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**DETERMINANTS OF INFLATION IN KENYA AND THE  
MODERATING EFFECTS OF GOVERNANCE REGIMES**



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**Admission No: MDF/66134/18**

**A Dissertation submitted to the Strathmore University Business School in  
partial fulfilment of the requirements for the Degree of  
Master of Science (MSc) in Development Finance of Strathmore University**

***Strathmore University Business School***

**Strathmore University**

**Nairobi, Kenya**

**August 2022**

## DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, the dissertation contains no material previously published or written by another person except where due reference is made in the dissertation itself.

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## ABSTRACT

A high level of inflation is undesirable because it causes a depreciation of the local currency. It also makes long-term financial planning difficult for market participants resulting in an inefficiency in a market economy, and subsequently, a lower rate of economic growth. An ideal economy would have price stability (low and steady inflation) and the wider economic goal of strong and sustainable growth and employment would be achieved. This study examined monetary and non-monetary determinants of inflation in Kenya, a developing country with a monetary policy objective of inflation-targeting. Using an Error Correction Model (ECM) based on the Autoregressive Distributed Lag (ARDL) model to explain the short run and long run impacts of each variable on inflation, this study covered secondary quarterly data spanning 25 years (1996 – 2020). The unique contribution of the study was the investigation of the moderating effects of governance regimes on the determinants of inflation. Governance regimes were examined with respect to the President of the country and the Central Bank Governor. The study concluded that in the Kenyan context, inflation is primarily influenced by prevailing interest rates and the most recent rates of inflation in the short run. The non-monetary factors and other monetary factors examined do not have a long run nor short run impact on the level of inflation, but given the moderating effects of governance regimes, their influence may be felt sporadically. Global oil prices and public debt levels are emerging as major factors influencing the rate of inflation. The study emphasises the importance of good governance to ensure consistency of policy across regimes in order to maintain price stability.

**Key words:** ARDL model, inflation-targeting, price stability, monetary determinants, non-monetary determinants and governance regime.

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## LIST OF ABBREVIATIONS AND ACRONYMS

ARDL	-	Autoregressive Distributed Lag Model
ADF	-	Augmented Dickey-Fuller Test
AIC	-	Akaike Information Criterion
ARDL	-	Autoregressive Distributed Lag Model
CBK	-	Central Bank of Kenya
CMA	-	Capital Markets Authority
CPI	-	Consumer Price Index
ECM	-	Error Correction Model
EDF	-	Empirical Distribution Function
GDP	-	Gross Domestic Product
HIC	-	Hannan-Quinn Information Criterion
IMF	-	International Monetary Fund
IRA	-	Insurance Regulatory Authority
KIPPRA	-	Kenya Institute of Public Policy Research and Analysis
KNBS	-	Kenya National Bureau of Statistics
KRA	-	Kenya Revenue Authority
MPC	-	Monetary Policy Committee (of the Central Bank of Kenya)
NSE	-	Nairobi Securities Exchange
OLS	-	Ordinary Least Squares Regression Method
OMO	-	Open Market Operations
RBA	-	Retirement Benefits Authority
SASRA	-	Sacco Societies Regulatory Authority
SBIC	-	Schwarz Bayesian Information Criterion

## DEFINITION OF TERMS

<b>Deflation</b>	A sustained decline in the price level (Blanchard, 2017). It is the opposite of inflation. It may also be referred to as negative inflation.
<b>Degrees of freedom</b>	The number of values free to vary when computing a statistic. The number of degrees of freedom for a contingency table of at least two rows and 2 columns of data is calculated from: $(\text{number of rows in the table} - 1) * (\text{number of columns in the table} - 1)$ (Saunders, Lewis and Thornhill, 2012).
<b>Disinflation</b>	A slow-down in the rate of inflation (Blanchard, 2017).
<b>Hyperinflation</b>	Instances of extraordinarily high inflation (Mankiw, 2010). This is an extremely high cost of living for residents in an economy.
<b>Inflation</b>	A sustained rise in the general price level (Blanchard, 2017). It is a macroeconomic variable used to analyse the state of an economy.
<b>Inflation-targeting</b>	A monetary policy strategy that entails seeking to achieve a certain target for the level of inflation for an economy over a specified period, with an objective of anchoring long-term inflation expectations. This approach is characterized, as the name suggests, by the announcement of official target ranges for the inflation rate at one or more horizons, and by explicit acknowledgment that low and stable inflation is the overriding goal of monetary policy (Bernanke and Mishkin, 1997).
<b>Monetary determinants</b>	For the purpose of this study, these are factors linked to monetary policy transmission. These include interest rates, exchange rates and money supply.

**Non-monetary  
determinants**

For the purpose of this study, these are all other factors that do not relate to monetary policy transmission. These include food prices, oil prices (energy costs), imported inflation and inflation expectations.

**Stagflation**

A situation that combines economic stagnation (falling output) with inflation (rising prices) (Mankiw, 2009). The stagnation referred to is slow economic growth.



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## DEDICATION

This work is dedicated to my parents for motivating, inspiring and relentlessly encouraging me to go on and complete the Master of Science in Development Finance degree. They never wavered.



# CHAPTER 1: INTRODUCTION

## 1.1. Introduction

This chapter captures the background of the study, followed by a statement of the problem, the research objectives, and the research questions that the study will seek to address. The scope of the study will follow thereafter and finally, the justification for the study.

## 1.2. Background

### 1.2.1. Inflation and Monetary Policy in Developing Countries

Most governments in developing countries are faced with the challenge of facilitating development in their economies to tackle their innate problems, key among them, poverty eradication. Africa is one continent that plays host to several developing countries. Historically referred to as the *Dark Continent*, Africa has, in recent years, had a renewed interest from the developed countries as an investment destination.

History has shown that countries that focus on building structures can promote their own development. A good case of this is the story of the *Asian Tigers*<sup>1</sup> who emerged from poverty after the devastating impact of World War II, becoming a phenomenal example of consistent growth despite financial crises such as the Asian crisis of 1997 and the global financial crisis of 2008.

In sub-Saharan Africa, there is another story – the story of the six *African lion economies*<sup>2</sup> that are among the developing countries that have continued to consistently grow at a fast pace.

Frankel (2010) carried out a survey of monetary policy implementation in emerging markets and identified certain distinct challenges for developing countries. To begin with, he noted that compared to large industrialized countries, the characteristics that distinguish most developing countries, include: greater exposure to supply shocks in general and trade volatility in particular; procyclicality of both domestic fiscal policy and international finance; lower credibility with respect to both price stability and default risk; and other imperfect institutions.

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<sup>1</sup> Asian Tigers: Hong Kong, Taiwan, Singapore and South Korea

<sup>2</sup> African Lions: Nigeria, South Africa, Ghana, Ethiopia, Mozambique and Kenya

According to Frankel (2010), the exchange rate was the favoured nominal anchor for monetary policy in inflation stabilisations of the late 1980s and early 1990s. On assessing the exchange rate as the key monetary policy objective, he noted that the contractionary effects of devaluation are also far more important for developing countries as price-takers on world markets, particularly the balance sheet effects that arise from currency mismatch.

Frankel (2010) noted, however, that after the currency crises of 1994-2001, inflation-targeting emerged as the preferred monetary regime in place of exchange rate targets. The global financial crisis revealed limitations to the choice of CPI for the role of price index.

Emerging economies have struggled to maintain inflation at manageable levels, and given that it has a link with sustainable economic growth, it cannot be ignored. Ochieng, Mukras and Momanyi (2016) posit that in many sub-Saharan countries, it is challenging for monetary authorities to control inflation even if there is a political will, due to weak institutional frameworks, thin financial markets and imperfect competition among banks.

### ***1.2.2. Understanding Inflation and its Determinants***

To understand inflation, one must first understand the distinction between price and value. Price can be viewed as the measure of the meeting point where a seller and a buyer agree to exchange money in order for one to enjoy a certain economic benefit of an asset. Value on the other hand can be viewed as the subjective measure of the economic benefit of an asset. These manifest within an economy through the infamous Law of Supply and Demand.

Inflation is defined by Blanchard (2017) as a sustained rise in the general price level. This is not to be confused with hyperinflation which Mankiw (2010) describes as instances of extraordinarily high inflation. Mankiw (2010) identifies the classic examples of Germany in 1923, when prices increased an average of 500 percent per month and Zimbabwe in 2008 when hyperinflation gripped the nation, reaching a peak inflation estimated at 6.5 sextillion percent in mid-November. This resulted in the depreciation of the Zimbabwean currency which was resolved by the adoption of the US Dollar.

Deflation is the opposite of inflation and is defined as a sustained decline in the price level (Blanchard, 2017). It may also be referred to as negative inflation. A slow-down in the rate of inflation is referred to as disinflation.

The measurement of inflation is mainly done through the Consumer Price Index (CPI). The CPI measures the cost of a market basket of consumer goods and services relative to the cost of that bundle during a particular base year (Samuelson and Nordhaus, 2010). The constituents of the consumption basket are assumed to be standard over a period. As such, the CPI is the most common measure of inflation. In practice, however, the consumption basket is likely to evolve over time owing to technological advancements and changes in consumer behaviour. These changes could manifest through changes in fashion, tastes and preferences.

From a producer perspective, there also exists another measure known as the Producer Price Index (PPI) which measures the average changes of prices of products at all stages of production. The intuition behind this is that prices of goods and services are majorly determined at the point of production due to the cost of inputs. However, PPI does not feature predominantly with reference to the inflation debate as the CPI essentially relates to the ultimate price paid by the consumer, which includes taxes.

Another lesser used measure of inflation is the GDP deflator. The GDP deflator is the price of all of the different components of GDP (Samuelson and Nordhaus, 2010). It is often taken as the ratio of the nominal GDP to the real GDP. The CPI differs from the GDP deflator in that it is based on a particular basket of goods and services; the GDP deflator is based on the whole economy. There are numerous other measures of inflation<sup>3</sup>, which speaks to the concern around this macroeconomic phenomenon.

Inflation is caused by several diverse factors. These could be broadly categorized as being either monetary or non-monetary. Monetary factors relate to those linked to monetary policy transmission. Inflation is a matter of price, which goes hand-in-hand with money, after all. The factors in question include interest rates, exchange rates and money supply.

There is the famous assertion by Friedman (1960) that “inflation is always and everywhere a monetary phenomenon”; and, as a result, “no country can succeed in stemming inflation without adopting measures directed at restraining the growth of the stock of money”.

Non-monetary factors (all other factors that do not relate to monetary policy transmission) include food prices, oil prices (energy costs), imported inflation and inflation expectations. There seems to be no consensus as to whether non-monetary

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<sup>3</sup> For example, wholesale price index (WPI), employment cost index (ECI) and retail prices index (RPI)

factors have significant influence on inflation based on available literature, though there seems to be a general alignment on monetary factors. The Monetary Policy Committee (MPC, 2021), through a white paper published on the Central Bank of Kenya (CBK) website (<https://www.centralbank.go.ke/modernisation-of-the-monetary-policy-framework-operations/>) identifies external shocks such as the global financial crisis and more recently, the global COVID-19 pandemic that create uncertainties for economic agents.

Among the non-monetary factors assessed in this study was the level of debt as measured by the debt-to-GDP ratio. In recent years, Kenya has taken on more debt, which may have influenced inflationary expectations. The country also issued debt in the international markets. A case that illustrates the impact of debt and inflationary expectations is when the inaugural five-year Eurobond issued by the country in June 2014 was due to mature in June 2019, a principal of US\$ 750 million. The expectation of a significant cash outflow in foreign currency (US Dollars) led to expectations of increased inflation. The rate of inflation in April 2019 was at 6.98 percent, but the issuance of a new Eurobond in May served to ease expectations as inflation dropped to 5.49 percent. It was envisaged that part of the US\$ 2 billion Eurobond would offset the cash outflow.

Spratt (2009), while describing Fisher's explanation of the cause of the Great Depression, notes that the increase in borrowing raises the money supply and therefore the rate of inflation, and this rise in prices reduces the value of the debt, which encourages ever more borrowing.

In addition to the aforementioned factors, this study investigated the movement of the stock market index to establish whether it has a significant influence on the rate of inflation. Kenya has a single stock market, the Nairobi Securities Exchange (NSE) which could serve as a valuable proxy for the performance of firms, and the economy at large.

A key distinction of the study is the examination of the inflation trends in relation to governance regimes. The study examined the moderating effects of the regimes based on the presidential regime of the time as well as the central bank governance era for the twenty-five-year period. Notably, governance is significant as inflation in Kenya has also been affected by political shocks, for example, the political transition of the 1990s and the post-election violence of 2008 (Gil-Alana and Mudida, 2016).

Given that managing inflation is under the ambit of the duties of the CBK, it would be important to examine whether a governance regime has any influence on inflation. Governance regime in this study was considered as the period within which a certain individual was the central bank Governor or the President of the country. This was a fairly novel consideration, and it was examined with a view to establishing whether the strategic and political objectives of Central Bank Governors and Presidents have had an influence, if at all, on the rate of inflation.

### ***1.2.3. Significance of Inflation***

Globally, the most common monetary policy objective is a low and stable inflation, or simply, price stability. This occurs when the price level does not adversely affect the decisions of consumers and producers. Price stability is significant in achieving the wider economic goal of strong and sustainable growth and employment. It is important for there to be some level of inflation because this ensures that other inflation-dependent factors are sustained such as a natural rate of employment.

Other secondary objectives of monetary policy include stability of the financial system, economic growth, full employment and stability of the foreign exchange markets. Therefore, ultimately, high inflation and deflation are not ideal, but price stability is.

To achieve price stability, monetary policy transmission is conducted via monetary policy tools such as open market operations, discount window (also known as standing facility), reserve requirements and interest on reserves. Open market operations include Repos, Reverse Repos, Term Auction Deposits (TAD), the Central Bank Rate (CBR), Horizontal Repos and Foreign exchange market operations.

There are a number of channels of monetary policy transmission such as the interest rate channel, the asset price channel, the exchange rate channel, the credit channel and the expectations channel. The expectations channel has emerged as a key channel based on the assumption of forward-looking and rational economic agents. The expectations channel thrives on enhanced signalling to economic agents. In practice, this channel is mainly attributed to developed economies with well-functioning and deep financial markets.

In such economies, expectations of future changes in the policy rate can immediately impact medium and long-term interest rates. Monetary policy can also guide economic agents' expectations of future inflation and thus influence price movements. Inflation

expectations matter with regard to the determination of real interest rates as well as influencing price- and wage-setting behaviour.

From the perspective of firms, a high inflation environment is not ideal as it increases the cost of debt by increasing the nominal interest rates. This reduces the willingness of firms to hire new employees and to spend in general. Firms experience a wealth effect as higher interest rates reduce their net worth and worsen their cashflow. High inflation also adds pressure to increase the wages of their workforce, thus creating uncertainties with regard to labour costs.

The government as an economic agent is keen to ensure that inflation is well managed, especially in the run-up to an election, to minimize dissent. In Kenya, the election cycle occurs every five years and this is usually taken into account. In other periods, it is important that inflation is maintained within a target for ease of planning and to ensure that there is sustained economic growth.

Unlike fiscal policy whose impact is felt fairly immediately in the economy, monetary policy is more gradual. This makes economists consider both short-term and long-term rates. It is in this regard that the term structure of interest rates comes to the fore given that monetary shocks tend to have a lagging impact on the economy. This relationship between interest rates over different horizons is the so-called term structure of interest rates which captures the relationship between default-free interest rates that only differ in the length of their maturity (Cox, Ingersoll and Ross, 1985).

