AN ASSESSMENT OF MONETARY POLICY TRANSMISSION IN KENYA

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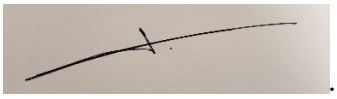
DECLARATION

This project is my work and has never been presented for a degree award in any other university.

Signature…  ……Date……16/11/2022……

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This project has been presented examination with my approval as a university supervisor.

Signature  …….Date……..……

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LIST OF ACRONYMS

ARDL	Autoregressive Distributed Lag
CBK	Central Bank of Kenya
CPI	Consumer Price Index
GDP	Gross Domestic Product
IMF	International Monetary Fund
MPTMs	Monetary Policy Transmission Mechanisms
NEER	Nominal Effective Exchange Rate
OMO	Open Market Operations
USD	United States Dollar
VAR	Vector Autoregressive
WDI	World Development Indicators

ABSTRACT

The role played by monetary policy towards sustainable economic outcomes cannot be refuted. Kenyan government through Central bank implements various monetary policies to foster stability in the macroeconomic environment and hence, economic growth and development. Even though previous studies argue that monetary policy influence price and output in the economy through various channels, there is dearth of these evidence in the Kenyan context. Therefore, this study investigates the influence of monetary policy on real economy. Specifically, the study evaluates credit, exchange rate and asset price mechanisms on prices and real economic growth. In addition, the study determines the most effective transmission channel in Kenya and finally, to tests for granger causality between monetary policy transmission channels, inflation and output. Data from 1990 to 2020 on quarterly basis was obtained from the Central Bank of Kenya Database. The study implemented Vector Autoregressive approach upon which the impulse response functions computed to help in explaining how economic growth and prices responds to shocks in the monetary policy instruments. In addition, granger causality test was conducted to examine the causality relationship between monetary policy instruments and output variables. The study established that both asset price and M1 money growth channels of monetary transmission had mixed results. It was also found that both credit and exchange rate were very effective monetary policy transmission mechanisms with respect to both GDP per capita and consumer price index in Kenya. Furthermore, credit channel is more effective pass-through mechanism to both GDP per capita and CPI. It was recommended that monetary authorities should maintain the base lending rates and also strengthen exchange rates for stability in other macroeconomics.

CHAPTER ONE

INTRODUCTION

1.1 Background

Monetary policy is defined as strategies adopted by governments around the world through Central banks to realize sustainable economic growth (Maturu, Maana & Kisinguh, 2010). The policy encompasses management of quantity of money in circulation to maintain stability in macroeconomic variables like level of interest rate, prices, exchange rate and employment. Since 1990, the world has been witnessing central banks adopting new framework for monetary policy commonly referred to as inflation targeting. Consequently, monetary authorities attempt to ensure that there is price stability in the economy by controlling interest rate as noted in the Taylor rule (Taylor, 1993). If economic output deviates from the expected level, adjustments of the interest rate whose effect on aggregate demand is aimed at restoring the targeted inflation level or mitigating occasional shocks in prices will correct the situation.

The effectiveness of the monetary policy is anchored on better understanding of those who draft such and an accurate understanding of how the policy is likely to impact the output variables (Cheng, 2006). A clear understanding of monetary policy impact is therefore critical in making accurate decisions regarding what policy measures to implement so as to realize macroeconomic objectives. Consequently, a better understanding of effective monetary policy transmission channels is critical (Cheng, 2010).

Central banks have been entrusted with the achievement of monetary policy goals. These goals include the stable prices, sustainable economic growth as well as stability in the general macroeconomic environment (Auclert, 2019). Essentially, this is aimed at helping the government

with its economic policies to ensure public welfare by pursuing relevant fiscal and monetary policies. Monetary policy are strategies adopted by central bank to increase or reduce credit informed by prevailing economic circumstances in a given economy. In addition to output and price stability, this policy is crucial towards the achievement of stable exchange rates, enhancement of foreign exchange reserves and elimination of fiscal deficits.

The Central Bank of Kenya (CBK) came into operation through an act of parliament (Central Bank Act, Cap 481) of 1966. The Act mandates CBK to formulate and implement sound monetary policy for sustainable economic growth. In addition, CBK is entrusted to ensure proper functioning of financial system as well as ensure that market based financial systems are sound. Relative to fiscal policy, monetary policy is fast and more effective in resolving economic shocks. According to Kahn (2010), the aim of monetary policy is to manage quantity money in the economy and ensure stable growth, full employment, prevention of financial crisis, streamlining business cycle, stable real exchange rate and stability of the long-term interest rates. The proponents of monetary policies are of the opinion that monetary authorities should concentrate on ensuring that there is financial stability as well as bank supervision to curtailing inflation alongside pursuing long term growth.

1.1.1 Channels of the Monetary Transmission and their effect of Prices and Output

There are various monetary policy tools at the disposal of CBK to control circulation of money for the purpose of stabilizing the economy. Key among these instruments are; the Open Market Operations (OMO), the Central bank base lending rate and cash reserve requirements. Others monetary tools include moral suasion and selective credit control (Mwega, 2014). Under OMO, the Central bank buys or sells Treasury bills or Bonds depending on the amount of money in circulation while the base lending rate (discount rate), refers to the rate at which the CBK lends to commercial banks. For instance, when there is low liquidity in the economy, this rate would be

reduced to encourage commercial banks to lend more to the public and vice versa. Another tool the CBK can use is cash reserve requirements whose main purpose is to stabilize money market interest rates in the money market.

Monetary policy affects the prices and level of output in the economy through what is known as, Monetary Policy Transmission Mechanisms (MPTMs) (Ireland, 2010). Understanding of these mechanisms is very critical in designing and implementing relevant monetary policies. Figure 1.1 illustrates five main channels via which monetary policy impacts other variables of the economy such as output and prices.

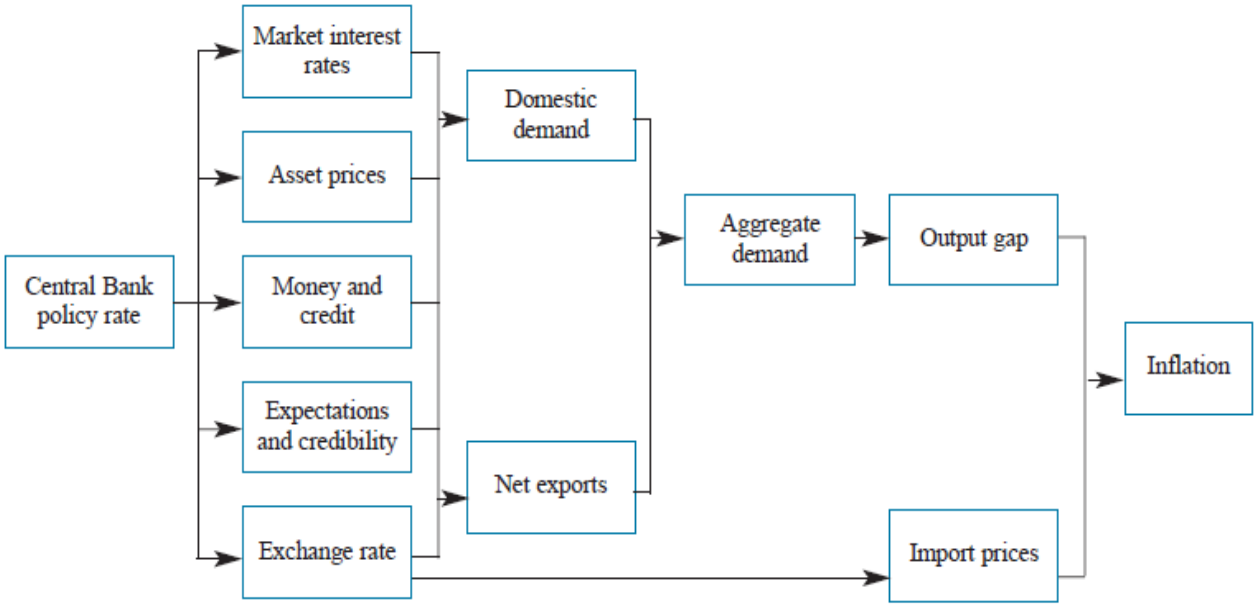

Figure 1.1: Monetary Policy Transmission Mechanisms

Source: Adopted from Thórarinn G. Pétursson (2001)

Traditional and most widely adopted MPTM is that of interest rate where, when monetary policy rates are changed, it leads to short-term changes in the interest rates (Bernanke & Gertler, 1995). This change affects the aggregate demand in the local economy and demand of credit which ultimately influences output, employment, and prices.

Concerning the asset price, any variations in the monetary policy can lead to change the price of assets (bonds, real estate, and stocks) which would in turn affects the aggregate demand, employment, output, and price. One of the direct MPTM is credit channel where any change in monetary policy, affects the amount credit availability in the economy and hence, changes in the investment demand and consumption.

Under the exchange rate mechanisms, changes in the monetary policy alters the exchange rate of the country and this affects the import and export demand. For example, an expansionary policy could lower rate of interest which could reduce the capital inflows. This could lead to balance of payment deficit and hence, depreciation of the domestic currency therefore encouraging exports and discouraging imports.

Finally, there is expectation transmission channel which is all about those expectations developed by economic agents and which affects monetary policy transmission. Such expectations impact decisions regarding investment and consumption and hence, aggregate demand (Christensen, 2010).

