.4678496	1.583949
L2D.	.6904186	.2567099	2.69	0.007	.1872764	1.193561
L3D.	.4733374	.2227089	2.13	0.034	.036836	.9098388
logM3						
LD.	.1675288	.6051818	0.28	0.782	-1.018606	1.353663
L2D.	-.2368423	.6226197	-0.38	0.704	-1.457154	.9834699
L3D.	1.57532	.5885587	2.68	0.007	.4217657	2.728873
_cons	.0016733	.0109189	0.15	0.878	-.0197273	.023074

D_logIFL						
_cel						
L1.	.0151039	.0926104	0.16	0.870	-.1664091	.1966169
logPED						
LD.	.1245163	.115125	1.08	0.279	-.1011246	.3501572
L2D.	-.0523153	.1031336	-0.51	0.612	-.2544535	.1498228
L3D.	-.0808371	.0861219	-0.94	0.348	-.249633	.0879588
logIFL						
LD.	.350634	.1011637	3.47	0.001	.1523568	.5489113
L2D.	.0634316	.1055784	0.60	0.548	-.1434982	.2703614
L3D.	.1312183	.1044708	1.26	0.209	-.0735408	.3359773
logDR						
LD.	.0045242	.12069	0.04	0.970	-.2320239	.2410723
L2D.	.0046399	.1195525	0.04	0.969	-.2296786	.2389584
L3D.	.1596077	.1159825	1.38	0.169	-.0677137	.3869292
logEXR						
LD.	-.5153393	.7025196	-0.73	0.463	-1.892252	.8615738
L2D.	.6720048	.6993911	0.96	0.337	-.6987765	2.042786
L3D.	1.26764	.6249425	2.03	0.043	.0427751	2.492505
logDD						
LD.	.2114232	.2511687	0.84	0.400	-.2808584	.7037049
L2D.	.1414918	.2548461	0.56	0.579	-.3579975	.640981
L3D.	-.0972915	.2560042	-0.38	0.704	-.5990505	.4044676
logRM						
LD.	-.2271526	.3234197	-0.70	0.482	-.8610435	.4067384
L2D.	-.1521872	.2915977	-0.52	0.602	-.7237082	.4193338
L3D.	-.2632383	.2529758	-1.04	0.298	-.7590619	.2325852
logM3						
LD.	.1715319	.6874282	0.25	0.803	-1.175803	1.518866
L2D.	-.5046166	.707236	-0.71	0.476	-1.890774	.8815405
L3D.	-.0176242	.668546	-0.03	0.979	-1.32795	1.292702
_cons	-.0040504	.0124028	-0.33	0.744	-.0283595	.0202587

D_logDR							
_cel							
L1.	.1403799	.0747578	1.88	0.060	-.0061428	.2869026	
logPED							
LD.	-.1337266	.0929323	-1.44	0.150	-.3158706	.0484175	
L2D.	-.0895796	.0832525	-1.08	0.282	-.2527516	.0735923	
L3D.	-.0669813	.0695202	-0.96	0.335	-.2032383	.0692758	
logIFL							
LD.	.0069872	.0816624	0.09	0.932	-.1530681	.1670425	
L2D.	.1187391	.085226	1.39	0.164	-.0483007	.285779	
L3D.	-.0346272	.0843319	-0.41	0.681	-.1999148	.1306604	
logDR							
LD.	.0942126	.0974246	0.97	0.334	-.0967361	.2851612	
L2D.	.0357517	.0965063	0.37	0.711	-.1533971	.2249006	
L3D.	-.0088832	.0936245	-0.09	0.924	-.1923838	.1746174	
logEXR							