The expectations hypothesis of the term structure of interest rates states that the long-term interest rate is an average of expected future short term interest rates (Mishkin, 1990). Consequently, lower real short term interest rates lead to a decline in the real long-term interest rate. Other theories include the liquidity preference theory (Hicks, 1946), the market segmentation hypothesis (Culbertson, 1957) and the preferred habitat theory (Modigliani and Sutch, 1966).

According to Cox et al. (1985), in its simplest form, the expectations hypothesis postulates that bonds are priced so that the implied forward rates are equal to the expected spot rates. Generally, this approach is characterised by the following propositions: (a) the return on holding a long-term bond to maturity is equal to the expected return on repeated investment in a series of the short-term bonds, or (b) the expected rate of return over the next holding period is the same for bonds of all maturities.

In developing countries, interest rate movements tend to have a conspicuous signalling effect on inflationary expectations owing to the dominance of banking financial institutions in the economy. The influence of the same in developed countries is much less emphasized as there are deep financial markets with a notable number of non-bank financial institutions.

The exchange rate against the major currencies could also cause inflation particularly in a country that is a net importer of goods and services. Inflation can also be caused by demand-side factors such as the amount of disposable income of economic agents.

Non-monetary factors also have a part to play with regard to inflation. However, existing literature varies depending on the country in question. One of the factors most commonly agreed on is inflation expectations which assumes that economic agents will act rationally in response to economic events.

Other factors include food prices and oil prices. These are the main drivers of inflation in developing countries. For instance, during periods of drought or excessive rain, the prices of food could increase, leading to an increase in the inflation rate. Fluctuating world oil prices could impact inflation, and this would be observed in movements in energy costs as well as transport costs.

Like most macroeconomic variables, inflation is a double-edged sword; there are winners and losers. Among those who benefit in times of high inflation are borrowers, especially those who borrow for a longer time horizon. Inflation causes a decline in the real value of repayments, *ceteris paribus*. Similarly, those who hold real assets such as property and land benefit from the appreciation in real value. Workers who have market power are also well-placed to benefit from inflation as they are able to negotiate wage increments in line with the shift in purchasing power. This is so because for firms, wages – an expense to firms – tend to be relatively static. A key objective of firms is to maximise profits.

On the flip side, one category of losers in the incidence of high inflation are lenders who suffer an opportunity cost on their funds and are predisposed to receive lower repayments in real terms. Individuals or households with fixed income interest investments such as fixed deposits are also likely to suffer a decline in real terms, particularly if the rate of their return on investment is lower than inflation. As Samuelson and Nordhaus (2010) put it, an unanticipated inflation redistributes wealth from creditors to debtors, helping borrowers and hurting lenders; an unanticipated deflation has the opposite effect.

Naturally, workers whose incomes do not keep pace with inflation are likely to lose out in the instance of a high inflation rate economy. These are often workers without enough leverage to negotiate increases to their wages in line with inflation such as casual labourers and contract employees.

The poor also stand to lose in case of hoarding within a high inflation environment. Oftentimes, people would buy non-perishable commodities (such as cereals) and other goods as stores of wealth (such as gold) to avoid the losses expected from the declining purchasing power of money. This in turn creates shortages of the hoarded goods. Unlike the rich, the poor would be more vulnerable in such a scenario.

Blanchard (2017) identifies four main costs of inflation among economists: shoe-leather costs, tax distortions, money illusion and inflation variability. Shoe-leather costs relate to the opportunity cost of trips to access one's funds from the bank which include working more or enjoying leisure. The tax distortions are the result of interactions between taxation and inflation among different tax brackets which may affect nominal income but not real income – inflation tends to increase the nominal income.

The money illusion arises from not taking into consideration the real value of money and assets. This leads economic agents to make incorrect decisions based on the illusion of increased value in nominal terms which may not be accompanied by increase in real terms. Inflation variability increases the risk of financial assets which promise fixed future nominal payments.

However, Blanchard (2017) also identifies certain benefits of inflation: seignorage; the use of the interaction between money illusion and inflation in facilitating real wage adjustments; and the option of negative real interest rates for macroeconomic policy. Seignorage refers to the process of money creation by central banks issuing treasury securities such as bonds through open market operations as an alternative to borrowing from the public or raising taxes.

As for the somewhat paradoxical money illusion interplay with inflation for wage adjustments, Blanchard (2017) notes that the constant process of change that characterizes modern economies means some workers must sometimes take a real pay cut. Thus, the argument is that the presence of a level of inflation allows for these downward real wage adjustments more easily than if inflation is equal to zero. So, for instance if inflation is 5 percent and nominal wages are increased by 1 percent, the net effect is the same as a nominal reduction of 4 percent in an economy with zero

inflation. However, workers would be willing to opt for the first instance. This is analogous to the question of whether a kilogram of feathers is heavier than a kilogram of steel. Of course, they weigh the same, but there is a psychological inclination to believe that the steel is heavier than the feathers.

From a developmental standpoint, inflation is important to consider for the bottom of the pyramid if indeed developing countries are to achieve the goal of eradicating poverty. The poor tend to spend a larger share of their meagre incomes on food, and as a result, high food prices are likely to affect them more than other segments of the population. Additionally, high food prices have the potential to push some lower middle-income households back to below poverty lines.

If a higher inflation rate meant just a faster but proportional increase in all prices and wages — a case called pure inflation — inflation would be only a minor inconvenience because relative prices would be unaffected (Blanchard, 2017). The challenge with pure inflation is that it is virtually impossible – during periods of inflation, prices and wages do not rise evenly and inflation leads to other distortions such as increased uncertainty which is exacerbated by taxes.

High levels of inflation inhibit economic growth by causing the local currency to lose value relative to international currencies, thereby affecting the competitiveness of local goods and services in the global markets. This arises with the increased cost of exporting the products to foreign markets. This also makes it difficult for foreign investors to make long-term financial decisions owing to uncertainty about the future value of their investments and savings (postponed consumption). This translates to inefficiency in a market economy and, in the medium to longer term, to a lower rate of economic growth.

#### ***1.2.4. Deflation and Zero Inflation***

One might wonder whether deflation (negative inflation) is desirable, given that inflation is worrisome. The answer is a resounding ‘no’. A high rate of deflation has much of the same effects as high inflation in that it also leads to increased uncertainty and has an impact on the effectiveness of monetary policy.

The crux of the matter is that dynamic changes in the general price level affect the economy by increasing uncertainty. Therefore, the ideal scenario is one in which price stability is maintained. This is achieved by maintaining a low and steady rate of inflation. In an ideal economy, price stability would be present, and the wider economic goal of strong and sustainable growth and employment would be achieved.

Why not eliminate inflation altogether?

A zero-inflation target is idealistic because it assumes a frictionless economy. In reality, there are frictions such as the resistance of reductions in wages. Efficient labour markets would rebalance such that there would be reductions in some sectors and increases in other sectors. Yet workers and firms are extremely reluctant to cut money wages. Some economists believe that, in the context of downward rigidity of nominal wages, a zero rate of inflation would lead to higher unemployment on average.

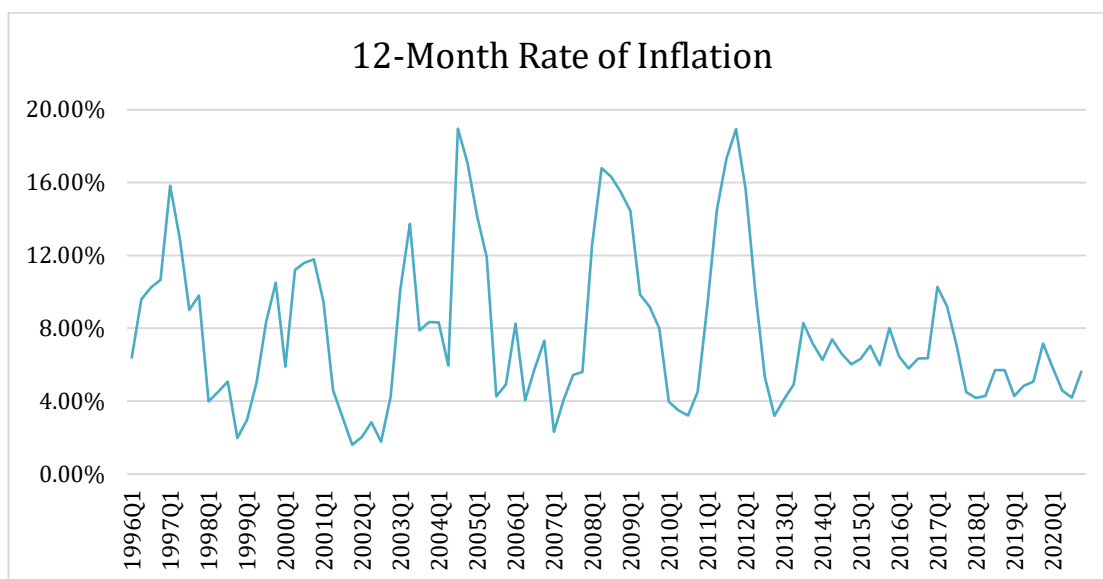
A more grievous concern about zero inflation is that economies might face a liquidity trap were they to encounter a major contractionary shock. They might need negative real interest rates to climb out of the recession with monetary policy. While fiscal policy would still be effective, most macroeconomists believe that a better solution is to aim for a positive inflation rate so that the threat of liquidity traps is minimized (Samuelson and Nordhaus, 2010).

The option of negative interest rates speaks to a scenario whereby inflation rates are so low that they hamper the influence of monetary policy in fending off a liquidity trap. In a high inflation environment, there is more wiggle-room to apply monetary policy. This scenario was observed during the global financial crisis whereby banks in developed countries were avoiding lending to the market and then had to allow for negative interest rates.

This also manifested globally more recently with the onset of the COVID-19 pandemic in 2020. The Kenyan banks responded by restricting credit to borrowers on account of the uncertainty that prevailed.

#### ***1.2.5. Inflation-targeting in Kenya***

In this study, the researcher examined the dynamics of inflation in Kenya, a developing country located in sub-Saharan Africa. Over the last two and a half decades, the monetary policy framework in Kenya has evolved from a purely monetary aggregate targeting framework towards a more forward-looking framework (MPC, 2021). The MPC defines the forward-looking monetary policy framework (inflation-targeting) as a strategy that communicates a numerical target for the level of inflation over a specified period, with an objective of anchoring long-term inflation expectations.



**Figure 1: Trend of the Rate of Inflation in Kenya**

Source: Author computation

From **Figure 1**, it is evident that inflation had been extremely volatile in the earlier years but has largely been tamed over time.

As observed from historical KNBS data, Kenya has had an average annual inflation rate reach as high as 54.52 percent in March 1984. In the period after the global financial crisis, inflation peaked at 15.96 percent in March 2009 and reached as low as 3.18 percent in October 2010. The MPC identifies the gradual decline in inflation in Kenya with better macroeconomic management; falling from the double digits witnessed in the 1990s to average 8.6 percent in 2000-2009, 7.1 percent in 2010-2019 and 5.5 percent in 2020-2021 (MPC, 2021).

According to Mishkin (2001), inflation-targeting encompasses five main elements: the public announcement of medium-term numerical targets for inflation; an institutional commitment to price stability as the primary goal of monetary policy, to which other goals are subordinated; an information inclusive strategy in which many variables, and not just monetary aggregates or the exchange rate, are used for deciding the setting of policy instruments; increased transparency of the monetary policy strategy through communication with the public and the markets about the plans, objectives, and decisions of the monetary authorities; and increased accountability of the central bank for attaining its inflation objectives.

According to the website of the CBK (<https://www.centralbank.go.ke/our-mission/>), its principal objective is the formulation and implementation of monetary policy

directed towards achieving and maintaining stability in the general level of prices (low and stable inflation).

In the Kenyan monetary policy framework, the ultimate objective is to manage headline inflation. Kenya targets an inflation rate of between 2.5 percent and 7.5 percent. The psychological median of 5 percent is a key consideration as any rate above 5 percent is likely to be worrisome to the participants in the economy.

The intermediate target is to manage inflation forecasts and expectations whereas the operational target is to control the overnight interbank rate through the central bank rate. While inflation-targeting has the advantage of transparency and accountability in an attempt to attain the target level of inflation, it could also present the challenges of delayed signalling because of the lags in monetary policy transmission and low economic growth as a result of low inflation.

Historically, Kenya had experienced low rates of inflation since independence in 1963 which began to rise in the late 1970s. This rise was mainly attributed to poor rainfall, global world recession and the oil crisis due to increasing oil imports as the oil prices rose (Kirimi, 2014). An oil shock and an attempted coup in 1982 eroded investor confidence and resulted in capital flight, leading to a rise in inflation.

The transition to an inflation-targeting framework began in 1993 on the backdrop of a high-inflation economic environment. The high inflation rate was mainly attributed to the low investor confidence owing to the transition to multi-party politics in 1992. The inflation-targeting monetary policy has been implemented since then with certain modifications.

The MPC (2021) notes that prior to 2008, the conduct of monetary policy was based entirely on a monetary aggregate targeting framework which later became unreliable owing to the rapid deepening of the financial markets, increased use of electronic payment systems over cash and a deepening of financial inclusion. Therefore, in order to better anchor inflation expectations, the CBK embarked on reforms geared towards transforming its framework from the quantity-based monetary aggregate targeting framework to a forward-looking monetary policy framework.

However, the adoption of this new monetary policy framework slowed down with the introduction of interest rate caps between September 2016 and November 2019, and the disruptions caused by the placement of three commercial banks under receivership in 2015 and 2016, a move that undermined the effectiveness of monetary policy transmission. The repeal of interest rate caps served to restore the clarity of monetary

policy decisions and was expected to strengthen the transmission of monetary policy (MPC, 2021).

Other teething troubles associated with the transition to the forward-looking monetary policy framework were the misalignment of the policy rate and short-term rate due to inefficiencies in the interbank market, largely attributed to segmentation, and the lack of transparency in commercial bank loan pricing. These will need to be addressed by the CBK and the findings of this study could help to inform the practical solutions.

According to Ochieng et al. (2016), the inflation targets in Kenya have been frequently missed and the implication of such dynamic inconsistencies is that macroeconomic policies formulated on the basis of inconsistent inflation forecasts may have a negative impact on economic growth. They further state that many reasons have been advanced for dynamic inconsistencies among them deficient models. These deficiencies include the lag selection, inappropriate transmission mechanism, inefficiency of financial systems and poor choice of policy tools.

Interestingly, Misati et al. (2012) studied the feasibility of inflation-targeting in an emerging market and concluded from the results that the Kenyan economy does not meet all the conditions necessary for adopting inflation-targeting. This is critical since inflation-targeting as a policy objective has been in place for over twenty-five years.

### **1.3. Problem Statement**

The CBK is mandated to formulate and implement monetary policy directed towards achieving and maintaining stability in the general level of prices (low and stable inflation). With price stability also as the most common monetary policy objective globally, its importance cannot be ignored.

As observed from historical KNBS data, the inflation rate in Kenya has been volatile, reaching as high as 15.96 percent in March 2009 and as low as 3.18 percent in October 2010.

We have already established that in the balance of things, an elevated level of inflation is undesirable by economic agents because it causes a depreciation of the local currency relative to international currencies. Depreciation of a currency tends to increase a country's balance of trade (net exports) by improving the competitiveness of domestic goods in foreign markets while making foreign goods less competitive in the domestic market by becoming more expensive.

A high inflation environment also makes it difficult for long-term financial planning with regard to investments and savings, resulting in an inefficiency in a market economy and, subsequently, a lower rate of economic growth. In an ideal economy, price stability would be present, and the wider economic goal of strong and sustainable growth and employment would be achieved.