1.1.2 Performance of Various Macroeconomic Variables over time

Figure 1.2 presents the trend of various macroeconomic factors for Kenya over the period 1980-2019. They include interest rate, exchange rate, inflation, and economic growth rate.

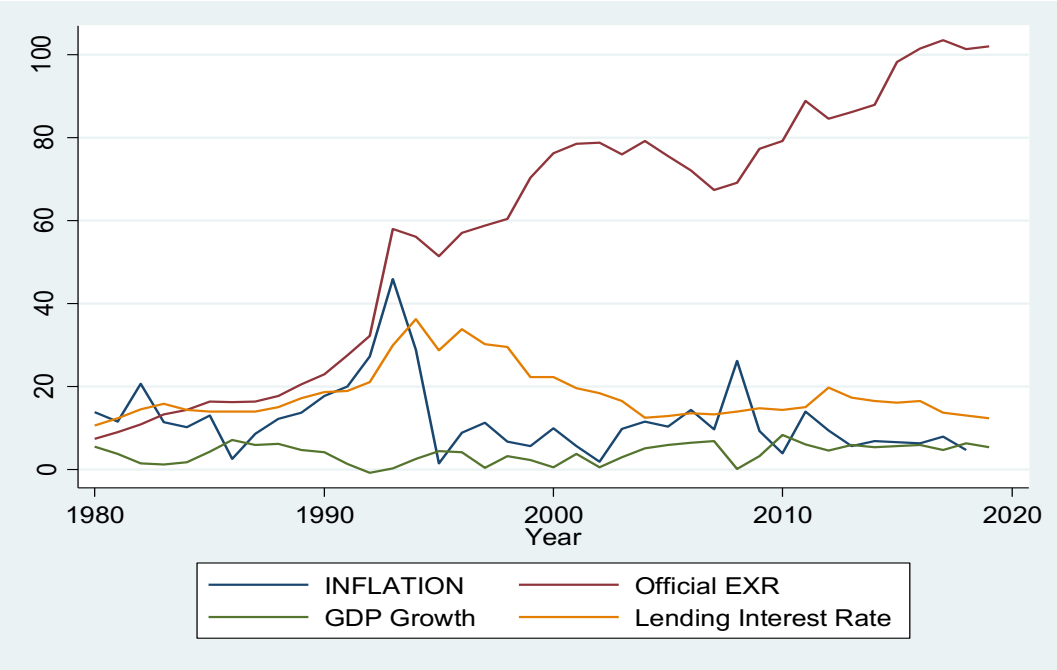

Figure 1.2: Macroeconomic variables trend in percentage over the period 1980-2019 in Kenya.

Source: World Development Indicators (2019)

From Figure, it can be shown that the official exchange rate has been increasing steadily since 1980. The upward trend is an indication that the Kenyan Currency has been depreciating against the USD over time. Consequently, the country has been importing most of the products compared to the exports hence the low demand for its currency in the international markets. This has caused the depreciation of currency. Lending rate increased from 1980s to early 1990s when it then sharply declined. Between the year 2000 to 2020, Kenya witnessed fluctuations in the lending rate though not sharply. Similarly, inflation rate increased over the period 1980 to early 1990s when it then sharply declined before fluctuation at relatively low rates. The economic growth rate since 1980s has been fluctuating from time to time. However, the fluctuation has been relatively low over the last close to four decades. These fluctuations in economic growth are associated with the macroeconomic instability.

1.2 Problem Statement

Monetary policy plays a critical role towards economic growth and development of an economy. Key among this is stabilization of macroeconomic environment for sustainability in growth and development. Central banks globally and Kenya in particular have adopted severally monetary policy tools like OMO, discount rates, reserve requirement ratio, moral suasion and selective credit control to ensure that there is balance between money demand and supply with an attempt to foster stability in the macroeconomic environment. Both theory and empirical findings from previous studies have demonstrated how economic growth and prices have been influenced by monetary policy several transmission avenues with key among them being: exchange rates, expectations, credit and asset prices.

Kenya is among the fastest growing economies in the Sub-Saharan African. According to statistics, the country has the third largest economy in terms of GDP (101.05 Billion USD) in the region after Nigeria and South Africa (Statistica, 2021). In East Africa, Kenya is an economic hub with the largest share of trade. These successes are partly attributed to significant political and economic reforms in the past two decades. However, despite the huge GDP in the region, the country has been facing fluctuations and uncertainties in various macroeconomic factors like exchange rates, inflation and even economic growth. This is in spite of robust implementation of monetary policies. Therefore, it is very critical to investigate how monetary policy is transmitted to the real economy to inform implementation of the right policies for economic stabilization.

Despite developments in the Kenya's monetary policy, there is limited evident on the monetary policy transmissions. In Kenya, several MPTMs studies have been conducted, such as, Cheng (2006), Maturu (2007), Sichei and Njenga (2012), and Davoodi, Dixit and Pinter (2013) whose findings indicate that monetary policy channels were operational at different time periods with

varied strengths. For example, Cheng (2006) finds a weak interest rate mechanism in the period 1997-2005 due to rigidities in the financial sector while Davoodi, Dixit and Pinter (2013) found a significance in credit channel. In addition, the most recent studies on Kenya have largely paid attention on interest rate channel and not others transmission mechanisms (Kabiro & Nyamongo, 2014; Gitonga, 2015). This imply that there is still some work to be done on monetary policy transmission in Kenya. This current study sought to update on the previous evidence in addition to establishing the most effective channel of monetary transmission by including other channels like asset price and exchange rate. Furthermore, the study tested for causality between monetary policy transmission channels and output variables.

1.3 Research Questions

i. How does credit, asset price and exchange rate channels affect monetary policy transmission on prices and output in Kenya?"
ii. Which is the most effective transmission channel in Kenya?
iii. What is the nature of causality between the monetary policy transmission channels, real GDP, and inflation?

1.4 Objectives of the study

General objective of the study was to evaluate monetary policy transmission mechanisms in Kenya. Specifically, this study addresses the following objectives:

i. To evaluate the effect of credit, exchange rate and asset price monetary policy transmission channels on price and real GDP in Kenya.
ii. To determine which transmission mechanism is more effective in Kenya and test for granger causality between monetary policy transmission channels, inflation, and output.
iii. To draw conclusions and make policy recommendations based on the study findings.

1.5 Significance of the Study

This study makes several contributions. Firstly, the study fills the existing knowledge gap on how inflation and real GDP responds to MPTMs due to dearth of evidence in Kenya, mainly by incorporating the credit channel, the asset price channel, and the exchange rate channel.

Secondly, findings of the study will be key in policy framework by the monetary authority. Specifically, results of the study will enable them coming up with better ways of maintaining economic growth. Thirdly, this study will form basis of reference for further studies to be carried out in this area in the future.

1.6 Organization of the Study

The remain part of the project is structured as follows: chapter two analyses relevant theories and empirical evidence while the third chapter provides the theoretical framework and research methodology which includes empirical model, variable description, data type and sources as well as estimation strategy. Chapter four presents findings and discussion while the fifth chapter presents summary, conclusion and policy recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Relevant literature is reviewed in this chapter. The chapter has two sub-sections where the first sub-section reviews theories underpinning the study while the second section comprises of empirical literature related to monetary policy transmission channels. The chapter ends with literature summary and highlights of research gaps which established the rationale for this study.

2.2 Theoretical Review

This section reviews various theoretical concepts associated with monetary policy transmission channels. Specifically, relevant theories applicable on monetary transmission mechanisms are examined. There exist many channels via which monetary policy can be transmitted to the real economy outputs. The most widely discussed channels in literature include expectations, credit, asset price, exchange rate, and interest rate. To begin which, Rotemberg and Woodford (1997) observed that high interest rate in real terms could lead to increased cost of entrepreneurship. The increased cost of capital leads to reduced investments and hence, the national output. From the demand side of the economy, the manufacturers could transfer the increased cost of production to the consumers in the form of higher prices with the potential to reduce aggregate demand in the economy. The reduced demand could ultimately lead to a decline in the overall production and thus, national output. According to Ando and Modigliani (1963), the responsiveness of aggregate demand interest rate changes explains how monetary policy affects the real economy.

Wealth channel is yet another conduit through which monetary policy can influence real economic outputs such as GDP and prices. This channel is based explained in the Ando and Modigliani

(1963)'s life cycle consumption theory. The wealth status of a household is affected by the interest rates and asset prices (stocks, bonds and real estates). For instance, a decline in the wealth of the household due to poor performance of the asset market could reduce the aggregate demand in the economy which leads to reduced production and national output. Prices of commodities in the economy could also be affected if this care occurs.

Turning to the credit channel, it has been argued that a higher Central Bank lending rate increases the cost of capital and therefore reduced investment levels (Bernanke & Gertler, 1989). Higher lending rates could also lead to higher real interests, and this might lower the household collateral. This could make borrowing difficult and might also reduce aggregate consumption in the economy with the likelihood of influencing both price and output. Thus, contractionary monetary policies are likely to suppress both aggregate consumption and investment in the economy and hence, lower both employment and output levels in the economy. An expansionary monetary policy such as sell of government securities, reduction in reserve ratios and lower central bank discount rates could lead to more bank loans which could encourage investment, consumer expenditure and increase output in the economy (Kashyap & Stein, 1995).