LD.	.2985745	.5670946	0.53	0.599	-.8129105	1.41006	
L2D.	.4296418	.5645692	0.76	0.447	-.6768935	1.536177	
L3D.	.034242	.5044721	0.07	0.946	-.9545051	1.022989	
logDD							
LD.	.1783698	.2027508	0.88	0.379	-.2190145	.5757541	
L2D.	-.2993894	.2057194	-1.46	0.146	-.7025919	.1038131	
L3D.	.2347499	.2066542	1.14	0.256	-.1702849	.6397847	
logRM							
LD.	-.552126	.261074	-2.11	0.034	-1.063822	-.0404304	
L2D.	-.1347777	.2353863	-0.57	0.567	-.5961264	.3265711	
L3D.	-.1779309	.2042096	-0.87	0.384	-.5781744	.2223125	
logM3							
LD.	1.359525	.5549124	2.45	0.014	.271917	2.447134	
L2D.	-.0451333	.5709019	-0.08	0.937	-1.16408	1.073814	
L3D.	-.3831105	.5396701	-0.71	0.478	-1.440844	.6746236	
_cons	-.0037877	.0100119	-0.38	0.705	-.0234107	.0158353	

D_logEXR						
_cel						
L1.	-.0442786	.0140376	-3.15	0.002	-.0717917	-.0167655
logPED						
LD.	.05743	.0174503	3.29	0.001	.0232281	.0916319
L2D.	.0187326	.0156326	1.20	0.231	-.0119068	.049372
L3D.	.024774	.0130541	1.90	0.058	-.0008115	.0503595
logIFL						
LD.	-.0076736	.0153341	-0.50	0.617	-.0377278	.0223806
L2D.	.0249175	.0160032	1.56	0.119	-.0064482	.0562832
L3D.	-.0054438	.0158353	-0.34	0.731	-.0364805	.0255929
logDR						
LD.	-.0223568	.0182938	-1.22	0.222	-.058212	.0134983
L2D.	-.0053828	.0181213	-0.30	0.766	-.0409	.0301343
L3D.	.0250849	.0175802	1.43	0.154	-.0093717	.0595415
logEXR						
LD.	-.1145729	.1064855	-1.08	0.282	-.3232807	.0941348
L2D.	.0714096	.1060113	0.67	0.501	-.1363687	.2791879
L3D.	-.052128	.0947266	-0.55	0.582	-.2377888	.1335328
logDD						
LD.	-.0921775	.0380713	-2.42	0.015	-.1667959	-.0175592
L2D.	.0041868	.0386287	0.11	0.914	-.0715241	.0798976
L3D.	-.0398493	.0388042	-1.03	0.304	-.1159042	.0362056
logRM						
LD.	.036877	.0490228	0.75	0.452	-.059206	.13296
L2D.	.0577998	.0441994	1.31	0.191	-.0288294	.144429
L3D.	.0320084	.0383452	0.83	0.404	-.0431468	.1071637
logM3						
LD.	.3601924	.104198	3.46	0.001	.1559681	.5644167
L2D.	.0510267	.1072004	0.48	0.634	-.1590823	.2611356
L3D.	.0765407	.1013359	0.76	0.450	-.122074	.2751554
_cons	-.0012744	.00188	-0.68	0.498	-.0049591	.0024103

D_logDD							
_cel							
L1.	.1027924	.0354574	2.90	0.004	.0332971	.1722877	
logPED							
LD.	-.0327932	.0440775	-0.74	0.457	-.1191836	.0535971	
L2D.	.0138022	.0394864	0.35	0.727	-.0635898	.0911942	
L3D.	-.003355	.0329732	-0.10	0.919	-.0679813	.0612714	