Price stability is a major challenge for developing countries. In the case of Kenya, this had been an elusive target for the CBK, though it has improved in recent years. As noted by Ochieng et al. (2016), inflation targets in Kenya have been missed frequently, and the level of inflation has been higher compared with the level of inflation in developed and emerging economies. Such missed inflation targets present a dynamic inconsistency challenge to policy makers.

Furthermore, given the weight taken by food and non-alcoholic beverages in the consumption basket used to compute Kenya's CPI, high inflation will be reflected in food prices. As stated in the Kenya Economic Report 2020 (KIPPRA, 2020), since food CPI and overall CPI move together, persistent food inflation can be a threat to macroeconomic stability. Whereas the affluent can easily forego certain luxuries and bootstrap, high food prices would end up having more adverse effects on the poor who have less disposable income.

The effects of inflation on development cannot be emphasised enough. The poor spend a larger share of their incomes on food, and therefore high food inflation is likely to affect them more than other segments of the population. High food prices also have the potential to push some middle-income households back to below poverty lines.

Inflation is also sensitive to economic and political events. Kenya has observed economic crises such as the foreign exchange rate crises of 1993, 1997 and 2015. The collapse of commercial banks such as Charterhouse Bank (under statutory management), Chase Bank (acquired by a foreign entrant), Imperial Bank and Dubai Bank (both insolvent) have served to erode investor confidence. These have a direct impact on inflation as well given the contagion effects. The recent global financial crisis and the COVID-19 pandemic have also impacted inflation in Kenya.

Politically, the onset of multi-party politics and the general election cycles have had an impact on inflation. The post-election violence of 2007 had a longstanding effect on the perception of Kenya's political risk given that the country had been known as the model of peace within the East African region. The violence that ensued after the general election had a notable impact on the economy well into 2008.

Given the unique characteristics of developing countries, it is quite interesting to note from literature that there is no consensus on the global determinants of inflation (Frankel, 2010; Modena, 2008). Scholars such as Ochieng, Mukras and Momanyi (2016), Odusanya and Atanda (2010), KebretTaye (2013) and Gyebi and Boafo (2013) identify differing determinants of inflation.

By gaining an understanding of the determinants of inflation in Kenya, it is envisaged that by adjusting these factors, policy makers would be better placed to develop appropriate policies to ensure that inflation is managed well enough to achieve price stability. The end goal of this is to achieve sustained economic growth.

#### **1.4. Research Objectives**

The main objective of the study was to evaluate the determinants of inflation in Kenya and the moderating effects of governance regimes.

The specific objectives of this study were to:

- i. Evaluate the monetary determinants of inflation in Kenya (those that relate to monetary policy transmission).
- ii. Evaluate the non-monetary determinants of inflation in Kenya.
- iii. Appraise the moderating effect of the governance regime (with respect to the President and Central Bank Governor) in place on inflation in Kenya.

#### **1.5. Research Questions**

- i. To what extent do monetary determinants influence inflation in Kenya?
- ii. To what extent do non-monetary determinants influence inflation in Kenya?
- iii. How much does the governance regime in place (with respect to the President and Central Bank Governor) moderate the rate of inflation in Kenya?

#### **1.6. Scope of Study**

This study examined quarterly data for the period from 1996 to 2020. This was a period characterised by the monetary policy objective of inflation-targeting after the shift in 1993 from a fixed exchange rate policy environment to a floating rate environment. It can be inferred that with an allowance of about three years, the transition had become fully adopted by 1996.

The study relied on secondary data that is publicly available for the period. Unlike the study by Mehl (2006), the focus of the study was on one country only – Kenya – and it did not consider exchange rate impact brought about by trade and diaspora remittances.

Fiscal policy tools such as taxes and subsidies were not covered in this study as part of non-monetary factors. This is because taxes and subsidies tend to be subjective depending on the dynamics of the country in question.

Nascent issues in finance such as cryptocurrencies were not considered in this study, though they are likely to become significant once more data becomes available in the future.

The global coronavirus (COVID-19) pandemic has also had far-reaching effects. In recent times, this phenomenon has impacted economies globally with an observed rise in inflation rates. Central bankers had gone to great lengths to manage inflation given the lockdowns of the global economy. This study however did not consider much of the period as it occurred at the tail-end of the period under study.

Therefore, this study did not delve deeper into external shocks as such as the global financial crisis and more recently, the global COVID-19 pandemic that create uncertainties for economic agents (MPC, 2021). These would necessitate event studies of their impact on inflation as more information becomes available.

## **1.7. Significance of the Study**

Ultimately, the objective of this study was to shed more light on the issue of inflation in developing countries. Since such countries aim to eradicate poverty and achieve economic growth, it was worth considering. It is therefore important for such countries to achieve a low and steady rate of inflation to spur sustainable economic growth in the long run.

There is need to establish a working framework for economic agents to be able to make proper daily economic decisions to enable them to achieve sustained economic growth and development.

### ***1.7.1. Households***

Households would benefit from the knowledge of determinants of inflation to inform their decision-making aimed at maximising utility, their main economic objective. A high inflation has a direct impact on the purchasing power of households with

implications on their basket of goods and services. This manifests through adjustments to their disposable income by saving, adjustments to their budgets and foregoing certain luxuries in times of strife. Furthermore, inflation impacts long-term investments of households such as pension savings.

### ***1.7.2. Firms***

Firms would be keen concerning expenditures as well, more importantly with regard to wage-setting, borrowing and investing. For firms as borrowers, a high inflation environment is ideal as it reduces the effective cost of debt in the long run. On the contrary, the high inflation environment could adversely impact the firms as lenders in the long run. Firms also consider inflation when evaluating investments to ensure that the return on investment is more than the rate of inflation.

### ***1.7.3. The government***

The government would primarily be concerned with achieving economic growth in a manner that minimises dissent due to high inflation, especially in the run up to an election for a second term.

Inflation could potentially lead to massive demonstrations and revolutions. For instance, inflation and especially food inflation is widely considered to be one of the main reasons that caused the French Revolution, the 2010–11 Tunisian revolution and the 2011 Egyptian revolution. Tunisian president Zine El Abidine Ben Ali was ousted. Egyptian President Hosni Mubarak was also ousted after only 18 days of demonstrations. The protests soon spread in many countries of North Africa and Middle East in what has come to be known as the Arab Spring. Notably, the high food inflation contributed to the French Revolution that was premised on social and economic inequality.

The study has a host of other potential beneficiaries within the government, key among them, the treasury and the central bank, which act as the market maker, and borrower respectively. The central bank would be interested in informing monetary policy transmission as it strives to further enhance its inflation-targeting monetary policy framework. The CBK is in the process of modernizing its monetary policy framework and operations (MPC, 2021).

Other government agencies would also be able to glean useful information from this study. Regulatory bodies of the financial markets would be interested to identify policies that could be developed to enhance the vibrancy of the financial markets. These include the Capital Markets Authority (CMA), the Sacco Societies Regulatory

Authority (SASRA), the Retirement Benefits Authority (RBA) and the Insurance Regulatory Authority (IRA). This is because a number of financial instruments in the Kenyan market have a keen interest in inflation such as pension funds, savings accounts and unit trusts. The CBK is also a regulator of banks which also offer such products. The Kenya Revenue Authority as the revenue collection agency of the government would be interested to note if certain inefficiencies could be addressed.

#### ***1.7.4. Investors***

Market participants as investors would be keen to know whether there is any inefficiency that could be exploited to make a return. There is need to identify the determinants of inflation in order to tweak them to a desired effect. This is crucial given their signalling effects to both the citizens and the international markets, particularly with regard to factors such as unemployment and cost of living.

Foreign investors would also follow the inflation statistics keenly to identify opportunities for investment. A high level of inflation would be cause for concern, particularly for foreign direct investment.

#### ***1.7.5. Academia and Policy Makers***

Policy makers would be keen to monitor the movements in the economic indicators to adjust policy and balance with the concerns of the political class. There is need to appreciate the implications of inflation on the bottom of the pyramid, particularly with regard to food prices. A high inflation environment could potentially also bring middle-income households to below the poverty line.

Academia would be keen on this study since there is already a shortage of research on financial markets in developing countries. Most research globally has drawn conclusions from developed countries whose conditions may differ drastically from those in emerging economies.

## CHAPTER 2: LITERATURE REVIEW

### 2.1. Introduction

In this chapter, the theoretical literature is put forth to explain the phenomenon of inflation as well as the empirical literature.

The rest of this chapter will cover a theoretical review of the literature followed by an empirical review. A critique of the same will follow thereafter and subsequently, the conceptual framework of the study will be laid out.

### 2.2. Theoretical Review

The study of inflation has been extensive over the years and three broad approaches have been developed over time. Firstly, the monetary approach views inflation from the perspective of it resulting from a distinct relationship between money and prices. This approach considers the point of view that monetary determinants of inflation are the key factors, considering that money is itself an asset.

The second approach is the public finance approach which looks at inflation as the result of a monetary expansion occurring in response to fiscal imbalances. A fiscal imbalance arises whenever a government fails to meet its revenue targets to fund its expenditures, resulting in a budget deficit.

Fiscal imbalances in developing countries with scarce resources often lead to monetisation of the fiscal deficit. Whereas the fiscal environments of developed countries tend to be similar, such dynamics tend to differ for emerging markets. This may be due to differences in political philosophies (such as Kenya and Ethiopia as identified by Durevall and Sjö (2012)); endowment of natural and economic resources; and external motivations for certain fiscal policies (such as dependence of foreign aid that could tether countries to demands of donors and supranational organisations). Since fiscal policy may vary from country to country, this was not considered for this study.

The third approach put forth is whereby scholars look at the structural and cost-push explanations of inflation. They posit that inflation arises due to oligopolistic behaviour by firms. Essentially, they argue that inflation is the result of producers apply a mark-up when pricing as well as cost pressures stemming from wage increases and devaluations.

Other than the aforementioned, there is another frequently-cited category of sources of inflation that is characteristic primarily of developing countries – inertia. As for inertia, inflation may also arise from the sluggish adjustment of expectations. This is because most prices and wages are normally set with future economic conditions in mind, especially with regard to firms. As such, economic agents tend to refer to recent inflation rates to forecast the inflation rates of the near future.

The theoretical review of this study delves deeper into understanding inflation by considering three broad categories of perspectives: the monetarist perspective, the non-monetary perspective (excluding fiscal policy) and the heterodox views on inflation. The heterodox or unorthodox views are examined with a view to understanding their assumptions and bases for their rejection.

### ***2.2.1. Monetary Perspective***

When observed from a monetary lens, inflation is fundamentally premised on the law of demand and supply given its relation to prices. From a macroeconomic standpoint, the root of inflation is money given that the concept of prices relates directly to money. Price however is a manifestation of consensus on value of a good or service. The distinction between price and value is fodder for philosophical debate. This is the cause of variance in prices within markets in an economy, leading to a contradiction of the Law of One Price. Some economists could argue that this is essentially the lifeline of an economy – the variation in prices creates markets.

From this perspective, there are two major considerations: demand-pull factors and cost-push factors. Demand-pull inflation arises notably from shocks in aggregate demand within an economy. Samuelson and Nordhaus (2010) define demand-pull inflation as that which arises when aggregate demand rises more rapidly than the economy's productive potential, pulling prices up to equilibrate aggregate supply and demand. Such demand-pull factors relate to changes in government spending, investment and net exports. An instance when this may manifest through deficit spending such as when a government prints money.

Cost-push or supply-shock inflation relates to the aggregate supply curve. It arises because of an increase in the cost of inputs and leads to stagflation (a period of stagnation with inflation).

The classical theory of inflation defines money as an asset that is regularly utilized by people to purchase goods and services. Akinboade, Siebrits and Niedermeier (2004) suggest that the simplest approach to price determination in an open economy is that

of purchasing power parity (PPP) whereby absolute purchasing power parity implies that price levels in different countries move towards equality in common currency terms. This emanates from the Law of One Price, which states that any commodity in a unified market has a single price. This speaks to the exchange rate as a form of relative price in an economy.

Akinboade et al. (2004) identify the shortcomings of the absolute purchasing power parity theory and suggest a less restrictive theory: the relative purchasing power parity theory. This theory implies that even when there are trade barriers, as long as these barriers are stable over time, the percentage change in the nominal spot exchange rate between two currencies should equal the inflation differential between the respective countries.

In the same vein, the Fisher effect is an important consideration as it addresses inflation in relation to both real and nominal interest rates. One of the foremost explanations of inflation emanated from the Fisher effect which was developed by Irving Fisher. It has been extended to the analysis of the money supply and international currencies trading. The Fisher Effect states that the real interest rate equals the nominal interest rate minus the expected inflation rate.

Among the most common theories that have been put forth to explain inflation is the monetarist theory. This theory was proposed by Cagan (1956) who viewed inflation as being caused by monetary growth and focused on the demand for money during hyperinflation. He held the view that past inflation rates influenced the expectations of future inflation rates.

Friedman (1982) emphasised the monetarist theory by revisiting the quantity theory of money. This theory examined the fundamentals of money within an economy. From his assessment, the price level within the economy was determined by the velocity of money (how fast money circulates within the economy) and the total number of transactions in the economy.

He presented this in an equation whereby the product of total money within an economy and the velocity of money is equal to the product of price level and total number of transactions within an economy. The number of transactions is often used interchangeably with the level of output. Transactions and output are related, because the more the economy produces, the more goods are bought and sold (Mankiw, 2010).

Therefore, on this basis, the price level in an economy is a factor of money supply, velocity and output. It was widely held that velocity and output are exogenous factors

in the classical quantity theory of money, thus implying that the price level is a factor of money supply. This was stated as Fisher's equation of exchange which views money as a medium of exchange (transactions version).

Economists from Cambridge University<sup>4</sup> developed the Cambridge cash balance equation which considered money as a store of value instead. In their version, the demand for money within an economy was a result of the interplay of the price level within an economy, the level of output and the portion of money held for convenience and security of having cash at hand.

Most economists concur that the quantity theory holds true in the long run. However, there is still disagreement about its practicality in the short run. Critics have expressed their aversion to the assumption that velocity is stable. Similarly, they argue that in the short-run, prices are sticky, so that there is no direct relationship between money supply and price level. An example is wages which could be reviewed after several years.

Keynes (1936), himself a Cambridge economist, developed a model to explain the nature of money within an economy by considering liquidity preference. Keynesian liquidity preference theory distinguishes three distinct motives for holding money: a transaction motive, a speculative motive and a precautionary motive. These speak to the need for keeping money for purchase of goods and services, taking advantage of arbitrage opportunities, and hedging or holding it for a rainy day respectively.

With regard to inflation, the speculative demand is the most influential since it considers the interest rate movement in the bond markets. The speculation arises when one believes that they can take advantage of interest rate movements in the financial markets. This speaks to the inverse relationship between bond prices and interest rates. If interest rates are high, the demand for bonds increases relative to the demand for money. If interest rates are low, there is little incentive to hold bonds – investors would rather maintain liquidity by placing funds in cash and cash equivalents. It is important to note that the demand for money is negatively correlated with interest rates and positively correlated with real income.

Friedman (1956), who was widely viewed as a proponent of free-market thinking, improved on the Keynesian liquidity preference model by treating money like any other asset. He achieved this by integrating an asset theory and a transactions theory

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<sup>4</sup> Cambridge economists include A. C. Pigou, Alfred Marshall and John Maynard Keynes (before he developed his own theory).

of the demand for money within the context of neoclassical microeconomic theory of consumer and producer behaviour. This allowed him to incorporate arguments for utility and production functions. He further opined that the marginal utility of money declines as the quantity of money held increases. A major assumption was that money competes with other assets such as bonds, stocks and physical goods for placement within the portfolios of economic agents.