With open economy, authors have argued that exchange rates have become critical transmission channel for monetary policies (Lown & Morgan, 2002). In a flexible exchange regime with an assumption of perfect capital mobility, a depreciation in the domestic currency could lead to capital outflow which could result into reduced foreign direct investment and hence, a decline in the national output. The exchange rate depreciation can be attributed to higher interest rates occasioned by contractionary monetary policy (Ramey, 1993). For the exchange rate channel to be effective, the central bank must be willing to allow free movement of the exchange rate.

2.3 Empirical Review

Various studies on monetary policy transmission have been conducted worldwide. To start with, Agha, Ahmed, Mubarik and Shah (2005) conducted a study on MPTM in Pakistan using Vector Autoregressive (VAR) model. Findings of the study show that there was a slight short-term (6 months) response to price as a result of monetary policy but which faded away with time. Further tightening of monetary policy led to V-shaped response in price. Nevertheless, this study explored only the credit channel and not other MPTMs for which the current study proposes to do. The most recent study in Pakistan indicates a significant effect of private sector credit on the real economy (Mukhtar & Youmans, 2019). In addition, the study reveals that monetary policy was effectively transmitted through exchange rate and credit.

Secondly, Hosono (2006) investigated how monetary policy influenced real economic variables in Japan between 1975-1999. Ordinary Least Square (OLS) estimator was adopted in the investigation. The study established that contractionary monetary policy tightens lending by commercial banks which ultimately leads to higher consumer prices and decrease in output. This imply that reduced lending rates resulting from higher interests discourages investment and hence, production. In this study, only the supply side of the economy felt the effects of monetary policy. The results of this study notwithstanding, use of OLS cannot generate impulse response functions which are very critical in evaluating the responsiveness of the real economy due to monetary policy shocks. The current study seeks to correct this through use of VAR model.

In India, Aleem (2010) sought to examine how unexpected MPT affects economic growth and prices using VAR framework. The findings indicate that unexpected shocks in the monetary policy led to a decline in economic growth and prices. Nevertheless, there was no statistically significant results with respect to asset price channel. Failure to compute impulse response functions means

that the study did not clearly show the evolution of output variables as a response to monetary policy shocks. This current study will compute and interpret the impulse response functions.

Yet in another study, Salmanov, Babina, Koba, Koba and Lopatina (2017) investigated MPTMs in Russia using VAR model. The study focused on the duration preceding the 2008 world financial crisis and the period after, with interest rate and bank credit as the main channels. The study observed that the two channels were statistically significant during the two periods though the levels of efficiency among the two channels were different. Nevertheless, the study ignored the role of impulse response function in explaining how shocks in monetary policy influences economic output and prices. A similar study on Russia and Eastern Europe was conducted by Stann and Grigoriadis (2020). This study reveals that asset prices caused stronger shocks to loan provisions in both Russia and Eastern Europe. In addition, loss in sovereign earnings, appreciation of exchange rates was in both Russia and Eastern Europe was attributed to unconventional monetary policies.

Nguyen, Phan and Williams (2017) conducted a study on MPT to output and prices in Russia by utilizing Autoregressive Distributed Lag (ARDL) model. Findings of the study reports a higher rate of transmission in the short run than in the long run. The study focused on the credit channel between 2011 and 2016. The limitation with this short observation period is that robust ARDL model cannot be realized as it requires longer observation period (at least 30). Thus, the results of this study could be biased.

In Vietnam, Anwar and Nguyen (2018) examined monetary policy pass-through to the real economy using quarterly data from 1995 to 2010. Structural VAR model was applied to establish how real economic output responded to monetary policy shocks on exchange rate and the credit channel. The study found that oil price shocks had an influence on Vietnam's interest rate through

the exchange rate. These shocks caused an adverse effect on the local price and output. Nevertheless, the impact of money supply (M2) was found to be less strong as expected.

Novalina & Rusiadi (2018) investigated monetary policy transmission to real output in India, Brazil, China, Russia, and Indonesia. The study applied VAR model and the results reveal that monetary policy was effective in these countries. In another study conducted in Poland, Chmielewski et l. (2018) found out that changes in interest rates had an impact on output variables in the short run. Additionally, the study discovered that because of internationalization of production, the exchange rate channel was weak.

Lombardi, Siklos and Xie (2018) adopted VAR approach to compare MPT in China, US, Eurozone and Japan. Monetary policy exhibited similar impact in all the economies investigated with reference to economic growth and inflation. In addition, interest rate was found to be a very effective monetary policy transmission channel in all the economies. Furthermore, the study reveals that the 2008 financial crisis did not cause structural breaks in the MPT mechanisms.

In Malaysian, Poon (2018) adopted VAR mode to investigate MPTMs during Asian financial crisis (1997 to 1998) as well as the 2007 to 2008 global financial crisis. The study failed to observe time-variations within the monetary policy pass-through to GDP and inflation via exchange rates. This was despite different performance of nominal exchange rates across the two periods of the study. In addition, the study noted that introduction of capital control measures suppressed the impact of monetary policy on the real economic outputs.

A study in the republic of Rwanda has established exchange rate as an effective monetary policy transmission channel (Kigabo, Munyankindi &Amahoro, 2008). The study adopted VAR model with annual data from 1994-2006. In addition, the credit channel transmission mechanism was also

found to be significant but only to the real output and not prices. Nevertheless, the study failed to establish statistically significant results with reference to the interest rate channel. Findings of this study are limited in the sense that the period for the study was too short and hence the small degree of freedom could allow robust results. The current study will use sufficient observations (120) which would allow for robust estimation.

In Eritrea, Mengesha and Holmes (2013) conducted a study to evaluate the responsiveness of economic growth and prices to monetary policy. Their study focused on the credit channel. The study established reported statistically significant results implying the effectiveness of the credit as a channel of the monetary transmission mechanism. Nevertheless, this effectiveness was only recorded in the short-run where the central bank could manipulate reserve requirement and manage inflation.

In Nigeria, Adeoye and Shobande (2017) sought to evaluate the monetary policy transmission using credit channel. VECM was adopted with data covering 1985 to 2015. The study established statistically significant results with respect to the credit channel. This imply that the Nigerian economy was stimulated through the interest rate channel. A recent study in Nigeria has indicated that monetary policy transmission was ineffective due to a huge informal financial sector (Igharo, Osabohien, Onyemariechi & Ibidapo, 2020).

In the Kenyan context, there are various studies on the monetary policy transmission. For instance, Cheng (2007) in a study commissioned by the Central bank sought evaluate how shocks in the monetary policy shocks between 1997-2005 affected real economy. Using VAR model, the study reported that higher interest rate reduced price levels in the short-run. Nevertheless, nominal exchange rate appreciation had no effect on real output. The study confirmed the effectiveness of the credit channel. Another Kenyan study, Kabiro and Nyamongo (2014) established adverse

effects of the expansionary monetary policy on loans in the period 2006-2011. This was consistent with Saxegaard (2006) who argued that more cash in the economy weakens the monetary policy effect on the real economy. Nevertheless, this study by Kabiro and Nyamongo adopted panel methodology which cannot permit the researcher to generate impulse response functions. In Addition, the period of the study was too short for any meaningful inferences.

Still in 2014, Mwega (2014) adopted VAR approach between 2000-2012 where it was established that tightening of CBK lending rates had weakened Kenya's economic growth. Nevertheless, this monetary policy measures have insignificant impact of price level. In another study on monetary transmission, Gitonga (2015) found that M3 and exchange rate had significant impact on both GDP and consumer price index in Kenya. In addition, the study established a long-term link between exchange rate, real output and price levels.

2.4 Summary of Literature Review

Globally, the reviewed theories and studies demonstrate existence of various channels through which monetary policy are transmitted to the real economy. Mainly, these include credit, price of assets, exchange rate and expectations. The reviewed literature indicates that monetary policy affects the real economy through both demand and supply sides. In addition, studies have demonstrated that the nature of the effect of monetary policy will depend on policy instruments being implemented. For instance, on one hand, contractionary monetary policy measures are likely to increase interest rate and hence, higher borrowing costs with the ultimate result of reduced investment. Expansionary monetary policy can lower interest rates and hence, encourage both demand and investment.

There are also studies on Kenya which have demonstrated key role played by monetary policy in the management of macroeconomics (Cheng, 2006; Kabiro & Nyamongo, 2014; Mwega, 2014,

Gitonga, 2015). Nevertheless, these studies focused mainly on the credit and exchange rate channel. The current study will incorporate asset price channel as well. In addition, even those the previous studies adopted VAR model, most of them did not consider impulse response functions which are very critical in determining evolution of monetary policy real economy. The current study addressed this gap. Furthermore, the time period for which these studies were conducted was very short to give sufficient degrees of freedom necessary for fitting a robust VAR model. The current study considered adequate data points (120) to address this gap.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

The methodology to be adopted in evaluating monetary policy transmission channels are explained in this chapter. Specifically, the chapter discusses theoretical approach which informs the empirical model, and description of variables. In addition, data estimation strategy and relevant diagnostic tests are discussed.