logIFL							
LD.	-.0032771	.0387322	-0.08	0.933	-.0791909	.0726367	
L2D.	-.0375831	.0404224	-0.93	0.352	-.1168096	.0416434	
L3D.	-.0289585	.0399984	-0.72	0.469	-.1073539	.049437	
logDR							
LD.	-.0277482	.0462082	-0.60	0.548	-.1183146	.0628182	
L2D.	-.0346813	.0457727	-0.76	0.449	-.1243941	.0550314	
L3D.	.0024067	.0444058	0.05	0.957	-.0846271	.0894405	
logEXR							
LD.	.0503011	.2689714	0.19	0.852	-.4768731	.5774753	
L2D.	-.2619813	.2677736	-0.98	0.328	-.7868078	.2628452	
L3D.	-.1722278	.2392697	-0.72	0.472	-.6411878	.2967322	
logDD							
LD.	-.0009096	.0961641	-0.01	0.992	-.1893879	.1875686	
L2D.	-.0941637	.0975721	-0.97	0.335	-.2854015	.0970741	
L3D.	-.0378942	.0980155	-0.39	0.699	-.2300011	.1542126	
logRM							
LD.	-.3028579	.1238266	-2.45	0.014	-.5455537	-.0601622	
L2D.	-.211933	.1116431	-1.90	0.058	-.4307494	.0068833	
L3D.	-.2686903	.096856	-2.77	0.006	-.4585246	-.078856	
logM3							
LD.	.0468378	.2631934	0.18	0.859	-.4690117	.5626873	
L2D.	.3694702	.2707771	1.36	0.172	-.1612432	.9001836	
L3D.	.5648156	.255964	2.21	0.027	.0631354	1.066496	
_cons	.0101099	.0047486	2.13	0.033	.0008028	.0194171	

D_logRM						
_cel						
L1.	-.1017703	.0433721	-2.35	0.019	-.1867781	-.0167624
logPED						
LD.	.0219111	.0539164	0.41	0.684	-.0837631	.1275853
L2D.	.0186352	.0483005	0.39	0.700	-.0760319	.1133024
L3D.	-.0124067	.0403334	-0.31	0.758	-.0914587	.0666454
logIFL						
LD.	-.0359691	.0473779	-0.76	0.448	-.1288281	.05689
L2D.	.0064229	.0494454	0.13	0.897	-.0904883	.1033342
L3D.	.0830017	.0489267	1.70	0.090	-.0128929	.1788963
logDR						
LD.	-.0622929	.0565226	-1.10	0.270	-.1730753	.0484894
L2D.	.0469892	.0559899	0.84	0.401	-.062749	.1567274
L3D.	-.0549716	.054318	-1.01	0.312	-.1614329	.0514896
logEXR						
LD.	.1297989	.3290103	0.39	0.693	-.5150495	.7746474
L2D.	-.1774342	.3275452	-0.54	0.588	-.8194109	.4645426
L3D.	.3667811	.2926788	1.25	0.210	-.2068587	.9404209
logDD						
LD.	.0096593	.1176296	0.08	0.935	-.2208905	.2402091
L2D.	.0193977	.1193519	0.16	0.871	-.2145277	.253323
L3D.	-.0861298	.1198942	-0.72	0.473	-.3211181	.1488586
logRM						
LD.	-.045267	.1514669	-0.30	0.765	-.3421366	.2516025
L2D.	-.1639566	.1365637	-1.20	0.230	-.4316166	.1037033
L3D.	-.287324	.1184759	-2.43	0.015	-.5195326	-.0551154
logM3						
LD.	.0494923	.3219426	0.15	0.878	-.5815036	.6804883