He therefore concluded that economic agents would be keen to hold real assets as opposed to nominal assets. The same applies to money. From the standpoint that inflation erodes the purchasing power, economic agents would then prefer to hold higher nominal amounts of money to compensate for the eroded real value. According to Friedman's argument, the level of real balances is a function of the relative expected return on assets such as stocks and bonds in comparison to money and expected inflation.

More recently, Mundell (1963) and Tobin (1965) proposed what has come to be known as the Mundell-Tobin effect, which is an explanation of the impact of inflation on economic growth premised on neoclassical growth theory. They posit that an increase in the nominal interest rate caused by inflation, makes investment more preferable than consumption, which in turn, causes an increase in the accumulation of capital, thus leading to economic growth.

### ***2.2.2. Non-monetary Perspective***

In general, the cause of inflation in developed countries is broadly identified as growth of money supply whereas in developing countries, inflation is not a purely monetary phenomenon (Totonchi, 2011). The literature on non-monetary determinants of inflation is centred on structuralist as well as cost-push factors.

Cost-push inflation arises from a shock to the aggregate supply within an economy. Examples of these include natural disasters or increased prices of inputs such as oil. The focus of cost-push inflation is on producers who may pass on costs to the consumers through increased prices. Under the cost-push theory, inflation is seen as the result of factor prices accelerating more rapidly than factor productivities (Ochieng, Mukras and Momanyi, 2016).

Gil-Alana and Mudida (2016) identify supply-side shocks in the Kenyan economy such as droughts or oil price hikes which are not directly under the control of the monetary authorities. Such factors directly impact the cost of production, particularly with regard to energy and transport costs. The costs are then passed on to the consumer

by the producers. Other examples are conflict and changes in the terms of trade which can lead to persistent changes in the price level.

High inflation can lead to employees demanding rapid wage increases to keep up with consumer prices. In the case of collective bargaining, wage growth would be set as a function of inflationary expectations, which tend to be higher when inflation is high. In essence, inflation begets further inflationary expectations, which beget further inflation in a form of wage spiral.

Totonchi (2011) identifies profit-push inflation as cause of cost-push inflation whereby monopolist and oligopolist firms take advantage of imperfect competition to raise the price of their products with a view to offsetting the increased labour costs and cost of production so as to increase their profits.

Non-monetary factors have been evaluated empirically. Phillips in 1958 plotted the rate of inflation in the United Kingdom against the rate of unemployment and the result was a negative correlation (Blanchard, 2017). Paul Samuelson and Robert Solow later replicated the same exercise in 1960 for the US using the CPI as their measure of inflation. This relation was henceforth labelled the Phillips curve. Most of the existing literature on inflation has been premised on this perspective.

Structural factors also have a role to play. The structuralist theory states that inflation arises because of structural rigidities in the economy. Examples of structural rigidities or imbalances include the imbalance between demand and supply of industrial inputs whereby governments are then forced to depend on deficit financing as commonly observed in emerging economies. This arises because of insufficient external borrowing, grants and aid.

Other structural imbalances that lead to inflation include foreign exchange bottlenecks and infrastructure bottlenecks, food insecurity, social and political constraints. Fundamentally, structuralist economists argue that inflation is the culmination of structural rigidities in the economy.

The structuralist model of imported inflation proposed by Frisch (1977) shows that a country's dependence on external markets may bring about inflation, since heavy reliance on external variables is expected to motivate upward pressure on domestic prices. This is likely to impact developing countries with a heavy reliance on imports. Another model from the structuralist school of thought, the Scandinavian model Frisch (1977), which seems mostly relevant to small open economies hypothesizes that

inflation is influenced by world prices, wages and productivity. Other factors include adverse weather conditions and trade protection policies that may impact inflation.

Inflation could also be understood to be a consequence of the behaviour of economic agents. The rational expectations theory builds on the learning curve of economic agents. Taking the example of the labour market that may find itself in a wage spiral, economic agents tend to form adaptive expectations. As prices and wages continue to rise, economic agents act rationally as they plan for this by observing the most recent patterns. They expect current inflation rates to continue into the future and therefore demand more wages to maintain their standard of living resulting in built-in inflation.

The interaction among economic agents influences inflation and given that central banks are not fully in control of all factors, necessitates the adoption of policies to attempt to achieve the target level of inflation. As identified by Lo (2004), specific behavioural biases<sup>5</sup> that manifest when human decision-making occurs under uncertainty may lead to undesirable outcomes for the economic welfare of an individual.

This is aligned to the adaptive market hypothesis proposed by Lo (2004) which was an improvement from the efficient market hypothesis by Fama (1970)<sup>6</sup>. The theory by Lo (2004) simply states that economic agents adapt to their ecosystem (the economy) over time given the information accessed as well as historical patterns observed. The most recent information tends to have the most impact; in this case, the most recent level of inflation influences expected inflation.

The interplay of the behavioural biases of economic agents could also cause inflation inertia. Durevall and Ndung'u (2001) address inflation inertia which they say is usually interpreted as measuring the effects of indexation or inflation expectations. They go on further to say that when there is no inertia<sup>7</sup>, the parameters on lagged inflation should be zero. They add that in the other extreme, when the level of inflation is only determined by inertia, the parameters on lagged inflation should sum to unity. This study looked into inertia to test its influence on inflation over the period by examining its lagging effects.

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<sup>5</sup> Examples include over-confidence, herding, loss aversion, overreaction, miscalibration of probabilities, psychological accounting, hyperbolic discounting and regret.

<sup>6</sup> The efficient market hypothesis states that prices reflect all available information. The adaptive market hypothesis builds on this by applying Darwinian principles.

<sup>7</sup> as claimed by Killick and Mweha (1989) and Mweha (1990), and implied by the model of Ryan and Milne (1994)

### ***2.2.3. Hybrid Models***

Akinboade et al. (2004) identify the emergence of hybrid (structuralist-monetarist) models of the determinants of inflation, stating that fundamental structural and cost-push factors had been omitted from the monetarist models. They note that this omission has been rectified in recent literature with several authors having developed models by directly augmenting the monetarist approach with cost-push factors.

Totonchi (2011) identifies the New Neoclassical Synthesis (NNS), as popularised by Samuelson, who billed it as an engine of analysis which offered a Keynesian view of determination of national income and Neoclassical principle to guide macroeconomic analysis. He goes on to add that in the NNS, monetary (or demand) factors are a key determinant of business cycles because of the incorporated new Keynesian assumption of price stickiness in the short run, while at the same time, however, the NNS assigns a potentially large function to supply shocks in explaining real economic activity, as suggested in the new classical real business cycle theory.

### ***2.2.4. Heterodox views***

There are a number of points of view on inflation that are not widely accepted by mainstream economists. These are quite simply unorthodox to neoclassical economics that stem from a difference of perspective and ideologies. The quantity theory has previously been contrasted by a number of economists with a number of other theories and withstood the test. These include the Austrian view, the real bills doctrine, the backing theory and the Marxist theory.

The Austrian view is premised on the argument that inflation does not manifest in a uniform manner across the economy (pure inflation). According to Shostak (2000), the Austrian school of thought stress that inflation affects prices in various degrees – prices rise more sharply in some sectors than in other sectors of the economy. This contravenes the argument of aggregate price levels with regard to inflation.

Naturally, this theory fails on the basis that it would be difficult to identify the rate of inflation with consideration for all the unique circumstances of economies and not allow for comparability among economies.

The Real Bills doctrine brings forth the argument of fractional reserve accounting, generally gold, in relation to money supply. This view put forth is that banks should also be able to issue currency against bills of trading, which is “real bills that they buy from merchants”. According to Timberlake (2005), the debate between currency, or quantity theory, and banking schools in Britain during the 19<sup>th</sup> century foreshadowed

the present-day debate on the credibility of money, given the move toward novel cashless forms of money such as blockchain technology and mobile money.

However, it is important to note that this doctrine was developed in the 19<sup>th</sup> century when the banking school had greater influence on policy in the United States and Great Britain, while the currency school was more dominant in non-British countries, particularly in the Latin Monetary Union and the earlier Scandinavia monetary union. This doctrine failed, according to Rothbard (2008), following the collapse of the international gold standard post 1913, and the move towards deficit financing of government.

The backing theory (also known as the anti-classical theory) posits that the assets and liabilities of the issuing agency determine the value of money. In contrast to the quantity theory, the anti-classical theory argues that authorities can issue money without significant impact on inflation so long as they have adequate assets to cover redemptions. Baumol and Alan (2006) state that there are very few proponents of this theory, making quantity theory the dominant theory explaining inflation.

Another theory that is rather unpopular in the explanation of inflation is the Marxist theory. The longstanding debate of Marxist philosophy has found its way to economic debate, and it is small wonder that its socio-political underpinnings have created divisions on economic thought, notwithstanding the varied interpretations of Marxist philosophy. The Marxist philosophy applied to economics is characterised by the relationship between those that provide the labour required to produce the goods (the proletariat) and those that buy the goods (the bourgeoisie) in the determination of value.

According to Bresciani (2006), the Marxist theory states that it is the value of the labour required to produce the goods and not the price of the goods themselves that determines the real cost of the goods and that the only important factor in the cost of goods is how the cost of labour goes up and down compared to the demand for the product by those with money – the bourgeoisie. Marx defined inflation in terms of its cause as depreciation of the currency arising from printing notes in excess of the basic quantity of gold.

## **2.3. Empirical Review**

This study has a focus on inflation in developing countries. An examination of empirical literature available gives varied conclusions as to the determinants of inflation. This section begins with a coverage of literature on inflation in emerging economies followed by sub-Saharan Africa. Lastly, literature on the Kenyan context is examined.

### ***2.3.1. Monetary Factors and Inflation***

With regard to monetarist theory, there has been focus on the term structure of interest rates and its relation to inflation, particularly with regard to expectations. This has received considerable support.

On studying the yield curve characteristics in emerging economies. Mehl (2006) noted that the domestic yield curve in emerging economies has in-sample information content even after controlling for inflation and growth persistence, at both short and long forecast horizons, and that it often improves out-of-sample forecasting performance. He also noted differences across countries are seemingly linked to market liquidity.

Ang, Bekaert and Wei (2007) studied the term structure of real interest rates in relation to inflation and concluded that changes in nominal interest rates must be due to either movements in real interest rates, expected inflation, or the inflation risk premium. An interesting finding was that the real short rate was negatively correlated with both expected and unexpected inflation, but the statistical evidence for a Mundell-Tobin effect was weak.

The paper by Mishkin (1990) provides empirical evidence on the information in the term structure for longer maturities about both future inflation and the term structure of real interest rates. He further adds that when the slope of the term structure steepens, it is an indication that the inflation rate will rise in the future.

The findings of Mishkin (1990) and Ang, Bekaert and Wei (2007) are aligned to the famous assertion by Friedman (1960) that “inflation is always and everywhere a monetary phenomenon.

Modena (2008) used a threshold model to examine the term structure of interest rates in relation to the expectations hypothesis. The hypothesis implies that rational investors can predict future changes in interest rates by simply observing the yield spread. On empirically examining the determinants of inflation, an interesting

observation is that there has been no consensus on factors in developing countries. As stated by Totonchi (2011), inflation in developed countries is deemed to be broadly caused by growth of money supply whereas in developing countries, inflation is not a purely monetary phenomenon.

Similar studies were carried out by Lim and Papi (1997) in Turkey as well as Lim and Sek (2015) in Malaysia. In the case of Turkey, it was observed that monetary variables (initially money, more recently the exchange rate) play a central role in the inflationary process, that public sector deficits contribute to inflationary pressures, and that inertial factors are quantitatively important. Moreover, the commitment by policymakers to active exchange rate depreciation on several occasions in the prior 15 years also contributed to the inflationary process.

As for the Malaysian economy, GDP growth and imports of goods and services were found to have a significant long run impact on inflation in low inflation countries. The findings also indicated that money supply, national expenditure and GDP growth are the determinants of inflation which impose long run impact on inflation in high inflation countries. In the short run likewise, none of the variables was found to be significant determinants in high inflation countries. However, money supply, imports of goods and services and GDP growth has significant relationship with inflation in low inflation countries.

Among the specific country studies carried out on the determinants of inflation were Botswana (KebretTaye, 2013), Ghana (Gyebi and Boafo, 2013), Tanzania (Ndanshau, 2010) and Nigeria (Oduanya and Atanda, 2010; Dahiru and Sulong, 2017).

For Botswana, price inertia, real GDP, money supply and South African prices were observed to play a dominant role in determining inflation. Similarly, a conclusion of the study was that unless international deflationary environment prevails, it was highly unlikely that the Bank of Botswana would achieve its medium-term objective range of 3 to 6 percent in the medium-term.

As for Ghana, Gyebi and Boafo (2013) focused on the period between 1990 and 2009 and observed that real output and money supply are the strongest forces exerting pressure on the price level to move up the exchange rate depreciation. Additionally, they found that the implementation of the Economic Recovery Program (ERP) helped reduce the level of inflation in Ghana giving evidence that the ERP achieved its basic objective of reducing inflationary trend in Ghana.

In a study of the Nigerian context by Odusanya and Atanda (2010), the inflation rate, growth rate of real output and money supply, and real share of fiscal deficit were found to be stationary, while other incorporated variables in the empirical analysis (real share of import, exchange rate and interest rate) were found to be stationary at first difference.

An ARDL approach was also applied by Ndanshau (2010) in their study of Tanzania and it was concluded that factors, particularly growth in real income, were found to exert the expected depressive influence on inflation; a finding that underscored the importance of the demand for money in explaining inflation. Ndanshau (2010) also found other important structural factors influencing inflation in Tanzania – nominal exchange rate and inflation inertia. He found that on aggregate the long run influence of changes in money was found to be very small if compared to that exerted by structural factors.

An assessment by Melaku (2020) of empirical studies conducted in the past on the determinants of inflation in Africa concluded that output/national income, broad money supply, price of imported goods and services and exchange rate are the critical variables affecting the performance of inflation. Other variables (interest rate, price expectation and population growth) were also found to be slightly important.

Further to these, it was observed that almost all literature examined used macro variables without consideration for factors such as political and social institutions. A recommendation from the study was that countries should seriously work on creating moderate inflation to grow their economy by increasing their national income in addition to stable fiscal and monetary policy with a focus on the aforementioned factors.

Mwega (2014) studied the term structure of interest rates in Kenya in an attempt to link it to inflationary expectations and concluded that the slope of the term structure is a good predictor of expected inflation. However, the study had the limitation of a relatively short period over which the analysis was done (TBR182 minus TBR91) and that the analysis for 364-day Treasury bill versus the 91-day Treasury bill gave non-significant results with only 10 observations involved.

Kiganda and Omondi (2020) studied the influence of monetary factors on inflation in Kenya. They examined monthly time series data from CBK spanning from 2005 to 2018 and the results indicated that total money supply had a positive influence on inflation that was highly influenced by extended broad money. The study concluded

that imports influence inflation in Kenya, but commercial imports highly determined total imports influence on inflation in Kenya.

However, Ochieng, Mukras and Momanyi (2016) studied the determinants of inflation and found that price fluctuations and lag inflation rates greatly affect inflation rate positively while real GDP growth affects inflation rate negatively. The findings also showed that money supply growth, foreign exchange rate and interest rate do not have a significant relationship with inflation.

In addition, they tested whether inflation could be explained by a non-linear model. The findings revealed that the inflation model exhibits a linear structure as the coefficients of squared terms of the predictor variables were found to be statistically insignificant. Based on the aforementioned findings, the study concluded that real GDP growth is the main instrument policy makers should aim at in controlling the inflation rate.

### ***2.3.2. Non-Monetary Factors and Inflation***

A number of the empirical studies on determinants of inflation posit that non-monetary factors tend to complement monetary factors, thus providing support for the NNS theory.