3.2 Theoretical Framework

Theoretical concepts in chapter two has demonstrated existence of various MPTM channels through which monetary policy is transmitted to the real economy. The common channels include expectation, credit, exchange rate and asset prices. To study these channels in the Kenyan economy, the study adopts Vector Autoregressive framework which has been widely used in the previous studies (Kigabo, Munyankindi & Amahoro, 2008; Aleem, 2010; Mengesha & Holmes, 2013; Mwega, 2014; Lombardi, Siklos & Xie, 2018; Poon, 2018; Mukhtar &Youmans, 2019). The use of VAR to analyze monetary policy transmission began with Sims (1980) seminal work. VAR framework treats every endogenous variable in the model as a function of the exogenous variables and then the lagged values of all the endogenous variables in the model, and described using a structural equation expressed as:

$$\mathrm{J(H)Y_t = C(H)X_t + \varepsilon_t} \quad \text{...1}$$

Where; $J(H)$ refers to lxl matrix polynomial in the lag operator, while $\mathrm{C(H)}$ is an lxk matrix in the lag operator, Y_t refers to lx1 vector of dependent variables, and X_t is a tx1 vector of

explanatory variables, ε_t is an mx1 vector of random terms, with var(ε_t)=Λ and Λ, is a diagonal matrix.

Consistent with equation 1 is, a reduced VAR model expressed:

$Y_t = \Lambda(H)Y_t + B(H)X_t + e_t$……...…...2

Where; $\Lambda(H)$ and $B(H)$ refers to matrix polynomials, while e_t is a stochastic term(vector), with, var (e_t)= Σ.

Letting F to be a contemporary coefficient matrix, and $I(H)$ be coefficient matrix in $J(H)$, without contemporary coefficient. This means:

$J(H) = F + I(H)$……...…3

We can therefore relate the structural and reduced-form equations as:

$\Lambda(H) = -F^{-1}I(H)$ and $B(H) = F^{-1}C(H)$…….……...…4

Consequently, the relationship of error terms can be expressed as:

$e_t = F^{-1}\varepsilon_t, or\ \varepsilon_t = Fe_t$, which imply that, $\Sigma=F^{-1}\ \Lambda F^{-1}$ …….…….5

Reliable F and Λ estimates can be obtained using maximum likelihood method (Poon, 2018).

In this study, the explanatory vector, X_t is assumed to comprise of price of commodity index (Com), computed from the main export, and the global fuel price index (oil):

X_t= (Com, oil) …….……....6

These variables (Com, oil), control for any change in the world economic position, and the fluctuations in price of the main exports of an economy and energy prices. Assuming that Kenyan

economy does not affect the world economy, these variables are treated as explanatory (Lombardi et al., 2018).

The endogenous variables are the GDP, CPI, Stock of Money (M), Bank rate (R), nominal effective exchange rate (NEER), assets price (AP) and Credit (CR):

$$Y_t = (\ M_t,\ AP_t, CR_t, NEER_t) \quad \ldots\ldots 7$$

Thus, equation 7 will be used to estimate how GDP and CPI (inflation) responds to shocks in monetary policy transmission channels.

There are two identification strategies for VAR that is recursive and non-recursive. The recurve approach imposes a standard structure on VAR with ranking or variables. In other words, in this approach, there is an assumption that CPI does not have an immediate effect on GDP, and M does not have an immediate effect on prices and lastly, NEER does not affect monetary policy immediately. This calls for estimating reduced form of VAR covariance matrix as shown:

$$\begin{bmatrix} \varepsilon_t^{GDP} \\ \varepsilon_t^{GPI} \\ \varepsilon_t^{M1} \\ \varepsilon_t^{CR} \\ \varepsilon_t^{AP} \\ \varepsilon_t^{NEER} \end{bmatrix} = \begin{bmatrix} 1 & \cdots & 0 \\ \vdots & \ddots & \vdots \\ l_{61} & \cdots & 1 \end{bmatrix} \begin{bmatrix} \mu_t^{GDP} \\ \mu_t^{GPI} \\ \mu_t^{M1} \\ \mu_t^{CR} \\ \mu_t^{AP} \\ \mu_t^{NEER} \end{bmatrix}$$

On the other hand, the non-recursive identification assumes the presence of contemporaneousness between exchange rate and monetary policy as argued by Sims (1980). Thus, the first two equations in the matrix shows slow-moving response of the monetary policy shocks to CPI and GDP. The third-up to fifth equations in the matrix represents contemporaneous response without immediate effect of GDP and CPI to monetary policy.

3.3. Empirical Model

Following the theoretical framework, the study presents an empirical model in equation 8.

$$Y_t = \alpha_0 + \sum_{i=1}^{n} \alpha_1 CR_{t-1} + \sum_{i=1}^{o} \beta_{1i} \Delta NEER_{t-1} + \sum_{i=1}^{p} \emptyset_{1i} M1_{t-1} + \sum_{i=1}^{q} \partial_{1i} AP_{t-1} + \varepsilon_t \quad \text{.......(8)}$$

Where; Y_t is the outcome variables (GDP, CPI); CR=Credit, NEER=Nominal effective exchange rate, M1= Money supply (Narrow) and AP=asset price.

ε_t= stochastic term

3.3.1 Variables

Table 3.1 presents a table explain the variables and how they are measured.

Table 3.1: Variable Description

Variable	Description	Measure
Dependent variables:		
GDP	Economic growth (Gross Domestic Product)	Real GDP
CPI	Consumer Price Index.	Inflation
Independent variables:		
CR(credit)	This refers to loanable funds available to borrowers in the country	CR will be measured by Bank rate.
M1(money supply)	This refers to stock of money circulation plus checkable deposits in banks.	Amount of M1 in Kshs.
AP(asset price)	Value of the stock as compared to cost of replacing physical capital belonging to the firm.	Nairobi Security Exchange(NSE)20 share index
NEER	Nominal Effective exchange rate	Rate

The study used, asset price, broad money (M1), credit and exchange rates as monetary policy instruments. The study sought to investigate how real GDP, and CPI responds to the shocks in the monetary policy. Closely associated with monetary policy is the nominal exchange rate. The study incorporates this variable following Dabla-Norris and Floerkemeier (2006) study which laid an emphasis on effective exchange to test how output and prices respond to exchange rates. In other words, NEER controls for changes in the world economy.

Real GDP and CPI are output variables in this study. CPI is the measure of inflation in this study. Inflation captures the changes in the price level.

3.4 Data Description

Data for money supply, inflation(CPI), real GDP and bank rates will be obtained from the CBK database. The study uses data collected for all the variables on quarterly basis beginning first quarter of 1990 to fourth quarter of 2020. This means that the study had a total of 120 observations. This offered sufficient degree of freedom for statistical inferences when using time series approaches like VAR.

3.5 Model Estimation

The study adopts VAR, a time series technique. To estimate monetary policy transmission mechanisms, the study adopted two techniques. Firstly, impulse response to explain how GDP, and inflation responds to the shocks in the monetary policy instruments. Impulse response enables tracing of transmission of a shock within or otherwise noisy system of equations, and hence, this is a very important tool in assessment of economic policies.

Secondly, the study compute impulse response functions which are very critical in quantifying relative importance of shocks among the outcome variables, in this case, GDP and inflation.

Impulse responses computes mean dynamics. To ensure that estimated results are devoid of bias, the study conducted various diagnostic tests.

3.4.1 Unit Root Test

This test seeks to establish whether a variable has unit roots or not. The presence of units roots imply that a series is non-stationary otherwise, the variable is termed stationary. A non-stationary series can lead to spurious regression due to the violations of the independence assumption of OLS (Wooldridge, 2009). In case the variance is found with a unit root, it is differenced until it becomes stationary. The study adopted Augmented Dickey-Fuller (ADF) whose null hypothesis argues that a variable has unit roots. The hypothesis is supported if test statistic is less than the critical values at 1%, 5% and 10% levels of significance, otherwise rejected.

3.4.2 Stability Test

To ensure the stability of VAR regression, the study adopted eigenvalues of a companion matrix of corresponding VAR. Eigenvalues less than 1 indicates that the regressions are stable.

3.4.3 Granger Causality Test

This test was adopted to investigate the nature of short run linkages among the study variables (Osei-Assibey & Digkang, 2020). Null hypothesis asserts that the lagged values of the independent variables don't explain variations in the dependent variable. Furthermore, the study also examines the causality link between the output variables and the monetary policy instruments.

CHAPTER FOUR

FINDINGS

4.1 Introduction

This chapter presents findings and discussions. There are two main sections in the chapter, that is section one on descriptive statistics and section two presents econometric analysis of monetary policy transmission in Kenya.

4.2 Descriptive Statistics

This section presents time plots and statistics summary of all the variables under study. This is deemed important to understand the distribution and trends in the study variables. Figures 4.1-4.6 displays time plots for variables.