L2D.	.6181813	.3312192	1.87	0.062	-.0309964	1.267359
L3D.	.3783564	.3130995	1.21	0.227	-.2353074	.9920202
_cons	-.0020042	.0058086	-0.35	0.730	-.0133888	.0093805

D_logM3						
_cel						
L1.	.0074853	.0168451	0.44	0.657	-.0255304	.040501
logPED						
LD.	.0176633	.0209403	0.84	0.399	-.0233789	.0587055
L2D.	-.0074344	.0187591	-0.40	0.692	-.0442017	.0293328
L3D.	-.0194397	.0156649	-1.24	0.215	-.0501423	.0112629
logIFL						
LD.	-.0063591	.0184008	-0.35	0.730	-.0424241	.0297058
L2D.	.0168929	.0192038	0.88	0.379	-.0207458	.0545317
L3D.	.0019742	.0190024	0.10	0.917	-.0352698	.0392182
logDR						
LD.	-.0420894	.0219525	-1.92	0.055	-.0851155	.0009367
L2D.	-.0013333	.0217456	-0.06	0.951	-.0439538	.0412873
L3D.	-.0337433	.0210962	-1.60	0.110	-.0750912	.0076045
logEXR						
LD.	-.1290106	.1277824	-1.01	0.313	-.3794595	.1214383
L2D.	.2784149	.1272134	2.19	0.029	.0290813	.5277485
L3D.	.2874149	.1136718	2.53	0.011	.0646223	.5102075
logDD						
LD.	.0521318	.0456855	1.14	0.254	-.0374101	.1416737
L2D.	.0069406	.0463544	0.15	0.881	-.0839123	.0977935
L3D.	-.0506204	.046565	-1.09	0.277	-.1418862	.0406454
logRM						
LD.	.0185203	.0588273	0.31	0.753	-.0967792	.1338197
L2D.	-.0235346	.0530392	-0.44	0.657	-.1274895	.0804203
L3D.	-.0443915	.0460142	-0.96	0.335	-.1345777	.0457946
logM3						
LD.	-.0821935	.1250374	-0.66	0.511	-.3272624	.1628753
L2D.	.1740319	.1286403	1.35	0.176	-.0780984	.4261623
L3D.	-.116009	.1216029	-0.95	0.340	-.3543463	.1223283
_cons	.0076975	.002256	3.41	0.001	.0032759	.0121191

Granger causality Wald tests

Equation	Excluded	chi2	df	Prob > chi2
logPED	logIFL	11.211	4	0.024
logPED	logDR	7.7695	4	0.100
logPED	logEXR	58.089	4	0.000
logPED	logDD	19.21	4	0.001
logPED	logRM	5.3959	4	0.249
logPED	logM3	10.096	4	0.039
logPED	ALL	116.09	24	0.000
logIFL	logPED	8.1029	4	0.088
logIFL	logDR	7.0574	4	0.133
logIFL	logEXR	9.1526	4	0.057
logIFL	logDD	7.7039	4	0.103
logIFL	logRM	2.0344	4	0.729
logIFL	logM3	4.4629	4	0.347
logIFL	ALL	38.8	24	0.029
logDR	logPED	1.2271	4	0.874
logDR	logIFL	7.2353	4	0.124
logDR	logEXR	.4349	4	0.980
logDR	logDD	5.3905	4	0.250
logDR	logRM	16.753	4	0.002
logDR	logM3	14.4	4	0.006
logDR	ALL	46.781	24	0.004
logEXR	logPED	13.627	4	0.009
logEXR	logIFL	9.0086	4	0.061
logEXR	logDR	6.9452	4	0.139
logEXR	logDD	5.2566	4	0.262
logEXR	logRM	8.6427	4	0.071