Dahiru and Sulong (2017) studied the long-run relationships of specific determinants of inflation in Nigeria as well with an ARDL approach. They concluded that there was indeed a long-run relationship, a positive one with the exchange rate, broad money supply, oil price and inflation; and a negative one with financial instability, interest rate, gross domestic product and broad money supply nominal effective. They recommended that the monetary authority in Nigeria pursue price stability either through monetary policy or the exchange rate target since shocks in both money supply and exchange rate influenced the rate of inflation.

Gil-Alana and Mudida (2016) econometrically examined the CPI and the inflation rate in Kenya, using quarterly data, for the time period 1963Q1 to 2013Q4. The results indicated both series (CPI and inflation) display high degrees of persistence, with orders of integration equal to or higher than 1 for CPI and smaller than 1 though positive, and thus showing long memory and mean reversion in the inflation rate. The implication drawn from this was the need for strong policy action to deal with inflation shocks in Kenya.

They noted that Kenya's current monetary policy is already based on inflation-targeting within the framework of Taylor's Rule, the policy implication being that

significant increases in inflation (falling outside medium-term central bank targets) should be addressed decisively and swiftly by raising the Central Bank Rate sufficiently despite the negative short-term consequences on economic growth. Interest rates can then be eased once inflationary pressure subsides.

They however noted a challenge for monetary policy in Kenya of inflation – supply-side shocks such as droughts or oil price hikes which are not directly under the control of the monetary authorities. Nonetheless, in the case of international supply side shocks such as oil price hikes, they proposed mitigation of the negative effects on inflation by taking strong policy actions to reduce the adverse effects on currency depreciation which also feed into inflation, a recognition of exchange rates as a key factor.

A comparative study of the dynamics of inflation in Kenya and Ethiopia was carried out by Durevall and Sjö (2012). They concluded that inflation rates in both Ethiopia and Kenya are driven by similar factors; world food prices and exchange rates have a long run impact, while money growth and agricultural supply shocks have short-to-medium run effects. They also found evidence of substantial inflation inertia in both countries. The key conclusion is that there is no nominal anchor for inflation in either country in the form of a clear and well-functioning monetary or exchange rate policy. Given that Kenya adopts inflation-targeting, Misati et al. (2012) studied its feasibility and found evidence of a dominant role of fiscal policy on both prices and output. The results therefore support the fiscal theory of price level, implying a need for incorporation of a fiscal variable in the design of monetary policy. The study of fiscal policy, however, does not feature in the scope of this paper. This would be a recommendation for future studies.

Their study also concluded that the employment contract of the office of the governor is relatively short-term and less than the Kenyan election cycle which is normally a period of five years. Misati et al. (2012) also found that the exchange rate has no role on both prices and output.

The most important finding of the study by Misati et al. (2012) was that the Kenyan economy does not meet all the conditions necessary for adopting inflation-targeting. This is important since inflation-targeting has been in place for over twenty-five years. However, not all studies support non-monetary factors. Landry, Hardit and Leroy (2016) studied the determinants of inflation the Central African Economic and

Monetary Community (CEMAC) countries<sup>8</sup> using data from 1990 to 2014. They observed that money supply and imported inflation are the two main sources of inflation, seemingly explaining inflation better than oil prices, budget balance and output gap. They noted an important inertia of inflation which brought to light some structural problems, particularly the slow adjustment of expectations of economic agents.

### ***2.3.3. Governance Regimes and Inflation***

When it comes to inflation and its relation to governance, most studies have focused on governance structures and decision-making roles of governing bodies. According to Tuladhar (2005), governments are frequently involved in setting targets, but to ensure operational autonomy, legal provisions explicitly limit government influence in internal policy decision-making processes. Internal governance practices differ considerably with regard to the roles and inter-relationships between the policy, supervisory, and management boards of a central bank.

Rossi (2005) notes that the current regime of inflation-targeting represents an improvement in terms of efficiency, credibility, transparency and communication with both the public and the financial markets, with respect to monetary- targeting regimes. He further added that this change in strategy had been accompanied by the general move to make the central banks independent of governments and political parties, with a view to further increase their ability in meeting the inflation targets over the long run.

The literature examined does not directly address the specific objective of governance regimes as defined in this study. The literature is focused on autonomy, transparency and accountability structures but not on moderation of the governance regimes. Moderation implies that the regimes in place would possibly markedly amplify the inflation trends. To the best of the researcher's knowledge, there has been little to no literature on the moderating effect of governance regimes. The researcher looked to meet this gap through this study.

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<sup>8</sup> Comprises six states: Cameroon, Central African Republic, Congo, Gabon, Equatorial Guinea and Chad.

## 2.4. Summary of the Reviewed Literature and Research Gap

The theoretical literature review of this study gives adequate support for the consideration of inflation as a monetary phenomenon from the Law of One Price, absolute and relative purchasing power parity, as well as the monetarist and Keynesian schools of thought. The empirical review however indicates varying levels of influence of the various factors. The most common appears to be lag inflation which is evidence of inertia as a consistent factor.

Among the non-monetary views that have been covered are those relating to cost-push inflation and structural factors which are a consequence of the interaction of economic agents. The New Neoclassical Synthesis (NNS) has been identified as a hybrid of both monetary and non-monetary theories to explain inflation and is the premise of this study.

The heterodox views to inflation examined stem from a difference of perspective and ideologies. For instance, the Marxist view is premised on the ideologies brought forth by Karl Marx that view society as a division between the proletariat and the bourgeoisie and base the determination of prices on their interaction. The shortcomings of these unorthodox views have been articulated.

Given the unique characteristics of developing countries identified by Frankel (2010), it is quite interesting to note from literature that there is no consensus on the global determinants of inflation. Modena (2008) concurred. This necessitates the identification of country-specific factors particularly for developing countries (Totonchi, 2011), a consideration of this study.

There is a gap arising from the lack of consensus with regard to factors identified by scholars in Kenya, as exemplified by Ochieng et al. (2016), Durevall and Sjö (2012), as well as Kiganda and Omondi (2020). Despite the empirical studies, the inconsistency in findings necessitates further investigation. With a view to addressing this gap, this study also sought to provide empirical evidence of the determinants in an attempt to resolve this lack of consensus.

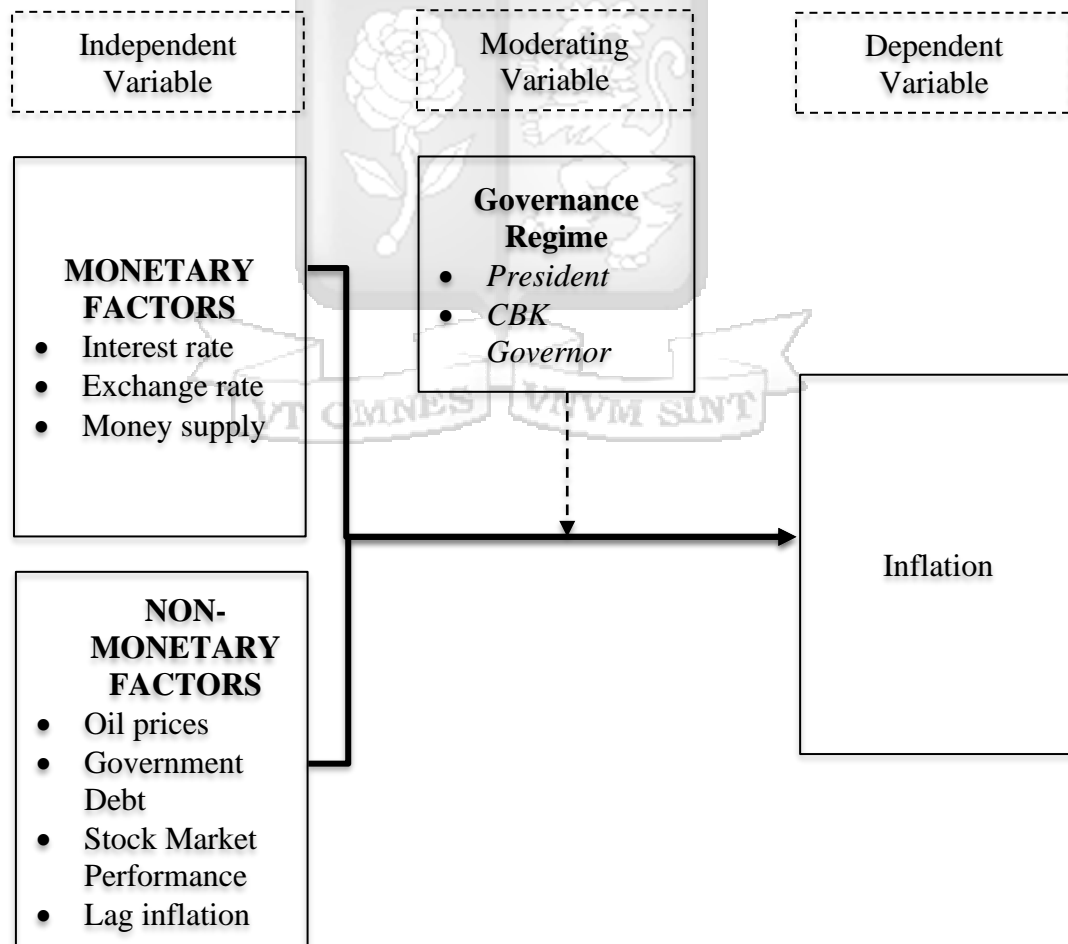
From the extensive empirical literature examined for emerging economies and more specifically Kenya, it is evident that there is a unique gap in the consideration of governance regime as a factor affecting the level of inflation. This study sought to cater to this gap by assessing its moderating effects on inflation in Kenya.

## 2.5. Conceptual Framework

This study sought to understand the determinants of inflation in Kenya. The determinants were categorized broadly as both monetary and non-monetary. The monetary factors studied were interest rates, exchange rates and money supply. The non-monetary factors studied comprised oil prices, the level of public debt and stock market performance as demonstrated by the movement in the stock market index.

A unique contribution of this study was the investigation of governance regime as a non-monetary determinant of inflation by looking at both the regime in place with respect to the President as well as the Central Bank Governor. Given the significant role of the CBK in the control of inflation within the Kenyan economy, it is presumed that the different regimes had different strategic objectives and approaches, hence the justification for consideration of the CBK Governors.

The study also considered lag inflation as a measure to verify the extent of its influence on inflation. **Figure 2** demonstrates the conceptual framework.



**Figure 2: Conceptual Framework**

Source: Author conceptualization

The operationalisation of the other variables applied for this study was captured in **Figure 3**. The rate of inflation was determined based on the CPI inflation rate. Therefore, the focus of this paper was on headline inflation rather than core inflation which is considered more responsive to monetary policy. The CPI was preferred because its data was consistently available and were used as the measure of inflation in previous studies on Kenya. It is from this data that the lag inflation was determined as inflation of the previous period.

The extended money supply (M3) was used as the proxy for money supply given that it captures both broad money as well as foreign currency deposits held by residents. The USD/KES exchange rate was used a proxy for foreign exchange rates given that it is the most commonly used rate as it is based on the global reserve currency.

Variable	Description	Measurement Proxy	Source
$\pi_t$	Rate of inflation	CPI inflation rate	KNBS (2021)
$MS_t$	Money supply	Extended broad money supply, M3	CBK (2021a)
$INT_t$	Interest rates	91-day Treasury bill rate	CBK (2021b)
$FX_t$	Exchange rate	USD/KES rate	CBK (2021c)
$OIL_t$	World oil prices	All Index	IMF (2021)
$DEBT_t$	Public debt	Debt-to-GDP ratio	CBK (2021d)
$NSE_t$	Stock market performance	NSE 20 Share Index	Trading Economics (2021)
$Pres\_Dum_t$	Governance regime based on the President (see <b>Appendix 4</b> )	Dummy numbered 1 for a period during the regime of the President of Kenya and 0 otherwise*	CBK (2021e)
$GOV\_Dum_t$	Governance regime, based on the CBK Governor (see <b>Appendix 4</b> )	Dummy numbered 1 for a period during the regime of each CBK Governor and 0 otherwise*	CBK (2021e)

**Figure 3: Operationalisation of the Variables**

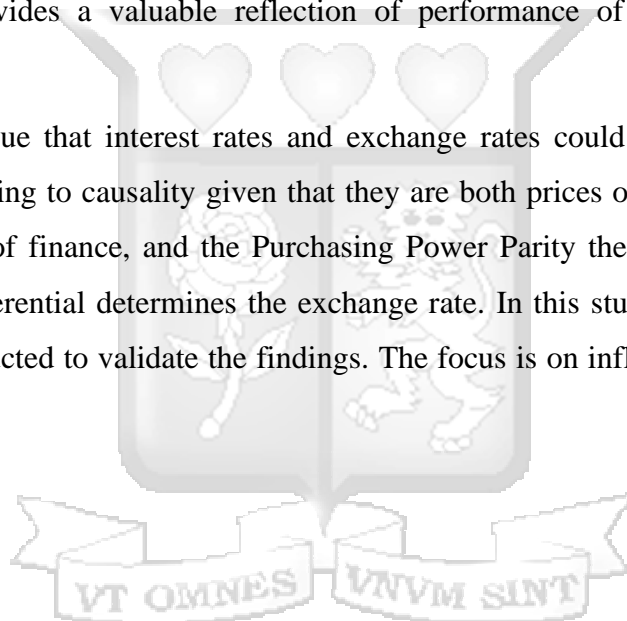
Source: Author conceptualization

The 91-day Treasury bill rate was used as a proxy for interest rates given that it is obtained through a weekly auction thus representing the market sentiment more closely with regard to the response to inflationary pressures.

Similarly, it is often considered a useful proxy for the risk-free rate applied in an economy as it is the basis for rationalizing the interest rates in a number of other rates such as commercial bank deposit rates. Commercial banks tend to apply a risk premium to the Treasury bill rate, the effect of which relays to the rest of the economy.

The NSE 20 Share Index is a valuable proxy of the stock market performance since it captures movement of the top twenty blue-chip stocks and has been tracked for several years, unlike the Nairobi All Share Index (NASI) which only began to be tracked in 2008. It provides a valuable reflection of performance of industries within the economy.

One may argue that interest rates and exchange rates could determine the rate of inflation leading to causality given that they are both prices of money. Interest rates are the cost of finance, and the Purchasing Power Parity theory concludes that the inflation differential determines the exchange rate. In this study, a test for causality will be conducted to validate the findings. The focus is on inflation as the dependent variable.



## **CHAPTER 3: RESEARCH METHODOLOGY**

### **3.1. Introduction**

This chapter narrates the methodology applied when conducting the analysis of the determinants of inflation primarily in developing countries with a focus on Kenya. It begins with a brief discussion of the research design and research philosophy. The population under study is indicated with a brief on the data collection method. The data analysis process is explained thereafter, followed by a brief demonstration of the expected research quality. Ethical issues considered in the research study are addressed as well.

### **3.2. Research Philosophy**

Research philosophy is an overarching term relating to the development of knowledge and the nature of that knowledge (Saunders et al., 2012). The study adopted a positivist research paradigm. The positivist research philosophy entails working with observable social reality to produce law-like generalizations. Positivism as a philosophy relies on the argument that only knowledge and facts obtained through the processes of observation like measurement is trustworthy. They believe in the existence of a singular reality. On the contrary, naturalists assume that reality constantly changes and can be known only indirectly, through the interpretations of people; they accept the possibility that there are multiple versions of reality.

Positivism goes hand in hand with deductive reasoning which was applied in the study. As a general rule, positivist researchers usually adopt a deductive approach (Crowther and Lancaster, 2008).