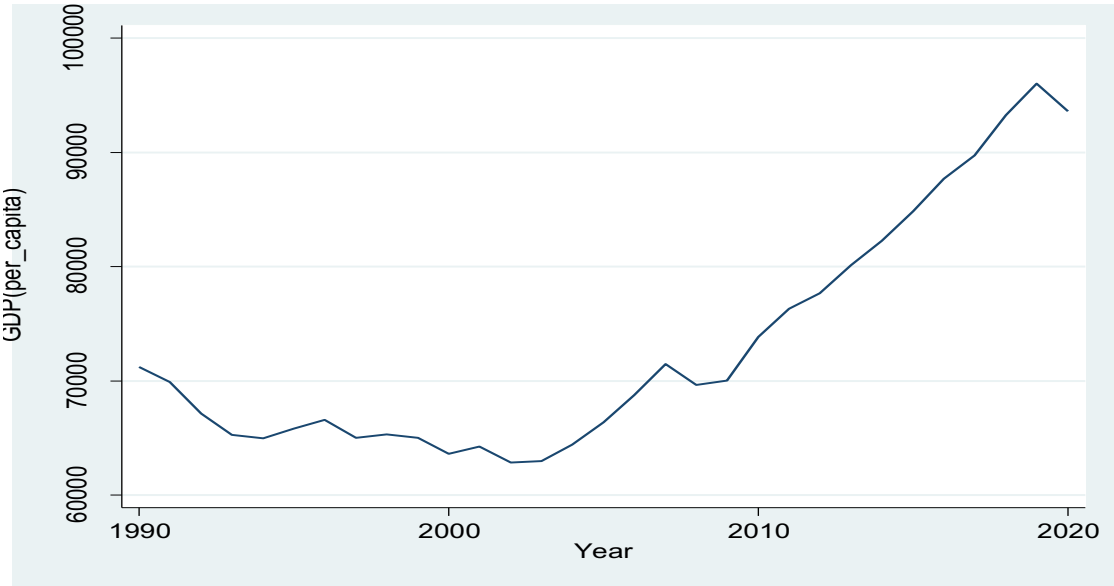

Figure 4.1: GDP per Capita (1990-2020)

Source: Author (2021)

Figure 4.1 indicates that Kenya's GDP per capita has been on an upwards trajectory for the period under study though with some periods of turbulence attributable to business cycles explained by macroeconomic fluctuations and changes in the business climate. Secondly, Figure 4.2 shows that Kenya's CPI has experienced sharp fluctuations during the period under study. For instance, there was sharp increase in the CPI in early 1990's. This was the time when the Kenyan economy faced economic hardships due to the suspension of IMF and World Bank loans which resulted into low foreign capital inflow, high costs of doing business and uncertainties in the economy.

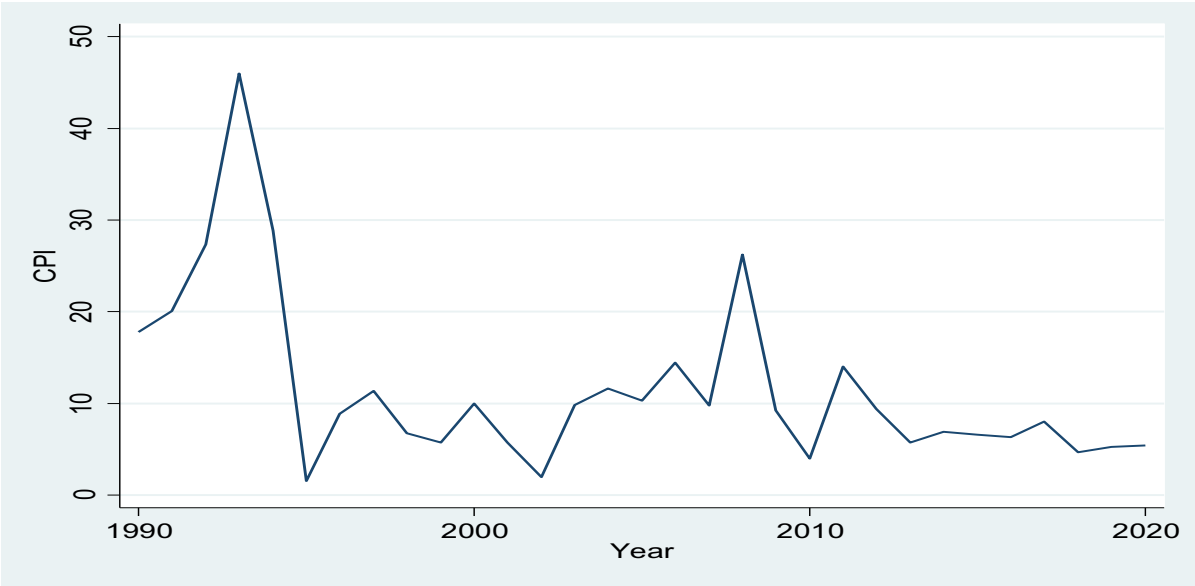

Figure 4.2: CPI (1990-2020)

Source: Author (2021)

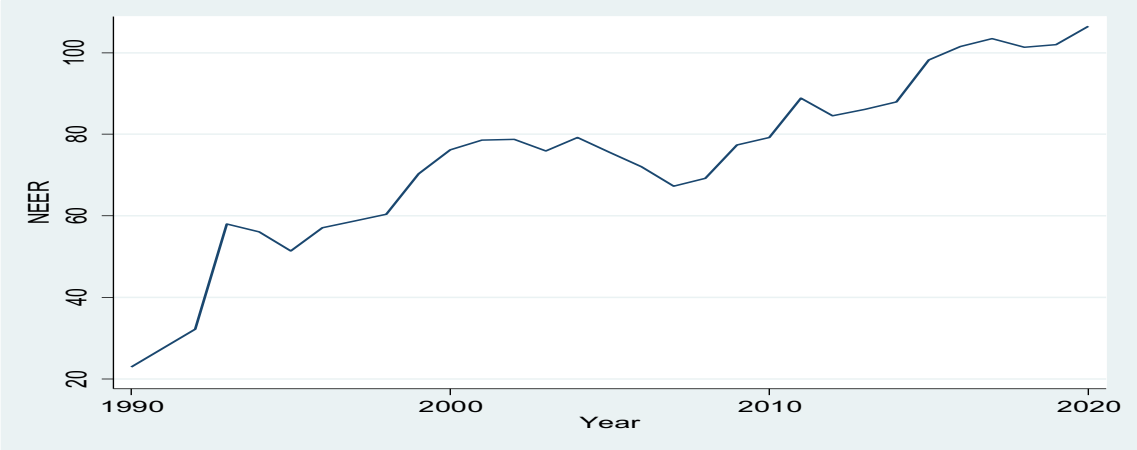

Figure 4.3: Nominal Effective Exchange Rate (1990-2020)

Source: Author (2021)

During the study period, Figure 4.3 indicates that Nominal Effective Exchange Rate (NEER) has experienced a steady increase. This imply Kenya's currency has been weakening against major currencies like the United States Dollar (USD), the Euro among others. This could partly explain why the county has always had balance of payment deficits with its major trading partners. With regard to broad money (M1), Figure 4.4 shows that there was no clear trend in the growth. This can be attributed to time-to-time regulations on money supply in the economy by the Central Bank of Kenya.

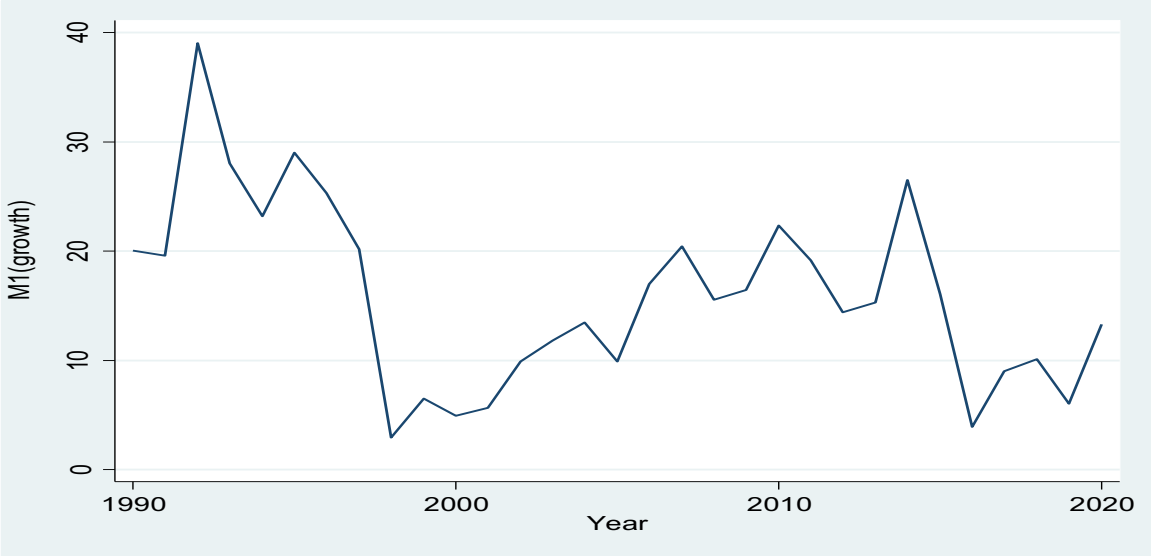

Figure 4.4: Broad Money (M1 growth) (1990-2020)

Source: Author (2021)

Finally, on time plots, while Kenya's credit as measured by CBK bank rate has been declining over the years (Figure 4.5), asset price has been on an upward trend in general terms (see Figure 4.6).