logEXR	logM3	21.804	4	0.000
logEXR	ALL	63.858	24	0.000
logDD	logPED	13.56	4	0.009
logDD	logIFL	9.0853	4	0.059
logDD	logDR	4.2019	4	0.379
logDD	logEXR	6.9659	4	0.138
logDD	logRM	9.3362	4	0.053
logDD	logM3	6.9693	4	0.138
logDD	ALL	51.139	24	0.001
logRM	logPED	2.1902	4	0.701
logRM	logIFL	3.051	4	0.549
logRM	logDR	21.364	4	0.000
logRM	logEXR	6.3205	4	0.176
logRM	logDD	2.7218	4	0.605
logRM	logM3	19.619	4	0.001
logRM	ALL	58.181	24	0.000
logM3	logPED	4.6448	4	0.326
logM3	logIFL	3.6911	4	0.449
logM3	logDR	21.339	4	0.000
logM3	logEXR	19.685	4	0.001
logM3	logDD	4.2572	4	0.372
logM3	logRM	3.9344	4	0.415
logM3	ALL	69.964	24	0.000

APPENDIX – II

Data Used

Date	Inflation	Private Debt	Discount rate	Exchange Rate	Domestic Debt	Reserve Money	M3
Jan-10	10.90%	1014.4	7.58%	1,323.6	1,903.5	3,017,457	8,931,437
Feb-10	9.60%	1510.9	7.58%	1,326.0	1,905.7	3,129,440	9,010,488
Mar-10	9.00%	979.17	7.58%	1,330.2	1,938.1	3,120,330	9,075,096
Apr-10	9.40%	973.7	7.58%	1,343.5	1,921.4	3,072,312	9,359,922
May-10	7.90%	1447.3	7.58%	1,376.0	1,919.1	3,030,861	9,284,484
Jun-10	7.20%	1521.8	7.58%	1,379.4	2,009.5	3,369,593	9,798,081
Jul-10	6.30%	1760.5	7.58%	1,382.3	2,064.4	3,455,297	10,233,334
Aug-10	6.60%	1638.3	7.58%	1,470.6	2,071.2	3,427,146	10,511,409
Sep-10	4.50%	1749.6	7.58%	1,483.8	2,277.5	3,433,324	10,348,718
Oct-10	4.19%	1784.7	7.58%	1,482.0	2,276.6	3,480,122	10,691,154
Nov-10	5.52%	1242.7	7.58%	1,470.5	2,288.3	3,526,427	10,910,407
Dec-10	5.56%	1246.1	7.58%	1,453.5	2,309.9	3,497,850	11,012,664
Jan-11	6.42%	1844.3	7.58%	1,483.3	2,261.6	3,591,099	11,203,232
Feb-11	7.49%	1760.9	7.58%	1,500.5	2,244.6	3,644,122	11,183,151
Mar-11	8.03%	1796.4	7.58%	1,490.8	2,303.3	3,554,159	11,234,052
Apr-11	8.58%	1829.4	7.58%	1,497.1	2,292.8	3,637,591	11,433,853
May-11	9.74%	1831.6	7.58%	1,518.3	2,307.0	3,637,266	11,610,376
Jun-11	10.90%	1925.2	7.58%	1,572.1	2,364.1	3,785,468	11,957,941
Jul-11	13.00%	1873	7.58%	1,569.7	2,381.0	3,903,575	12,111,605
Aug-11	14.10%	1905.8	7.58%	1,604.8	2,460.5	4,054,870	12,759,599
Sep-11	16.80%	1981.2	7.58%	1,631.2	2,448.1	4,239,423	12,800,865
Oct-11	17.90%	1955.3	9.58%	1,646.4	2,482.1	4,200,960	13,438,230
Nov-11	19.20%	1945.3	12.00%	1,655.9	2,577.7	4,126,094	13,211,385
Dec-11	19.75%	1810.4	12.00%	1,566.7	2,469.7	4,111,917	13,021,322
Jan-12	19.73%	1777.4	12.00%	1,575.7	2,599.8	4,305,279	13,005,693