The data collected for this study was quantifiable thus enabling statistical analyses on the relationship between inflation and its determinants. The expected conclusions and recommendations from the study are also measurable. This resonates with most studies as the researcher is completely objective and independent of the research (Saunders et al., 2012).

### **3.3. Research Design**

This study was quantitative in nature as it only used secondary data to address the research questions, with the unit of analysis being Kenya. Data on governance was

categorical and nominal in nature. The study was longitudinal in nature as it covered the observations of variables over an extended period.

An explanatory research design was adopted in an effort to empirically test and establish the causal relationship between inflation and the determining factors. The study adopted a deductive approach since it draws from a generally accepted theory to try and affirm it. Deductive reasoning aims at assessing an existing theory or a theory-based hypothesis. The theory in question is the New Neoclassical Synthesis (NNS) as popularised by Samuelson (Totonchi, 2011). This theory incorporates both monetary and non-monetary factors as determinants of inflation.

Given the quantitative nature of the study, it relied on past data. As such, the research strategy to be adopted was archival. An archival research strategy allows research questions which focus upon the past and changes over time to be answered, be they exploratory, descriptive or explanatory (Saunders et al., 2012). They note, however, that the researcher's ability to answer such questions will inevitably be constrained by the nature of the administrative records and documents.

### **3.4. Data Collection**

This study solely applied secondary data. The data is publicly available and was obtained from websites of institutions such as KNBS, CBK and IMF. The data was compiled from publicly available websites as stated in **Figure 3**.

The study covered quarterly data of variables from 1996Q1 to 2020Q4. The period was chosen because there was significant data publicly available for the period and it is aligned with the inflation-targeting policy period. Data for prior periods tends to be inconsistent across most variables. In instances where the data was not be available for index variables such as the NSE 20 share index and CPI, the end of quarter observations (March, June, September and December) were applied.

The data was downloaded in MS Excel format after creating the necessary account credentials on the various websites. The data was then filtered to isolate only that which was relevant to the period in line with the variables of the study.

### **3.5. Data Analysis**

#### ***3.5.1. The Approach to the Analysis***

On collection of the relevant data, the researcher first compiled it for the period. The researcher began by cleaning the data to identify any missing data, errors and senseless outliers. Once done, the researcher adopted the logarithmic values of the data points in order to standardise them and avoid multicollinearity.

The researcher then carried out an analysis of the descriptive statistics in order to adequately describe the data. This was followed by a correlation analysis. The researcher, thereafter, developed interaction terms by taking the product of the independent variables and moderating variables (taking an integer value of 0 in the absence of a governance regime and 1 in its presence). To support the internal validity of the study, tests for stationarity and other diagnostic tests were carried out.

The researcher analysed the variables by using econometric analysis, where inflation as the dependent variable was regressed on the independent variables as demonstrated in the conceptual framework<sup>9</sup>.

The researcher adopted an Error Correction Model based on the Autoregressive Distributed Lag (ARDL) model to estimate the monetary and non-monetary determinants of inflation. An ARDL model is an ordinary least square (OLS) based model which is applicable for both non-stationary time series as well as for time series with mixed order of integration (Shresta and Bhatta, 2018).

From the review of literature, inflation expectations are identified to have a level of persistence in the determination of inflation as explained by Durevall and Ndung'u (2001). This gives support for the hypothesis that inflation could have lagging effects. It is expected that an OLS regression may yield a spurious regression. The ARDL model therefore emerges as a better method to estimate the model. The researcher borrowed from the methodology applied by Dahiru and Sulong (2017) considering their similarity in objectives.

Therefore, in analysing the data, the ARDL model was applied. ARDL model was considered more appropriate given the inflation expectations that would cause the lag inflation to have a significant influence.

The researcher considered the sign (whether positive or negative) and the statistical significance of the coefficients of the independent variables to determine the level of

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<sup>9</sup> see **Figure 2**

their influence on the dependent variable. A 5 percent level of significance was applied to assess the hypotheses. The variables identified to be significant would constitute the evidence for their influence on inflation in Kenya and their coefficients would give an indication of the magnitude of that influence.

### 3.5.2. The ARDL Model

The ARDL (p, q) model is a finite distributed lag model used for testing the long-run relationship between time series observations. It is used primarily for non-stationary time series. Time series that diverge away from their mean over time are said to be non-stationary (Nkoro and Uko, 2016).

The intuition behind the model is that the dependent variable can also be a factor of p lags of itself, as well as q lags of the independent variables. It is given by:

$$Y_t = \beta_0 + \sum_{i=1}^p \varphi_i Y_{t-i} + \sum_{j=0}^q \gamma_j X_{t-j} + \varepsilon_t$$

In this paper, the rate of inflation (dependent variable) was presumed to be influenced by past inflation stemming from the expectations developed over time. The ARDL model can be specified as the Error Correction Model (ECM);

$$\Delta Y_t = \beta_0 + \phi Y_{t-1} + \theta X_{t-1} + \sum_{i=1}^{p-1} \varphi_i \Delta Y_{t-1} + \sum_{j=0}^{q-1} \gamma_j \Delta X_{t-1} + \varepsilon_t$$

The optimal lags p and q are selected using the AIC, HIC or SBIC. The ARDL model assumes that the error term,  $\varepsilon_t$ , is serially uncorrelated –  $\text{Cov}(\varepsilon_t, \varepsilon_s) = 0$ , for  $t \neq s$ , and  $\text{Var}(\varepsilon_t) = \sigma^2$ .

In conducting the regression analyses using the ARDL model, the researcher will carry out several iterations to determine the optimal lags (p and q) to estimate the equation. This would be determined based on the probability of the t-statistic for the estimates of the coefficients falling within the range to reject the null hypothesis, in this case within a 5 percent level of significance.

The ARDL cointegration technique is used in determining the long run relationship between series with different order of integration (Pesaran and Shin, 1999; Pesaran et al., 2001).

### 3.5.3. The Model Specifications

The adapted model of the variables stated in **Figure 3** was given by:

$$\ln \pi_t = \beta_0 + \beta_1 \ln \pi_{t-1} + \beta_2 \ln MS_t + \beta_3 \ln INT_t + \beta_4 \ln FX_t + \beta_5 \ln OIL_t + \beta_6 \ln DEBT_t + \beta_7 \ln NSE_t + \mu_t \dots \dots \dots (3.1)$$

where;

$\pi_{t-1}$  represents lag inflation

$\mu_t$  represents the error term;  $\mu_t \sim \text{IID}(0, \sigma^2_t)$

The main objective of the study was to estimate parameters represented by  $\beta_t$ . These parameters were assessed based on the research objectives laid out for this study. Initially, a regression was carried out based on equation (3.1). It had been expected that the coefficients of the monetary factors will be positive based on literature with those of the rest to be determined.

According to Namazi and Namazi (2016), in correlational studies, a moderator variable is a third variable which could affect the amount of the correlation and/or change the direction of the dependent and independent variables. They further add that in experimental settings, the effect of a moderator variable can be shown via the interaction effect of the independent variable and moderator variable.

The moderating effects of the governance regime were studied using categorical variables to represent the periods of governance for each President of Kenya and each CBK Governor. This was carried out by developing interaction terms in two parts.

Firstly, governance was examined based on presidency by developing an interaction term that considers the moderating variable of presidency. The interaction term is the product of monetary and non-monetary factors by the moderating variables.

The regression equation (3.2) for this was as follows:

$$\ln \pi_t = \beta_0 + \beta_1 \ln \pi_{t-1} + \beta_2 \ln MS_t + \beta_3 \ln INT_t + \beta_4 \ln FX_t + \beta_5 \ln OIL_t + \beta_6 \ln DEBT_t + \beta_7 \ln NSE_t + \mathbf{Pres}_{Dum_{i,t}} * (\beta_8 \ln \pi_{t-1} + \beta_9 \ln MS_t + \beta_{10} \ln INT_t + \beta_{11} \ln FX_t + \beta_{12} \ln OIL_t + \beta_{13} \ln DEBT_t + \beta_{14} \ln NSE_t) + \mu_t, \mathbf{for\ i = 1, 2, 3} \dots \dots \dots (3.2)$$

From **Appendix 4**, it is evident that for the period of the study that there have been three Presidents. A separate regression was conducted for each President – a total of three ARDL regressions.

Similarly, the regression equation for governance on the basis of CBK Governor (3.3) was as follows:

$$\ln \pi_t = \beta_0 + \beta_1 \ln \pi_{t-1} + \beta_2 \ln MS_t + \beta_3 \ln INT_t + \beta_4 \ln FX_t + \beta_5 \ln OIL_t + \beta_6 \ln DEBT_t + \beta_7 \ln NSE_t + GOV_{Dumj,t} * (\beta_8 \ln \pi_{t-1} + \beta_9 \ln MS_t + \beta_{10} \ln INT_t + \beta_{11} \ln FX_t + \beta_{12} \ln OIL_t + \beta_{13} \ln DEBT_t + \beta_{14} \ln NSE_t) + \mu_t, \text{ for } j = 1, 2, 3, 4, 5 \dots \dots \dots (3.3)$$

From **Appendix 4**, there have been five CBK Governors for the period under study. A separate regression was carried out for each Governor – a total of five ARDL regressions.

The multiplication of the independent variable by a categorical variable of zero value will yield a zero, indicating absence of the particular President or CBK Governor. The multiplication of the independent variable by a categorical variable of a value of one will yield a value other than zero, indicating that the particular President or CBK Governor was in office at the time, hence presence of the governance regime.

An analysis of covariance (ANCOVA) model was applied to test for significance of the categorical variables for governance. The ANCOVA model is a blend of analysis of variance (ANCOVA) and regression. ANCOVA removes any effect of covariates, which are variables that you do not intend to study. The researcher would need to account for systematic differences between the different categories of variables. For instance, this method has been applied in the field of medicine to compare different test groups for a drug whereby one of the groups is a control group. This makes it ideal for categorical variables.

To run an ANCOVA test, first one would have to run a regression between the independent and dependent variables. On identifying the residual values from the result, one should run an ANOVA on them.

A comparison of coefficients was carried out for the regressions for each President and each CBK Governor to determine the impact of their tenures on inflation. This would serve to give an indication of the moderating effect of governance. The coefficients, if found to be significant, would be indicative of the influence of each of their tenures on inflation.

The decision-making criteria for the moderation analysis are summarised below. The focus would be on the interaction variable as the key indicator of moderation.

<b>Independent Variable (A)</b>	<b>Moderator Variable (B)</b>	<b>Interaction Variable (A*B)</b>	<b>Moderation Effect</b>
Significant	Significant	<b>Significant</b>	<b>Yes</b>
Significant	Significant	<b>Not Significant</b>	<b>No</b>
Significant	Not Significant	<b>Not Significant</b>	<b>No</b>
Not Significant	Significant	<b>Significant</b>	<b>Yes</b>

**Figure 4: Decision-making criteria for Moderation Analysis**

Source: Author conceptualization

The coefficients of determination would also serve to objectively compare the difference between the different regressions. If on carrying out the moderation analysis it would be found that the moderated regressions have a higher coefficient of determination than equation (3.1), there would be grounds to conclude that governance has a moderating effect on inflation.

### **3.6. Descriptive Statistics**

In conducting the study, the researcher would begin by analysing the descriptive statistics of the variables for the quarter century. Initially, the researcher would determine the measures of central tendency such as the mean, median and mode. This would be followed by measures of dispersion such as variance, standard deviation, minimum and maximum variables (range), skewness and kurtosis. To provide better visualisation of the data, the data would be presented in form of graphs and figures.

### **3.7. Diagnostic Tests**

#### **3.7.1. Tests for Stationarity**

Unit root tests would be carried out even though the ARDL cointegration technique does not require pre-tests for unit roots unlike other techniques (Nkoro and Uko, 2016).

Though most research utilises the Durbin-Watson test for stationarity, it would not be used in this study for this purpose. As identified by Nkoro and Uko (2016), when non-stationary time series are used in estimation of an econometric model, the Ordinary Least Square (OLS) traditional diagnostic statistics for evaluation of the validity of the model estimates such as, coefficient of determination ( $R^2$ ), Fisher's Ratio (F-Statistic), Durbin-Watson (DW-Stat), t-statistic etc. become highly misleading and unreliable in terms of forecast and policy.

The ADF test (Dickey and Fuller, 1981) is the most common test and as such, it would be applied. To corroborate the findings, the Phillips-Perron test (Phillips and Perron, 1988) will also be applied. It is expected that the tests will result in non-stationarity given the lag effects, and therefore not lead to spurious results.

### ***3.7.2. Lag Selection for the ARDL Model***

For the lag selection, the AIC, HIC and SBIC would be applied. Cointegration is a powerful way of detecting the presence of steady state equilibrium between variables (Nkoro and Uko, 2016).

An F-Bound test of cointegration (Wald test) would be carried out to determine the long-run relationship of underlying variables. The long-run relationship would be said to be established when the F-statistic exceeds the critical value band (Nkoro and Uko, 2016).

### ***3.7.3. Other Diagnostic Tests***

Normality tests would be conducted in order to determine whether the data set follows a normal distribution. This is important to the use and interpretation of the regression model. To test for normality, the researcher will use the Shapiro-Wilk test (S-W test). The Kolmogorov-Smirnov test (K-S test) is another such test. The K-S test involves an empirical distribution function (EDF) where the theoretical cumulative distribution function of the test distribution is compared with the EDF of the data. The Shapiro-Wilk test is founded on the existing correlation between the data and the equivalent normal scores thereby providing better power than the K-S test even after the Lilliefors correction (Ghasemi and Zahediasl, 2012).

For both these tests, the calculation consists of the test statistic (labelled  $D$  and  $W$  respectively), the degrees of freedom ( $df$ ) and, based on this, the probability (p-value) that the data for your variable differ by chance from a comparable normal distribution for that variable. In each case, p-value less than 5 percent implies that there is a likelihood of the actual data distribution differing from a comparable normal distribution by chance alone.

Among the diagnostic tests to be carried out by the researcher is the test for heteroscedasticity. Heteroscedasticity is a measure of the extent to which data exhibits unequal variances. This would be determined using the White test for which a p-value less than 5 percent is indicative of the presence of non-uniform variance.

The test for autocorrelation was performed to establish whether residuals are correlated across time, with assumptions requiring that residuals should not be correlated across time. According to Baltagi (2005), cross-sectional dependence is a problem in macro panels with long time series (over 20-30 years). This study considered a 25-year period and as such, a test for cointegration would be carried out using the Breusch-Godfrey test. This would ensure that residuals are not correlated.

The coefficient of multiple determination is key in identifying whether the model adequately describes the relationship between the variables.

Endogeneity is a concern for most research studies as it is often ignored by researchers. It refers to a situation in which the explanatory variables are correlated to the error term. One of the advantages of ARDL as identified by Nkoro and Uko (2016) is that since each of the underlying variables stands as a single equation, endogeneity is less of a problem in the ARDL technique because it is free of residual correlation (i.e. all variables are assumed endogenous). Therefore, this would not be tested.

Multicollinearity arises when at least two predictor variables are correlated. In regression models, multicollinearity causes the standard error of co-efficient to increase, making them unreliable. Variance Inflation Factor (VIF) is used to test whether variables are correlated. A Variance Inflation Factor greater than 10 implies that multicollinearity is a problem in the model (Sinan and Alkan, 2015). If found to exceed the VIF of 10, the researcher will have grounds to drop a number of predictor variables.

A Granger causality test will be carried out for inflation, interest rates and exchange rates as a test for reverse causality in order to validate the findings. This was based on a Vector Autoregressive (VAR) model of the three variables.

### **3.8. Research Quality**

#### ***3.8.1. Data Validity***

Saunders et al. (2012) identify three key aspects of assessing data validity: construct validity, internal validity and external validity. Construct validity relates to the extent to which the research measures actually measure what one intends for them to assess. This study considers an ARDL model to achieve this at a significance level of 5%.