Figure 4.5: Credit (1990-2020)

Source: Author (2021)

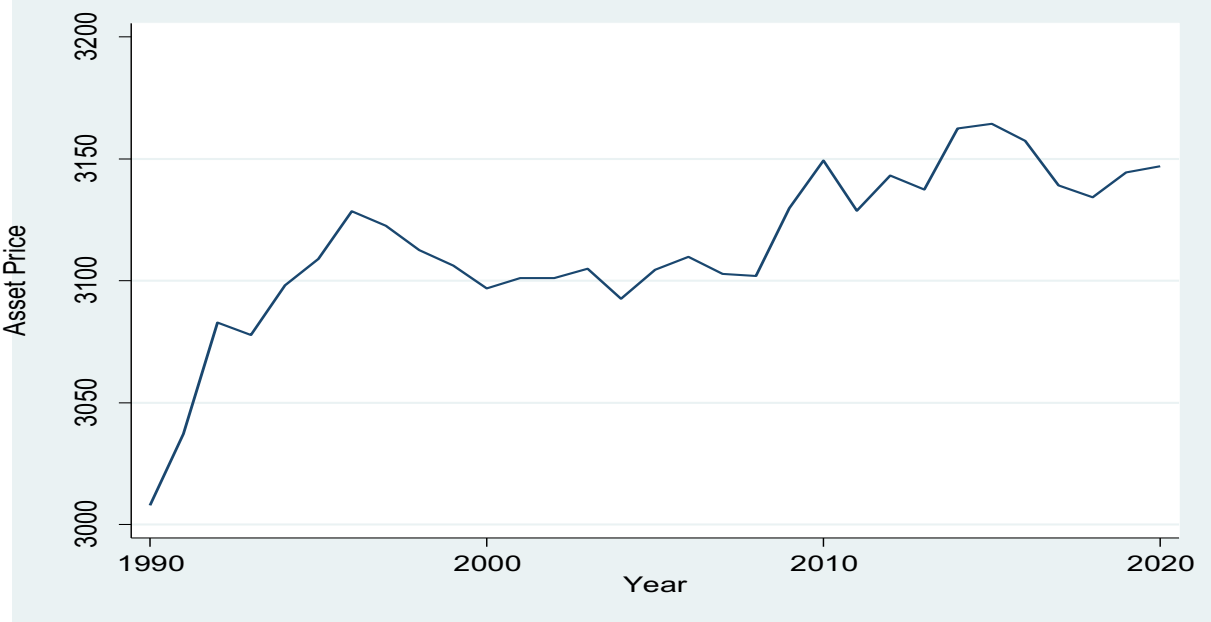

Figure 4.6: Asset Price (1990-2020)

Source: Author (2021)

Having presented time plots, Table 4.1 presents the statistics summary of all the variables. These comprises of the means, standard deviation, minimum and maximum values, as well as skewness and kurtosis coefficients.

Table 4.1:Summary statistics

Variable	Mean	Std. Dev.	Min	Max	Skewness	Kurtosis
GDP_per capita	73092.76	10246.65	62860.99	96042.01	0.9	2.63
CPI	11.60	9.47	1.55	45.98	1.97	7.01
NEER	73.68	21.58	22.91	106.45	-.61	3.01
M1(growth)	15.96	8.45	2.93	39.02	.55	3.10
Credit	19.19	6.83	11.99	36.24	1.09	1.09
Asset Price	3114.04	33.92	3007.9	3164.36	-1.09	-1.09

Source: Author (2021)

The mean per capita income for Kenya over the study period was Kshs. 73,092 with a minimum of 62,860 and maximum of 96042. On the CPI, findings indicate a mean of 11.6 with a standard deviation of 9.47 and a maximum of 45.98. This imply that there was a time when Kenya's inflation was extremely high. Kenya's effective exchange rate for the period 1990-2020 was averaged at 73.68 with a minimum of 22.91 and a maximum of 106.45. Summary statistics show that the mean growth rate of M1 stood at 15.96 with the standard deviation of 8.45 and maximum of 39.02 while with respect to credit, study results have found a mean of 19.19 central bank rate with a maximum of 36.24. Finally, the mean asset price proxied by NSE 20 share index was 3114.04 with standard deviation 33.92. The Nairobi Stock Exchange-NSE 20 share index is an indicator of the performance of the stock market with implications of the Kenyan economic performance.

With reference to Skewness, all the coefficients show that the variables have symmetrical distribution given that their values range between -2 and +2. With regard to Kurtosis, only CPI variable displays a leptokurtic distribution which is positive while the rest, show normal distribution given that their coefficients fall largely between -3 and +3. Having analysed descriptive statistics, the next section presents econometric analyses on the topic monetary transmission mechanisms.

4.3 Econometric Analysis

The study adopted VAR technique to analysis monetary policy transmission mechanisms in Kenya. This is a time-series approach and which calls for stationary time-series distribution to avoid spurious regressions. Series with unit roots (non-stationary) violates the independent assumptions of the Ordinary Least Square (OLS) methods (Wooldridge, 2009). Thus, the first step in data analysis was to investigate presence of unit roots in all the variables, this is conducted in the next-sub-section.

4.3.1 Unit root Test

The study adopted ADF test to check and test stationarity status of all the variables. Estimated results of the test are presented in Table 4.2. The test at level found that all variables contained unit roots. This was because, the ADF test statistic was less negative than the critical values at 1%, 5% and 10% levels of significance. In this case, all the variables were differenced and subjected to the test again (test at first difference) as show in Table 4.2. At this level, all except GDP per capita variable were found stationary. A second differencing was therefore conducted on GDP per capita and the variable tested again. This time, this variable became stationary after establishing a higher negative ADF test statistic as compared to the three critical values. Thus, variables became

stationary at different levels of differencing. After confirming the stationarity status, new variables were generated for data analysis.

Table 4.2: Unit Root Test

Variable	Optimal Lag (BIC)	ADF test
Level		
GDP per capita	0	2.389
CPI	0	-3.385
M1	0	-2.766
NEER	0	-2.766
Credit	0	-2.352
Asset Price	0	-3.794
First difference		
GDP	0	-3.483
CPI	0	-5.802***
M1	0	-5.977***
NEER	0	-5.977***
Credit	0	-5.411***
Asset Price	0	-5.070***
Second difference		
GDP per capita	0	-5.506***

Note: * ** indicate levels of statistical significance at 1%
Source: Author (2021)

Next, the study conducted a normality test using Shapiro-Wilk approach whose results are presented in Table 4.3. The study finds that with a null hypothesis of normally distributed data, apart from CPI, NEER and Credit, all the others variables have normal distribution given their p-value of greater than 0.05..

Table 4.3: Shapiro-Wilk test for Normal Data

Variable	W	V	z	Prob>z
GDP per capita	0.93934	1.976	1.411	0.07914
CPI	0.91555	2.751	2.096	0.01802
NEER	0.84411	5.078	3.367	0.00038
M1growth	0.97358	0.860	-0.311	0.62228
Credit	0.92064	2.585	1.968	0.02455
Asset_Price	0.95494	1.468	0.795	0.21323

Source: Author (2021)

4.3.2 Response of GDP to Monetary Policy Transmission Mechanisms (MPTMs)

To analyze the response of MPTMs to GDP, the study conducted first, a VAR regression analysis whose results are presented in Table 4.4. To examine whether VAR equations were correctly specified, the study used Eigenvalue stability condition (see Figure 4.7) which plots Eigenvalues of the companion matrix.

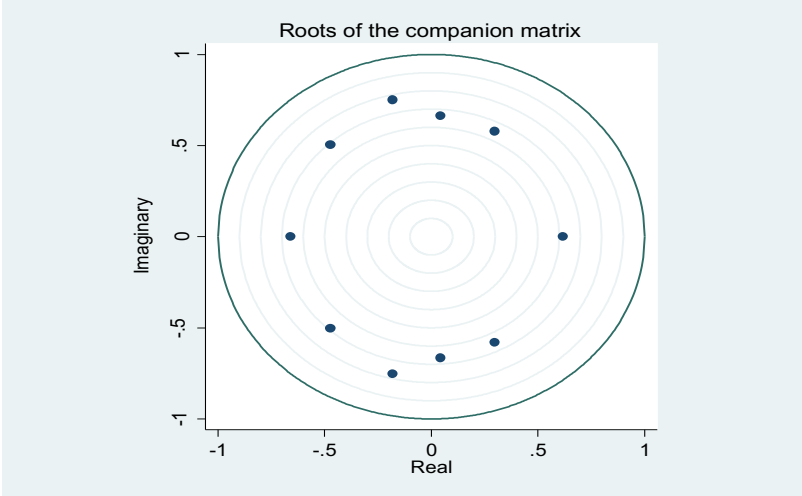

Figure 4.7: Roots of Companion Matrix

Figure 4.7 shows that the eigenvalues lie inside the unit circle (or are less than 1) implying that the VAR satisfies stability condition.

Table 4.4: Regression Coefficients

Sample: 19901stQ – 20202ndQ				Number of	obs	= 120
Log likelihood = -577.2186				AIC	=	43.60128
FPE = 2.793719				HQIC	=	44.41342
Det(Sigma_ml) = .1189579				SBIC	=	46.19443
	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
GDP_percapita						
L1.	-.4918219	.1810198	-2.72	0.007	-.8466143	-.1370296
L2.	-.7329933	.1939659	-3.78	0.000	-1.113159	-.3528271
NEER						
L1.	16.64005	59.97746	0.28	0.781	-100.9136	134.1937
L2.	144.6378	58.98374	2.45	0.014	29.03177	260.2438
M1growth						
L1.	69.65146	48.56279	1.43	0.151	-25.52985	164.8328
L2.	-13.02662	55.5711	-0.23	0.815	-121.944	95.89072
Credit						
L1.	-59.99657	122.3159	-0.49	0.624	-299.7314	179.7383
L2.	-44.78483	104.8261	-0.43	0.669	-250.2402	160.6706
Asset Price						
L1.	-17.05725	22.83346	-0.75	0.455	-61.81001	27.69551
L2.	30.51408	28.59088	1.07	0.286	-25.52302	86.55118
_cons	-327.8468	367.53	-0.89	0.372	-1048.192	392.4988

Source: Author (2021)

These regression coefficients present a short-run relationship between GDP per capita and monetary transmission mechanisms. To interpret the meaning of these findings, the study computed impulse response functions presented in Figure 4.8.