Feb-12	19.40%	1793.2	12.00%	1,573.6	2,602.9	4,073,258	13,008,302
Mar-12	18.96%	1800.7	12.00%	1,575.0	2,672.3	3,881,051	13,001,660
Apr-12	18.66%	1842.8	12.00%	1,568.4	2,647.6	3,991,853	12,985,684
May-12	18.24%	1825.2	12.00%	1,570.8	2,663.8	4,236,357	13,082,593
Jun-12	17.40%	1914.6	12.00%	1,568.9	2,650.6	4,591,635	13,263,353
Jul-12	15.72%	1911.6	12.00%	1,574.8	2,857.8	4,514,139	13,558,428
Aug-12	14.91%	1921.6	12.00%	1,567.2	2,918.0	4,627,805	13,812,100

Sep-12	13.51%	1956.3	12.00%	1,569.3	2,947.1	4,492,021	14,022,575
Oct-12	12.89%	1921.2	12.00%	1,572.0	3,268.3	4,695,012	14,228,623
Nov-12	12.11%	1886.9	12.00%	1,571.4	3,481.3	4,839,768	14,601,694
Dec-12	12.06%	1879.3	12.00%	1,571.6	3,277.8	4,525,609	14,647,105
Jan-13	10.93%	1906.6	12.00%	1,584.2	3,246.4	4,699,774	14,426,146
Feb-13	10.37%	2080.5	12.00%	1,587.5	3,310.0	4,663,432	14,631,491
Mar-13	9.77%	2030.01	12.00%	1,590.5	3,424.9	4,715,508	14,823,339
Apr-13	9.38%	2091.2	12.00%	1,591.0	3,447.3	4,816,614	14,916,445
May-13	8.34%	2119.3	12.00%	1,599.4	3,554.1	4,976,787	15,184,353
Jun-13	7.64%	2150.5	12.00%	1,602.7	3,519.4	4,917,715	15,241,122
Jul-13	7.54%	2302.6	12.00%	1,613.4	3,712.0	5,286,989	15,855,708
Aug-13	6.75%	2050.6	12.00%	1,611.4	3,791.6	5,127,548	15,945,038
Sep-13	6.06%	2059.8	12.00%	1,604.7	3,829.7	5,091,313	15,932,883
Oct-13	6.32%	2223.1	12.00%	1,601.5	3,756.9	5,343,350	15,967,500
Nov-13	6.24%	2226.8	12.00%	1,607.4	3,713.6	5,210,854	16,019,409
Dec-13	5.56%	2257.4	16.00%	1,574.0	3,831.7	5,027,784	16,106,768
Jan-14	6.03%	2313.6	16.00%	1,614.4	3,867.4	5,202,593	16,448,010
Feb-14	5.99%	2085.4	16.00%	1,619.5	3,826.2	5,401,671	16,540,734
Mar-14	6.10%	2102.4	16.00%	1,630.7	3,964.2	5,113,896	16,549,584
Apr-14	6.30%	2122.4	16.00%	1,633.2	4,005.6	5,461,748	17,021,124
May-14	6.49%	2155.8	16.00%	1,644.4	3,984.2	5,474,901	17,283,044
Jun-14	6.41%	2218.6	16.00%	1,649.7	3,961.7	5,647,773	17,656,512
Jul-14	6.54%	2276	16.00%	1,654.8	3,932.9	5,901,322	17,900,343
Aug-14	6.70%	2062.4	16.00%	1,660.6	4,299.2	5,916,258	18,160,616
Sep-14	6.63%	2076.7	16.00%	1,665.1	4,481.7	5,799,093	18,274,252
Oct-14	5.88%	2072.2	16.00%	1,683.4	4,546.1	5,898,853	18,604,641
Nov-14	5.84%	1937.4	16.00%	1,727.9	4,438.6	6,032,788	18,807,756
Dec-14	4.75%	1916	16.00%	1,725.8	4,335.3	5,909,475	18,614,151