Internal validity, on the other hand, seeks to establish whether the research can adequately demonstrate a causal relationship between two variables. This is essentially

seeking to address model validity. As appropriate for scientific research, diagnostic tests would be conducted to this end. These include tests for normality, stationarity, autocorrelation, multicollinearity, heteroscedasticity as well as tests for serial correlation.

External validity is concerned with the question: can a study's research findings be generalised to other relevant settings or groups? (Saunders et al., 2012). Given that the country sampled in the study, Kenya, is a developing country within sub-Saharan Africa, it tends to have similarities with other countries in the same region. As such, it had been envisaged that the results would be similar to such studies. This is supported by literature (Durevall and Sjö, 2012; Melaku, 2020; Landry et al., 2016).

### ***3.8.2. Research Reliability and Objectivity***

Reliability refers to whether one's data collection techniques and analytic procedures would produce consistent findings if they were repeated on another occasion or if they were replicated by a different researcher (Saunders et al., 2012).

With regard to reliability, there is a stronger argument for the adoption of the ARDL model as opposed to the OLS method in that there is theoretical backing for the lagging effects of inflation owing to expectations. Most studies that have adopted OLS may not have taken account for this fact, and it is therefore envisaged that the results of the study would be more robust.

By design, the secondary data of the study is publicly available, and it is expected that the research could be easily validated by independently applying the same procedure. The data is sufficiently positioned to address the research questions around monetary and non-monetary determinants of inflation as well as the influence of the governance regime.

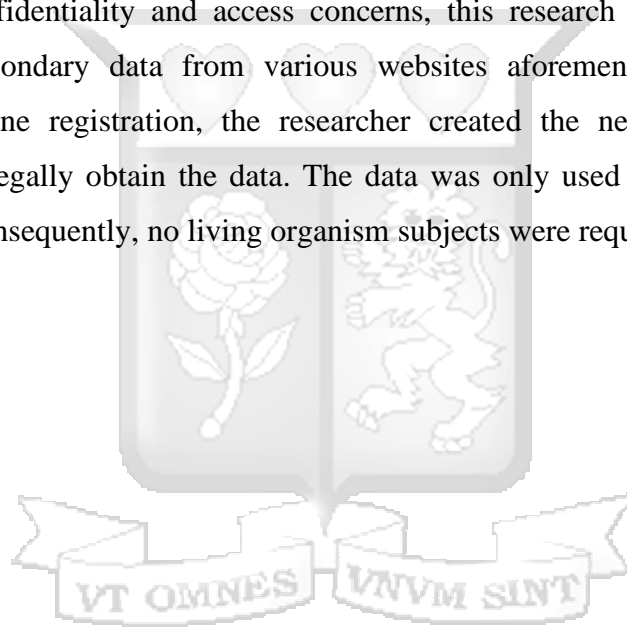
With data sourced from reliable reputable websites, the results of the study should be easily and conveniently replicated by other researchers. It is expected that the same data will be available on the same websites for the foreseeable future.

### 3.9. Ethical Issues in Research

The researcher ensured that the proposed research was approved by the Institutional Ethics and Review Committee (IERC) of the University<sup>10</sup> and thereafter, the National Commission for Science, Technology and Innovation (NACOSTI)<sup>11</sup>.

One of the critical ethical considerations in institutions of higher learning is plagiarism. The Strathmore University Business School has very clear guidelines with regard to using an approved similarity index in the examination of research works. Further, the researcher has endeavoured to make citations and acknowledge all sources of information in the thesis. In order to address any ethical issues that may arise during this study, the researcher committed to abide by the Code of Ethics of Strathmore University.

On data confidentiality and access concerns, this research made use of publicly available secondary data from various websites aforementioned. Where access required online registration, the researcher created the necessary online access accounts to legally obtain the data. The data was only used for academic research purposes. Consequently, no living organism subjects were required.



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<sup>10</sup> Approval under **Appendix 2**

<sup>11</sup> Research license under **Appendix 3**

## CHAPTER 4: PRESENTATION OF RESEARCH FINDINGS

### 4.1. Introduction

The primary objective of the study was to evaluate the determinants of inflation in Kenya and the moderating effects of governance regimes.

This chapter presents the findings of the analysis done on data derived from publicly available sources. It begins with a brief explanation of the sample representation and descriptive statistics of the study, followed by the diagnostic tests undertaken. Thereafter, the results of the ARDL method of analysis are broken down.

### 4.2. Sample Representation

Sample representation refers to the extent to which various observations of a variable in a study are represented in data analysis. The study covered quarterly data of variables from 1996Q1 to 2020Q4. The data utilised was complete and this gave a 100% sample representation.

### 4.3. Descriptive Statistics

The data utilised for the study had 100 observations for each of the variables – four observations for every year. The dependent variable was the natural logarithm of inflation as measured by the change in CPI.

The independent variables were natural logarithms of monetary and non-monetary factors as detailed in **Appendix 5**. The natural logarithm of lag inflation was also an independent variable given the ARDL model characteristics. The unit of analysis was Kenya.

Categorical variables were incorporated to capture the governance regimes based on the Presidents and CBK Governors. The categorical variables to represent the periods of governance for each President of Kenya and each CBK Governor. This was carried out by developing interaction terms. For instance, the interaction term for interest rates during the tenure of President Moi was indicated by *pmoi\_intbill* which is taken as the product of the categorical variable for the President (*pmoi*) and the natural logarithm of the Treasury bill rate (*intbill*).

Variable	N	Mean	Std. Dev	Min	Max	Skewness	Kurtosis
Inflation ( <i>lninfl</i> )	100	-2.703	0.550	-4.135	-1.662	-0.207	2.764
Exchange rate ( <i>lnfx</i> )	100	4.384	0.179	3.991	4.696	-0.168	2.350
Money supply ( <i>lnms_m3</i> )	100	13.737	0.895	12.440	15.191	-0.169	1.524
Interest rate ( <i>Intbill</i> )	100	-2.461	0.616	-4.461	-1.319	-0.814	4.820
Oil prices ( <i>lnall_index</i> )	100	4.576	0.435	3.759	5.296	-0.246	1.822
Debt-to-GDP ratio ( <i>Indebt2gdp</i> )	100	-0.565	0.162	-0.872	-0.240	0.093	2.414
Stock market performance ( <i>lnmse20</i> )	100	8.052	0.384	6.950	8.639	-0.822	3.314

**Figure 5: Descriptive Statistics for Monetary and Non-Monetary Factors**

There were one hundred observations of each variable for each quarter. The categorical variables for governance regimes that were used to develop the interaction terms had values of 0 and 1.

The use of natural logs led to some interaction terms having negative values owing to their nature as ratios. For instance, the natural logs of inflation, interest rates and debt-to-GDP ratios had mean values of -2.703, -2.461 and -0.565 respectively.

The interaction terms had varying levels of skewness and kurtosis, which was expected given the impact of binary values. However, for the monetary and non-monetary factors, the skewness ranged between -0.81 (*Intbill*) and 0.09 (*Indebt2GDP*). The level of kurtosis was also fairly contained, ranging between 1.52 (*Inms\_m3*) and 4.82 (*Intbill*).

**Appendix 5** captures the detailed descriptive statistics of all the variables – mean, standard deviation, minimum, maximum, median, skewness and kurtosis.

#### 4.4. Correlation Analysis

Correlation is a measure of the strength of the relationship between two variables regarding intensity and co-movement. Correlation analysis is therefore the method of evaluating the extent of correlation.

In instances of high correlation, two or more variables have a strong relationship to each other, whereas a weaker correlation shows that the variables are barely related. The power of the relationship is indicated by the correlation coefficient which fluctuates between +1 and -1. A value of  $\pm 1$  shows a perfect degree of association between two variables.

Since correlation is not a measure of causality, a correlation analysis would be carried out simply to gauge the intensity of the relationship between variables. Therefore, for strongly positively correlated variables, an increase in one is likely to lead to an increase in the other. The correlation matrix for the monetary and non-monetary variables at a 5-percent level of significance is represented in

	Lag inflation	Exchange Rate	Money Supply	Interest Rate	Oil Prices	Debt-to-GDP	Stock Market Index
Lag inflation	1.0000						
Exchange Rate	0.0157	1.0000					
Money Supply	0.0419	-0.8853	1.0000				
Interest Rate	0.0953	0.3322	-0.3230	1.0000			
Oil Prices	-0.1325	0.1640	-0.4909	0.2846	1.0000		
Debt-to-GDP	-0.1365	0.1109	-0.3061	0.0314	0.6374	1.0000	
Stock Market Index	0.0120	0.6002	-0.5090	0.0587	-0.1045	0.3265	1.0000

Figure 6.

	Lag inflation	Exchange Rate	Money Supply	Interest Rate	Oil Prices	Debt-to-GDP	Stock Market Index
Lag inflation	1.0000						
Exchange Rate	0.0157	1.0000					

<b>Money Supply</b>	0.0419	-0.8853	1.0000				
<b>Interest Rate</b>	0.0953	0.3322	-0.3230	1.0000			
<b>Oil Prices</b>	-0.1325	0.1640	-0.4909	0.2846	1.0000		
<b>Debt-to-GDP</b>	-0.1365	0.1109	-0.3061	0.0314	0.6374	1.0000	
<b>Stock Market Index</b>	0.0120	0.6002	-0.5090	0.0587	-0.1045	0.3265	1.0000

**Figure 6: Correlation Matrix of the Monetary and Non-Monetary Variables**

Based on the Pearson's correlation statistic, money supply was negatively correlated with exchange rates and interest rates as expected. It was also negatively correlated with all other factors except lag inflation. The rest of the monetary factors were positively correlated. The weakest correlation was between lag inflation and stock market at 0.0120.

#### 4.5. Moderation Analysis

On conducting an analysis of variance and covariance (ANCOVA), the results were as shown in **Figure 7**.

Source	Partial SS	df	MS	F	Prob>F
Model	8.020166	6	1.33669	5.66	0.0000
pmoi	1.036733	1	1.03673	4.39	0.0388
pkib	0.163157	1	0.16316	0.69	0.4078
puhr	0	0			
gchesm	1.433285	1	1.43329	6.07	0.0156
gnyag	0.12313	1	0.12313	0.52	0.4719
gmlei	0.144163	1	0.14416	0.61	0.4364
gndng	0.077833	1	0.07783	0.33	0.5672
gnjrg	0	0			
Residual	21.94786	93	0.23600		
Total	29.96803	99	0.30271		

R-squared = 0.2676  
Adj. R-squared = 0.2204

**Figure 7: Results of ANCOVA Analysis**

It was evident that the F-statistic for the model as well as for two of the moderator variables (President Moi and Governor Cheserem) were significant. This would therefore necessitate the examination of the coefficient of determination (with interaction variables) to provide further information as to the influence of the governance regimes.

#### 4.6. Diagnostic Tests

In order to ascertain the internal validity of the estimated ARDL model and the ECM model, the researcher had to identify whether it could be used to make practical inferences. The following were the tests carried out.

##### 4.6.1. Test for Normality

This was carried out using the Shapiro-Wilk test (S-W test). The results of the test are indicated in **Figure 8** below.

Variable	Obs	W	V	z	Prob>z
lninfl	100	0.98334	1.376	0.708	0.23950
lnfx	100	0.95683	3.564	2.820	0.00240
lnms_m3	100	0.90347	7.970	4.605	0.00000
lntbill	100	0.89470	8.694	4.797	0.00000
lnall_index	100	0.93466	5.395	3.739	0.00009
lndebt2gdp	100	0.98411	1.312	0.603	0.27326
lnnse20	100	0.94066	4.900	3.525	0.00021

**Figure 8: Results of Shapiro-Wilks Test**

For the S-W test, a p-value of less than 5 percent in each case implies that there is a likelihood of the actual data distribution differing from a comparable normal distribution by chance alone. From the results, all variables except inflation and debt-to-GDP were significant at 1% level of significance. This implies that the two variables were likely to be normally distributed unlike the rest. All interaction terms were significant as indicated in **Appendix 10**.

##### 4.6.2. Test for Serial Correlation

For the Breusch-Godfrey test, the null hypothesis is that there is no serial correlation. The Breusch-Godfrey test conducted for 4 lags had a chi-square statistic of 16.118 for 4 degrees of freedom. In this case, the chi-square statistic was significant at 5% level

of significance. This implied that the researcher needed to reject the null hypothesis, indicating that autocorrelation was present.

Though not initially applied as a test for stationarity, the Durbin-Watson (DW) test was carried out for autocorrelation. The DW test produces a statistic known as the DW statistic. The DW statistic ranges from 0 to 4, with values that are closer to 2 (middle range) indicating a lesser autocorrelation. Values approaching 0 or 4 indicate either a greater positive or negative autocorrelation respectively. The DW statistic for this study was 1.897636, an indication of mild positive autocorrelation.

#### 4.6.3. Test for Heteroscedasticity

The White test was applied, and the results are indicated in **Figure 9**. For the White's test, the null hypothesis is that there is homoscedasticity. In this case, the probability value was not significant. This means that we fail to reject the null which implies that homoscedasticity is likely to be present.

Source	chi2	df	p
Heteroskedasticity	84.46	77	0.2623
Skewness	13.45	11	0.2651
Kurtosis	1.79	1	0.1812
Total	99.7	89	0.2057
chi2(77) = 84.46			
Prob > chi2 = 0.2623			

**Figure 9: Results of the White's Test**

#### 4.6.4. Test for Multicollinearity

To test for multicollinearity, the Variance Inflation Factor (VIF) was used. VIF states the extent to which the standard error of coefficient of interest has been increased by having multicollinear variables.

The rule of thumb is to ignore standard errors that have been inflated more than twice their basic size – a VIF greater than 4. However, a VIF greater than 10 indicates presence of multicollinearity.

Variable	VIF	1/VIF
lnms_m3	12.84	0.077880
lnfx	9.49	0.105406
lnall_index	6.2	0.161209

lnnse20	3.28	0.304657
lndebt2gdp	3.25	0.307789
lnbill	1.35	0.739314
Mean VIF	6.07	

**Figure 10: Results of Variance-Inflation Factor**

The results, as summarised in **Figure 10**, show that money supply has multicollinearity with the exchange rate having a relatively high acceptable level of multicollinearity.

#### 4.6.5. Test for Causality

A Granger causality test will be carried out for inflation, interest rates and exchange rates as a test for reverse causality in order to validate the findings. This was based on a Vector Autoregressive (VAR) model of the three variables. The findings are presented in **Figure 11** below.

Equation	Excluded	chi2	df	Prob > chi2
lninfl	lnbill	8.2055	2	0.017
lninfl	lnfx	6.1744	2	0.046
lninfl	ALL	12.709	4	0.013
lnbill	lninfl	1.6895	2	0.43
lnbill	lnfx	14.462	2	0.001
lnbill	ALL	17.461	4	0.002
lnfx	lninfl	0.64294	2	0.725
lnfx	lnbill	2.1929	2	0.334
lnfx	ALL	2.9075	4	0.573

**Figure 11: Results of the Granger causality Wald test**

The results indicate that there is no causality for the exchange rate. However, for the interest rates, the p-values are significant at 5%. This implies that we reject the null hypothesis, meaning that Granger causality may be present between inflation and interest rates.

## 4.7. The ARDL Analysis

### 4.7.1. Optimal Lags

On carrying out the ARDL model, the researcher began by obtaining the optimal lags for each variable. The output for the Akaike Information Criterion (AIC), Hannan-Quinn Information Criterion (HIC) and Schwarz Bayesian Information Criterion (SBIC) is identified in **Appendix 6**. Ultimately, the SBIC was adopted simply because it was the default criterion for Stata®, the software that was utilised for the study.