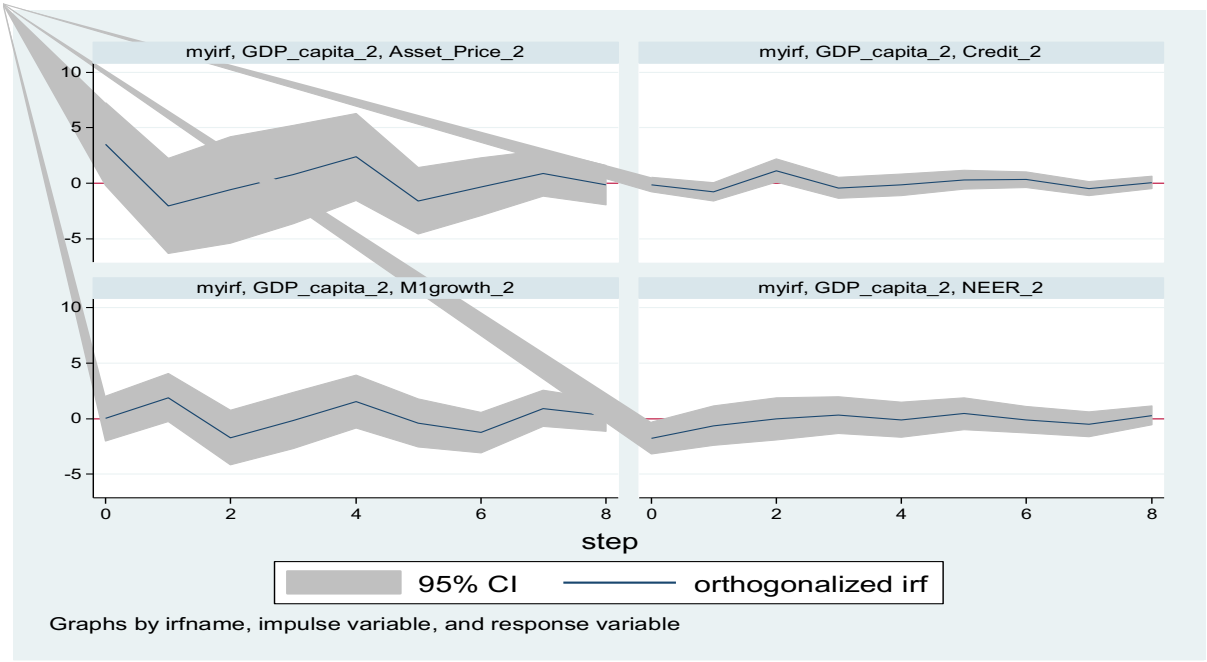

Figure 4.8: Impulse functions of Monetary policy shocks on GDP

Source: Author (2021)

The response function (1,1) shows that a shock on the asset price tend to lead to a strong negative adjustment in the GDP per capita for a period of two years. This is then followed by a positive response in the GDP per capita which was short-lived and again followed by a negative and positive cycle in GDP per capita. In general, shocks in the asset price because of adjustments in the monetary policy have led to drastic adjustments in the Kenya's per capita income for the period under study. Asset prices have been found to cause stronger shocks in Russia and Eastern Europe though not on GDP but, on loan provisions (Stann & Grigoriadis, 2020).

Secondly, a shock on credit (1,2) would initially lead to a negative and then a positive adjustment in the GDP per capita. However, this response is short-lived. Nevertheless, the responsiveness of the GDP per capita to credit (base lending rate) furnishes in a period of four years. Similar results were established by Kigabo, Munyankindi and Amahoro (2008) for the case of Rwanda, although a shock of the credit was much stronger in Rwanda as compared to Kenya.

On M1 growth (2,1), the study has found that its shock, causes a short-term positive adjustment in the GDP per capita which is then followed by another short-term negative adjustment. These positive and negative adjustments of the GDP per capita continues throughout the study period.

Finally, a shock in the NEER led to a positive adjustment in the GDP per capita for about three years and thereafter, the adjustment furnished. This could imply that during the duration under study, the effective exchange rates were more favorable to the GDP per capita. Thus, monetary policy was very effective monetary policy transmission channel to the real output. Similar findings are reported by Mukhtar and Youmans (2019). Nevertheless, Chmielewski et l. (2018) found out that the exchange rate channel was weak.

Next, the study conducted Granger causality test (see Table 4.5) which shows that GDP per capita has a bi-directional relationship with the effective exchange rate, and uni-directional relationship with credit channel, coming from credit to GDP per capita. The results from the study also indicate a bi-directional relationship between exchange rate and credit channels and between exchange rate and asset price.

Table 4.5: Granger Causality

Equation	Excluded	chi2	Df	Prob > chi2
GDP_capita	NEER	6.4304	2	0.040
GDP_capita	M1growth	2.1321	2	0.344
GDP_capita	Credit	.41151	2	0.814
GDP_capita	Asset_Price	1.55	2	0.461
GDP_capita	ALL	11.136	8	0.194
NEER	GDP_capita	6.3954	2	0.041
NEER	M1growth	.28343	2	0.868
NEER	Credit	7.7675	2	0.021
NEER	Asset_Price	19.305	2	0.000
NEER	ALL	32.903	8	0.000
M1growth	GDP_capita	4.0748	2	0.130
M1growth	NEER	5.3282	2	0.070
M1growth	Credit	3.8256	2	0.148
M1growth	Asset_Price	5.2864	2	0.071
M1growth	ALL	14.237	8	0.076
Credit	GDP_capita	5.0096	2	0.042
Credit	NEER	9.1994	2	0.010
Credit	M1growth	13.024	2	0.001
Credit	Asset_Price	1.6984	2	0.428
Credit	ALL	68.086	8	0.000
Asset_Price	GDP_capita	.99424	2	0.608
Asset_Price	NEER	13.231	2	0.001
Asset_Price	M1growth	4.874	2	0.087
Asset_Price	Credit	18.324	2	0.000
Asset_Price	ALL	26.973	8	0.001

Source: Author (2021)

4.3.3 Response of CPI to Monetary Policy Transmission Mechanisms (MPTMs)

To analyze the CPI to MPTMs, the study conducted a VAR regression analysis (see Table 4.6). To examine whether VAR equations were correctly specified, the study used Eigenvalue stability condition (see Figure 4.9) which plots Eigenvalues of the companion matrix.

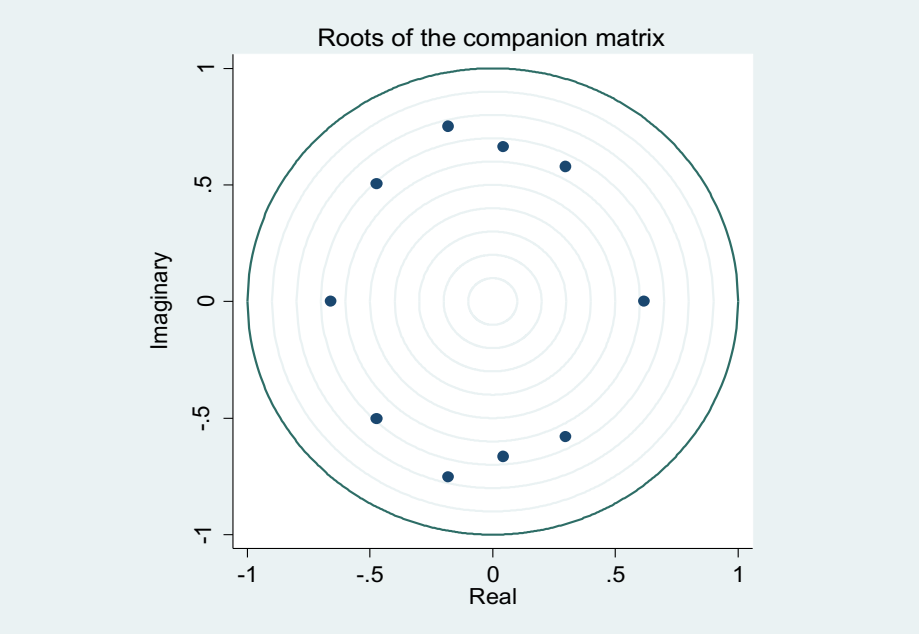

Figure 4.9: Roots of Companion Matrix

Figure 4.9 indicates that the eigenvalues lie inside the unit circle (or are less than 1) implying that stability condition for VAR was satisfied.

Table 4.6 presents the short-run relationship between CPI and monetary policy transmission mechanisms, with the results showing that the first lagged variable of NEER found statistically significant. Other significant relationships are reported with respect to the second lagged variables for credit and asset prices.

Table 4.6: Regression Coefficients

Sample: 19901stQ – 20202ndQ				Number of	obs	= 120
Log likelihood = -420.7206				AIC	=	32.80832
FPE = 2.793719				HQIC	=	33.62046
Det(Sigma_ml) = 2746481				SBIC	=	35.40147
	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
CPI						
L1.	-.1465796	.1657608	-0.88	0.377	-.4714649	.1783056
L2.	.1107544	.1525857	0.73	0.468	-.188308	.4098169
NEER						
L1.	-.5601296	.248376	-2.26	0.024	-1.046938	-.0733217
L2.	-.1797833	.2342181	-0.77	0.443	-.6388423	.2792756
M1growth						
L1.	.1944332	.1910792	1.02	0.309	-.1800752	.5689416
L2.	-.1345232	.2210123	-0.61	0.543	-.5676995	.298653
Credit						
L1.	-.9253442	.5153967	-1.80	0.073	-1.935503	.0848148
L2.	-1.747588	.477135	-3.66	0.000	-2.682756	-.8124209
Asset Price						
L1.	.1240862	.0938016	1.32	0.186	-.0597617	.307934
L2.	.3786423	.121275	3.12	0.002	.1409478	.6163369
_cons	-1.23477	1.422002	-0.87	0.385	-4.021842	1.552303

Source: Author (2021)

However, to understand the monetary policy transmission mechanisms, the study interprets impulse response functions presented in Figure 4.10.