Jan-15	3.98%	2,000.8	16.00%	1,782.0	4,198.0	5,691,919	18,740,903
Feb-15	4.18%	2,059.1	16.00%	1,781.5	4,162.5	5,943,814	18,790,161
Mar-15	4.30%	2,084.5	16.00%	1,788.1	4,255.0	5,587,042	18,740,559
Apr-15	4.50%	2,092.1	16.00%	1,829.0	4,192.8	5,748,783	19,486,117
May-15	5.30%	2,087.3	16.00%	1,997.2	3,859.2	5,862,539	19,871,084
Jun-15	6.10%	2,134.3	16.00%	2,020.3	3,808.6	6,575,646	19,964,284
Jul-15	6.45%	2,146.8	16.00%	2,086.4	3,593.3	6,709,751	20,831,713
Aug-15	6.36%	2,155.9	16.00%	2,133.8	3,647.7	6,775,987	21,388,950
Sep-15	6.08%	2,148.3	16.00%	2,150.0	3,640.1	6,538,226	21,281,793
Oct-15	6.30%	2,105.7	16.00%	2,159.9	3,697.0	6,677,246	21,689,511

Nov-15	6.60%	2,112.2	16.00%	2,149.1	3,912.7	6,829,566	21,545,615
Dec-15	6.80%	2,196.8	16.00%	2,148.5	3,997.2	6,833,088	22,115,315
Jan-16	6.50%	2,927.6	16.00%	2,177.3	4,046.4	6,617,895	21,778,943
Feb-16	5.63%	2,317.8	16.00%	2,179.5	4,232.9	6,350,406	22,009,569
Mar-16	5.42%	2,724.1	16.00%	2,179.6	4,345.1	6,522,555	21,648,496
Apr-16	5.09%	2,955.9	16.00%	2,178.9	4,453.3	6,434,071	22,001,214
May-16	5.20%	3,143.2	16.00%	2,182.3	4,595.1	6,464,718	22,252,445
Jun-16	5.47%	3,169.3	16.00%	2,178.9	4,596.1	6,772,719	22,514,698
Jul-16	5.10%	3,287.9	16.00%	2,179.0	4,597.1	6,565,100	22,281,357
Aug-16	4.90%	2,787.8	16.00%	2,176.6	4,598.1	6,733,606	22,486,184
Sep-16	4.50%	3,330.3	16.00%	2,171.9	4,599.1	6,619,015	22,262,101
Oct-16	4.51%	2,727.5	16.00%	2,175.1	4,600.1	6,536,886	22,346,742
Nov-16	4.80%	3,368.5	16.00%	2,171.0	4,601.1	6,930,242	22,630,782
Dec-16	5.04%	3,438.2	16.00%	2,172.6	4,602.1	6,854,370	22,877,866
Jan-17	5.17%	3,466.6	16.00%	2,222.0	4,717.5	6,562,493	22,783,437
Feb-17	5.45%	4,308.0	16.00%	2,226.3	4,783.7	6,484,781	22,379,398
Mar-17	6.39%	3,465.8	12.00%	2,223.9	4,935.8	6,356,675	22,589,919
Apr-17	6.42%	3,507.2	12.00%	2,227.3	4,973.9	6,486,270	22,840,701
May-17	6.08%	3,516.1	12.00%	2,229.5	5,092.6	6,560,387	23,410,633
Jun-17	5.44%	3,654.4	12.00%	2,230.1	5,285.2	6,827,067	23,865,382
Jul-17	5.16%	3,735.3	12.00%	2,231.6	5,374.5	6,709,573	23,562,522
Aug-17	5.02%	3,722.9	9.00%	2,234.9	5,458.3	6,861,341	23,484,994
Sep-17	5.27%	3,794.1	9.00%	2,237.8	5,530.8	6,551,273	23,512,764
Oct-17	5.08%	3,843.2	9.00%	2,237.8	5,614.2	6,682,309	23,985,592
Nov-17	4.43%	3,858.3	9.00%	2,233.1	5,687.8	7,189,556	24,700,641
Dec-17	3.97%	3,912.4	9.00%	2,230.1	6,013.8	6,954,415	24,714,325
Jan-18	3.97%	3,884.7	9.00%	2,250.8	6,206.2	7,169,185	24,947,200
Feb-18	4.08%	4,308.0	9.00%	2,255.9	6,279.7	7,143,214	24,879,760
Mar-18	3.93%	4,345.3	9.00%	2,259.8	6,265.4	6,744,870	24,476,846
Apr-18	3.82%	4,324.7	9.00%	2,273.6	6,273.9	6,487,664	24,433,776
May-18	3.64%	4,427.4	9.00%	2,276.8	6,082.3	6,811,875	24,522,936
Jun-18	3.40%	4,467.8	9.00%	2,277.7	6,725.2	7,136,631	25,294,539
Jul-18	3.30%	4,455.6	9.00%	2,282.6	6,094.2	6,680,291	24,705,180
Aug-18	3.27%	4,583.5	7.00%	2,286.2	6,021.1	6,753,213	25,042,405
Sep-18	3.36%	4,657.5	7.00%	2,288.8	6,181.3	6,487,310	25,275,789
Oct-18	3.15%	4,684.9	7.00%	2,290.8	6,162.0	6,587,212	25,267,472
Nov-18	2.96%	4,937.6	7.00%	2,290.1	6,299.6	6,789,971	25,490,495
Dec-18	3.30%	4,897.4	7.00%	2,292.6	6,382.1	6,992,882	25,823,453

Jan-19	3.00%	4,914.2	7.00%	2,294.8	6,223.3	6,707,176	25,763,119
Feb-19	3.00%	5,088.8	7.00%	2,289.0	6,146.1	6,840,739	25,868,691
Mar-19	3.13%	5,094.4	7.00%	2,289.5	6,162.2	6,688,376	25,702,829
Apr-19	3.20%	5,090.1	7.00%	2,289.5	6,483.5	6,764,667	25,629,054
May-19	3.52%	5,105.8	7.00%	2,288.6	6,778.7	6,973,944	25,945,565
Jun-19	3.74%	5,188.3	7.00%	2,289.5	6,491.8	7,963,799	27,240,790
Jul-19	3.71%	5,424.3	7.00%	2,289.2	5,957.2	7,262,425	26,930,010
Aug-19	3.57%	5,047.9	7.00%	2,289.4	6,148.0	7,125,645	27,163,153
Sep-19	3.39%	5,002.4	7.00%	2,289.4	6,141.7	7,218,809	27,640,720
Oct-19	3.59%	4,827.9	7.00%	2,288.8	6,198.6	7,594,207	28,050,911
Nov-19	3.76%	4,648.1	7.00%	2,288.3	6,313.6	7,411,187	28,164,329
Dec-19	3.85%	4,735.8	7.00%	2,287.9	6,309.3	7,466,360	28,313,147
Jan-20	3.72%	4,835.2	7.00%	2,288.6	6,396.1	7,200,780	28,114,151
Feb-20	3.74%	4,896.4	7.00%	2,289.4	6,396.5	7,114,457	28,416,965
Mar-20	3.42%	4,831.3	7.00%	2,289.9	6,432.9	6,876,559	28,242,438
Apr-20	3.30%	4,869.9	7.00%	2,291.3	6,482.5	7,445,377	28,767,887
May-20	3.20%	4,853.5	5.00%	2,291.9	6,575.3	7,509,786	29,030,805
Jun-20	3.17%	5,155.6	5.00%	2,296.5	6,756.2	8,302,436	29,841,650
Jul-20	3.30%	5,196.8	5.00%	2,297.8	6,576.5	7,609,514	29,338,833
Aug-20	3.30%	5,218.3	5.00%	2,297.6	6,599.6	7,409,093	30,003,247
Sep-20	3.10%	5,259.4	5.00%	2,297.6	6,665.9	6,999,421	29,429,181
Oct-20	3.10%	5,281.2	5.00%	2,297.7	6,793.2	7,367,554	29,701,184
Nov-20	3.00%	5,423.7	5.00%	2,297.7	6,912.3	7,437,491	29,620,910
Dec-20	3.20%	5,495.6	5.00%	2,298.5	7,039.3	7,169,348	29,920,566