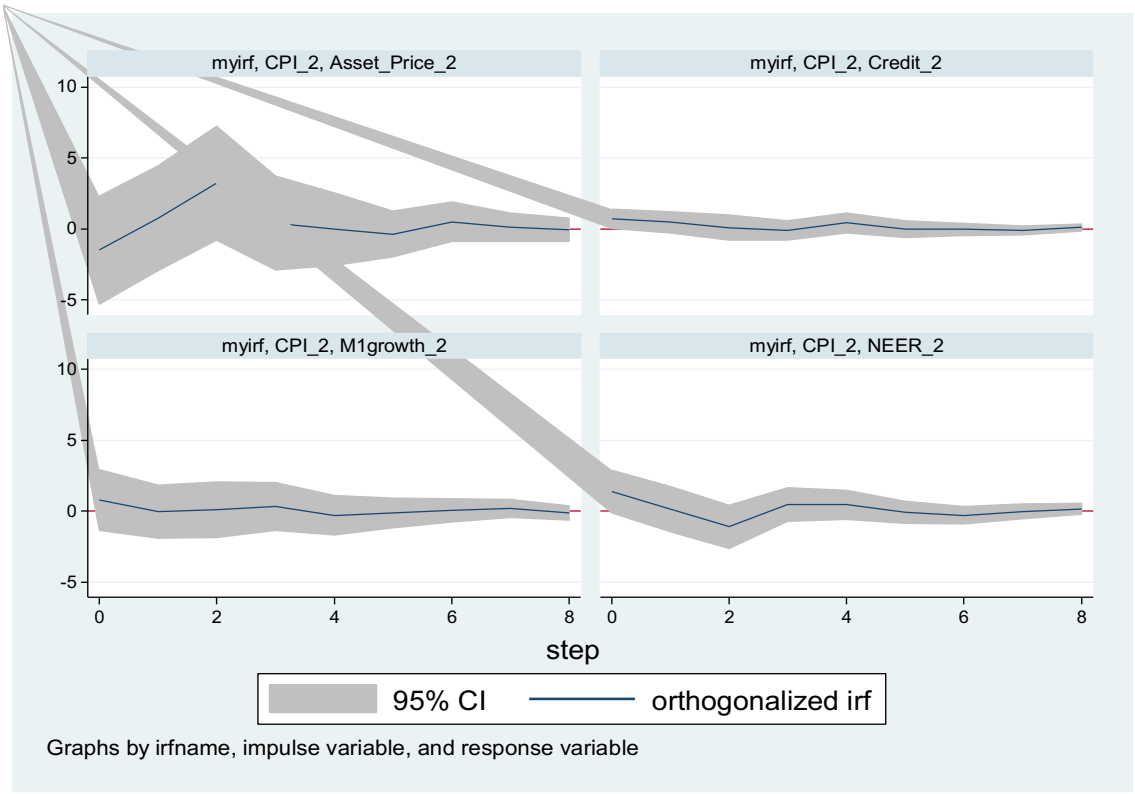

Figure 4.10: Impulse functions of Monetary policy shocks on CPI

The impulse response function (1,1) show that, initially, CPI had a short-term positive response to shocks in the asset prices a shock in the asset price followed by a negative response. The adjustment of the CPI caused by shocks in the asset prices furnished in the long run.

With regard to credit channel, there was slow response to CPI throughout the study period. Initially, a shock in the credit caused a slight negative response in the CPI which could not last long followed by positive and then, the response waned. Nevertheless, Kigabo, Munyankindi and Amahoro (2008) found no response on prices with respect to credit channel.

A shock in money growth (M1) generated a negative response in CPI which was followed shortly by a positive then again, negative response before finally furnishing. In Vietnam, Anwar and Nguyen (2018) established that M2 money supply was less strong channel of monetary transmission. Finally, a shock in NEER had an initial sharp negative response which was later followed by another sharp but positive response in CPI. CPI stabilized in the long run.

Finally, the study examined the short-run relationships using granger causality test (see Table 4.7) for results.

Table 4.7: Granger Causality

Equation	Excluded	chi2	Df	Prob >ch2
CPI	NEER	5.9197	2	0.052
CPI	M1growth	1.509	2	0.470
CPI	Credit	17.436	2	0.000
CPI	Asset_Price	11.647	2	0.003
CPI	ALL	36.787	8	0.000
NEER	CPI	4.0443	2	0.132
NEER	M1growth	.66151	2	0.718
NEER	Credit	5.9318	2	0.052
NEER	Asset_Price	18.706	2	0.000
NEER	ALL	28.792	8	0.000
M1growth	CPI	.38569	2	0.825
M1growth	NEER	2.9646	2	0.227
M1growth	Credit	2.4778	2	0.290
M1growth	Asset_Price	3.4302	2	0.180
M1growth	ALL	9.4142	8	0.309
Credit	CPI	.59329	2	0.743
Credit	NEER	5.5468	2	0.062
Credit	M1growth	10.731	2	0.005
Credit	Asset_Price	1.2189	2	0.544
Credit	ALL	55.479	8	0.000
Asset_Price	CPI	1.0463	2	0.593
Asset_Price	NEER	14.676	2	0.001
Asset_Price	M1growth	4.9245	2	0.085
Asset_Price	Credit	12.595	2	0.002
Asset_Price	ALL	27.07	8	0.001

Source: Author (2021)

The granger causality test results show that CPI had a unidirectional relationship with both credit and asset price channels. The relationship is running from CPI the credit channels. This imply that consumer price index determines to certain extent the asset prices and level of credit in the economy. There is a bidirectional relationship between NEER and asset prices as well as asset prices and credit channels.

CHAPTER FIVE

SUMMARY, CONCLUSION AND POLICY RECOMMENDATION

5.1 Introduction

After presentation of results and discussion in the previous chapter, the summary of the study and conclusions are provided in chapter five. In addition, the chapter provides policy recommendations.

5.2 Summary

The study sought to evaluate MPTMs in Kenya. Specifically, the study addressed the following objectives. Three specific objectives were formulated in this case. They included to evaluate the effects of credit, exchange rate and asset price monetary policy transmission channels on price and real GDP, determining which transmission mechanism is more effective in Kenya and finally, to test for granger causality between monetary policy transmission channels, output, and inflation.

The study focused on the Kenyan economy between the first quarter of 1990 up to quarter four of 2020. The study adopted VAR technique to estimate the results which comprised of the regression coefficients and then, impulse response functions and granger tests-which are post-VAR estimations. Prior to the VAR estimation, the study conducted the unit root test on all variables using ADF technique. The test was aimed at ensuring that all variables are stationary to avoid spurious regressions which might have resulted in the presence of non-stationary variables. In addition, the study computed Eigenvalues to check for the stability of the model. In both the two regressions conducted, Eigenvalues of less than 1 were reported in each of the estimated equations,

an indication of stability in the VAR model. Thus, the estimated results are believed to be free from bias and hence, they can inspire relevant policies.

With reference to the first objective, the study finds that both asset price and M1 money growth channels of monetary transmission had mixed results. This is because, shocks in these variables caused sharp negative and positive responses on the GDP per capita income in Kenya. But, M1 growth was fairly effective in the long-run. Nevertheless, the study has established that both credit and exchange rate were very effective monetary policy transmission mechanisms with respect to both GDP per capita and CPI in Kenya.

On the question of what transmission mechanism is more effective, the results indicate that generally, credit channels, and exchange rate were more effective transmission channels to GDP per capita and with reference to CPI, credit and M1 money growth are found to be more effective monetary policy transmission channels. Thus, credit channel is more effective pass-through mechanism to both GDP per capita and CPI.

Finally, study results on granger causality show a bi-directional relationship between GDP per capita and the effective exchange rate. Additionally, there is a bidirectional relationship between NEER and asset prices as well as asset prices and credit channels. A uni-directional relationship with credit channel, coming from credit to GDP per capita was discovered. CPI had a unidirectional relationship with both credit and asset price channels.

5.3 Conclusion

Following summary of the findings, the study concludes that both asset price and M1 money growth channels of monetary transmission had mixed results. Secondly, it is concluded that both exchange rate and credit were very effective monetary policy transmission mechanisms with respect to both GDP per capita and consumer price index in Kenya. Thirdly, the study concludes

that both credit channel is more effective pass-through mechanism to both GDP per capita and CPI. Fourthly, it is concluded by the study that there is a bi-directional relationship between GDP and the effective exchange rate and a bidirectional relationship between NEER and asset prices as well as asset prices and credit channels.

5. 4 Policy Recommendation

The government through monetary authorities is hereby called upon to maintain the base lending rates (credit channel) as it has proven to be an effective monetary transmission channel to the growth and stability of real economy. Maintaining stability of the exchange rate will also go a long way in enhancing macroeconomics and spearhead movement towards a steady stage.

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