### 4.7.2. Test for Stationarity

On identifying the optimal lags for each variable, a test for stationarity was carried out. A stationarity test determines whether the data is stationary to avoid spurious regression. Non-stationary data does not exhibit mean reversion. Thus, a spurious regression cannot be used for hypothesis testing, forecasting or prediction. This study applied both the ADF test (Dickey and Fuller, 1981) and the Phillips-Perron test (Phillips and Perron, 1988) resulting in similar p-values.

Variable	Lags based on SBIC	Test statistic	MacKinnon p-value	Outcome
lninfl	4	-4.514	0.0002	Stationary
lnfx	1	-1.251	0.6511	Non-stationary
lnms_m3	2	0.757	0.9909	Non-stationary
lnbill	2	-3.420	0.0103	Stationary
lnall_index	2	-1.382	0.5910	Non-stationary
lndebt2gdp	1	-1.520	0.5237	Non-stationary
lnnse20	3	-2.037	0.2708	Non-stationary

**Figure 12: ADF Test Results of Monetary and Non-Monetary Variables**

From the above, only inflation and interest rates (as measured using the 91-day Treasury bill rate as a proxy) were identified as stationary at I (0). The interaction variables were also identified as non-stationary.

All other variables were however stationary for the first difference, that is, at I (1). This is presented in **Figure 13** below whereby the variables were significant at a 5% level.

Variable	Lags based on SBIC	Test statistic	MacKinnon p-value	Stationarity Level
lninfl	4	-4.514	<b>0.0002</b>	I (0)
lnfx	1	-1.251	0.0000	I (1)
lnms_m3	2	0.757	0.0142	I (1)
lntbill	2	-3.420	<b>0.0103</b>	I (0)
lnall_index	2	-1.382	0.0000	I (1)
lndebt2gdp	1	-1.520	0.0000	I (1)
lnnse20	3	-2.037	0.0004	I (1)

**Figure 13: ADF Test Results at First Difference**

The data was deemed appropriate since an ARDL model is applicable for both non-stationary time series as well as for time series with mixed order of integration (Shresta and Bhatta, 2018).

#### 4.7.3. Estimating the Model

The next step taken was to estimate the ARDL model. The optimal lags identified from the output were later used for the bounds cointegration test (Wald test). The lags are summarised below.

Variable	Lags based on ARDL Output
lninfl	4
lnfx	0
lnms_m3	0
lntbill	1
lnall_index	0
lndebt2gdp	0
lnnse20	0

**Figure 14: Optimal Lags for Bounds Cointegration Test**

The ARDL (4 0 0 1 0 0 0) regression resulted in an equation with an F-statistic probability value that was significant at 1% level of significance. The output is summarised in **Figure 15** below.

All but the second order of lags of inflation were significant. Similarly, interest rates were significant.

Variable	Coefficient	SE	t-Statistic	Prob.
<b>lninfl</b>				
L1.	0.6445750	0.0959505	6.72	0.000
L2.	-0.0632899	0.1193482	-0.53	0.597
L3.	0.2413897	0.1175642	2.05	0.043
L4.	-0.4479559	0.0922238	-4.86	0.000
lnfx	-0.1226645	0.6530059	-0.19	0.851
lnms_m3	-0.0912701	0.1500743	-0.61	0.545
<b>Intbill</b>				
--.	0.4043299	0.1354552	2.98	0.004
L1.	-0.4505392	0.1441310	-3.13	0.002
lnall_index	0.2615212	0.2049325	1.28	0.205
lndebt2gdp	0.2805779	0.3897260	0.72	0.474
lnnse20	0.0829082	0.1642779	0.50	0.615
_cons	-1.7174590	2.2208990	-0.77	0.442
F (11,84) = 15.92		R-squared = 0.6758		
Prob > F = 0.0000		Adj R-squared = 0.6333		

**Figure 15: Output for ARDL (4 0 0 1 0 0 0) Regression**

When carried out separately for monetary and non-monetary factors, the ARDL output was slightly different. For monetary factors, the ARDL (4 0 0 1) regression yielded an adjusted coefficient of determination of 66.77%. For non-monetary factors, the ARDL (4 0 0 0) regression yielded an adjusted coefficient of determination of 61.86%. This supports the expectation that monetary factors would have a greater influence on inflation than non-monetary factors.

In both instances, the lags of inflation were significant at 5% level of significance except for the second order lag. For the monetary factors, interest rates and their lags were significant. None of the non-monetary factors was significant, but the constant term was significant at 1% level of significance.

Separate ARDL regressions were carried out for the different governance regimes, both for Presidents and CBK Governors. A maximum lag of one was applied to limit the number of iterations, given the vast number of interaction variables present. A summary of the output is shown in **Figure 16** below.

	F (df <sub>1</sub> , df <sub>2</sub> )	F statistic	Prob.	R-squared	Adj. R-squared
<b>Without Governance<sup>12</sup></b>	F (11, 84)	15.92	0.0000	0.6758	0.6333
<b>Presidents</b>					
Moi	F (16, 82)	16.48	0.0000	0.7627**	0.7164
Kibaki	F (17, 81)	23.71	0.0000	0.8327**	0.7975
Kenyatta	F (14, 84)	9.91	0.0000	0.6229	0.5600
<b>CBK Governors</b>					
Cheserem	F (15, 83)	10.36	0.0000	0.6518	0.5889
Nyaga*	F (12, 86)	13.99	0.0000	0.6612	0.6140
Mullei	F (17, 81)	12.79	0.0000	0.7286**	0.6716
Ndung'u	F (14, 84)	12.10	0.0000	0.6685	0.6132
Njoroge	F (16, 82)	8.41	0.0000	0.6214	0.5475

\*Interaction terms for non-monetary factors (oil prices, debt-to-GDP ratio and stock market index) eliminated due to collinearity  
\*\*R-squared is greater than without governance

**Figure 16: Comparative ARDL Output for the Various Governance Regimes**

The output so far seems to suggest that certain governance regimes had a greater influence on inflation than others. In this case, the Moi and Kibaki regimes seem to have had a greater influence on the rate of inflation when examined on the basis of the coefficient of determination. The Mullei era of CBK governance appears to have had noteworthy influence on inflation when compared to the other regimes.

The optimal lags for the ARDL models are captured in **Appendix 7** with the lags for the interaction terms indicated on the right-hand side.

#### **4.7.4. Bounds Cointegration Test**

The ARDL cointegration technique is used in determining the long run relationship between series with different order of integration (Pesaran and Shin, 1999; Pesaran et al., 2001).

For a bounds cointegration test, we reject the null hypothesis if the value of F statistic is higher than the value of the I (1) series. From **Figure 17**, it is evident that 8.257 is higher, even at 1% level of significance. We therefore reject the null hypothesis. The conclusion, therefore, is that there is cointegration.

<sup>12</sup> Refer to **Figure 15**.

	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
<b>ADJ</b>						
lninfl						
L1.	-0.625281	0.090017	-6.95	0.000	-0.804289	-0.446273
<b>LR</b>						
Infx	-0.196175	1.048139	-0.19	0.852	-2.280515	1.888165
Inms_m3	-0.145967	0.237667	-0.61	0.541	-0.618593	0.326660
Intbill	-0.073902	0.118653	-0.62	0.535	-0.309856	0.162053
Inall_index	0.418246	0.330268	1.27	0.209	-0.238529	1.075020
Indebt2gdp	0.448723	0.633608	0.71	0.481	-0.811277	1.708722
Innse20	0.132593	0.260281	0.51	0.612	-0.385005	0.650192
<b>SR</b>						
lninfl						
LD.	0.269856	0.097281	2.77	0.007	0.076403	0.463309
L2D.	0.206566	0.093199	2.22	0.029	0.021230	0.391903
L3D.	0.447956	0.092224	4.86	0.000	0.264559	0.631353
Intbill						
D1.	0.450539	0.144131	3.13	0.002	0.163919	0.737160
_cons	-1.717459	2.220899	-0.77	0.442	-6.133961	2.699043
F-statistic = 8.257						
<b>Critical values</b>			<b>1%</b>	<b>5%</b>		
Upper bound			3.23	3.61		
Lower bound			2.12	2.45		
R-squared = 0.4444						
Adj. R-squared = 0.3717						

**Figure 17: Bounds Cointegration Test Output**

The result of the estimation indicates that the explanatory variables account for about 44 percent of the variation in inflation in Kenya.

For the bounds test separately carried out for the monetary and non-monetary factors, the F-statistics were 14.079 and 10.800 respectively. These were much higher than their respective upper bounds. We therefore reject the null hypothesis, concluding that there is cointegration.

#### **4.7.5. Estimation of Error Correction Model**

The Error Correction Model (ECM) was estimated based on the optimal lags identified for the determinants of inflation. The output was as shown in **Figure 18** below.

	D.lninfl	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
<b>ADJ</b>	lninfl						
	L1.	-0.625281	0.090017	-6.95	0.000	-0.804289	-0.446273
<b>LR</b>	lnfx	-0.196175	1.048139	-0.19	0.852	-2.280515	1.888165
	lnms_m3	-0.145967	0.237667	-0.61	0.541	-0.618593	0.326660
	Intbill	-0.073902	0.118653	-0.62	0.535	-0.309856	0.162053
	lnall_index	0.418246	0.330268	1.27	0.209	-0.238529	1.075020
	lndebt2gdp	0.448723	0.633608	0.71	0.481	-0.811277	1.708722
	lnnse20	0.132593	0.260281	0.51	0.612	-0.385005	0.650192
<b>SR</b>	lninfl						
	LD.	0.269856	0.097281	2.77	0.007	0.076403	0.463309
	L2D.	0.206566	0.093199	2.22	0.029	0.021230	0.391903
	L3D.	0.447956	0.092224	4.86	0.000	0.264559	0.631353
	Intbill						
	D1.	0.450539	0.144131	3.13	0.002	0.163919	0.737160
	_cons	-1.717459	2.220899	-0.77	0.442	-6.133961	2.699043
R-squared = 0.4444							
Adj. R-squared = 0.3717							

### Figure 18: Error Correction Model (ECM) Output

From **Figure 18** above, the initials ADJ refer to an adjustment, LR refers to long run and SR refers to short run. Given that ARDL estimates short run and long run relationships, the results indicate that there is long run convergence of inflation based on the negative coefficient of the adjustment. A positive coefficient would mean that the model would be explosive. The coefficient implies that previous errors would be corrected in the current period at a speed of 62.53% in the adjustment process towards the long run equilibrium.

For the long run coefficients, none was significant at a 5 percent level of significance as observed from the probability value. The monetary factors had a negative coefficient, implying an inverse relationship in the long run while the non-monetary factors had positive coefficients.

As for the short run, lag inflation and interest rates were significant with positive coefficients. This implies that in the short run, inflation in Kenya is primarily a factor of the most recent inflation and prevailing interest rates. Therefore, based on the evidence, non-monetary factors do not have much bearing on inflation.

Separate ECM regressions were carried out for both monetary and non-monetary factors. The output showed adjusted coefficients of determination of 37.83% and 29.45% respectively. In terms of significance of the coefficients, the results were consistent with the combined ECM model.

When governance regimes are considered the ECM output is as shown in **Appendix 8** and **Appendix 9**. Inflation adjustment is significant all through.

From the output, during President Moi's era, debt-to-GDP ratio and the stock market index were significant in the long run, as well as the interaction variables for inflation and debt-to-GDP ratio. In the short run, interest rates and the interaction variable for lag inflation were significant.

In President Kibaki's era, the oil price index, debt-to-GDP ratio and the stock market index were significant in the long run, as well as the interaction variable for inflation. In the short run, interest rates and the interaction variables for lag inflation and interest rates were significant.

As for President Kenyatta's era, the oil price index and debt-to-GDP ratio were significant in the long run. In the short run, interest rates were significant.

When the ECM was run for the regimes of the various CBK Governors, the adjustment to inflation remained significant at 1% level of significance. In the era of Governor Cheserem, only the interaction term for inflation was significant in the long run and only interest rates were significant in the short run.

In the Nyagah era, the stock market index and the interaction term for inflation were significant in the long run with interest rates being significant in the short run. It is worth noting that for the ARDL regression for Nyagah, some variables had been omitted due to multicollinearity.

As for the Mulei era, only the interaction term for inflation was significant in the long run. In the short run, interest rates together with the interaction terms for inflation and interest rates were significant.

Under the Governor Ndung'u regime, the stock market index and the debt-to-GDP ratio were significant in the long run. The interaction term for inflation was significant as well at 1% level of significance. Interestingly, in the short run, the constant was significant. This was the only instance in which the constant was significant.

Lastly, for the Governor Njoroge regime, the oil price index, the debt-to-GDP ratio and the interaction term for inflation were significant in the long run. In the short run, the interest rates were significant.



## CHAPTER 5: DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

### 5.1. Introduction

This chapter briefly presents discussions and interpretations of the research findings. The summary of findings is presented in accordance with the research objectives. From these, it shows the conclusions and recommendations of the researcher. Finally, the limitations of the research and contribution to the body of knowledge and areas of possible further research are discussed.

### 5.2. Discussion of Findings

This study sought to examine the short-run and long-run impacts of the determinants on inflation. The discussion of findings is broken down in line with the objectives of the study.

#### 5.2.1. *The Monetary Determinants of Inflation in Kenya*

The evidence presented in Chapter 4 demonstrates that monetary factors have an influence on inflation. From the ECM model for the determinants presented in **Figure 18**, lag inflation and interest rates have a significant impact on inflation.

The long run variables had negative coefficients but were not significant, implying that there was negligible impact of monetary determinants on inflation in Kenya in the long run. Nevertheless, the short run variables (lag inflation and interest rates) had significant short run relationships.

This is an indicator of inflation inertia as the most recent rates of inflation tend to have a bearing on current inflation. Additionally, the prevailing interest rates appear to have a notable effect on the rate of inflation.

Interestingly, Ochieng, Mukras and Momanyi (2016) had found evidence for lag inflation but not for interest rates as significant determinants of inflation in Kenya.

Other monetary factors such as foreign exchange rates and money supply do not generally have a significant influence on inflation in the long run but may have periods in which their influence is observed. In this study, the moderating effect of governance regimes has demonstrated this. The results contradicted the findings of Kiganda and Omondi (2020) who had observed the significant influence of total money supply on inflation.

### ***5.2.2. The Non-Monetary Determinants of Inflation in Kenya***

The ECM model presented in **Figure 18**, shows that the non-monetary determinants of oil price index, debt-to-GDP ratio and the stock market index, do not have a significant impact on inflation in Kenya.

This implies that they are not a major consideration for economic agents when determining the level of inflation to expect but are a consequence of inflationary factors. The output shows that lag inflation still has noteworthy influence on current inflation rates. This speaks to inflation expectations influencing current inflation.

Similarly, the non-monetary factors do not have a long run or short run impact on the level of inflation, but given the moderating effects of governance regimes, their influence may be felt sporadically. The results were consistent with the findings of Misati et al (2012) in that the exchange rate has no influence on inflation.

### ***5.2.3. The Moderating Effect of the Governance Regime***

The study of governance regimes is the main contribution of this paper. From the results, it is evident that governance regimes have had an influence on the rate of inflation.

Looking at the ECM output in **Appendix 8** and **Appendix 9**, there seemed to be a variation in the significance of both monetary and non-monetary factors over time depending on the regime. A constant theme across time is the significance of interest rates and lag inflation in the short run.

In President Moi's era, debt-to-GDP ratio and the stock market index were significant in the long run, as well as the interaction variables for inflation and debt-to-GDP ratio. This is consistent with the reality at the time given that the President Moi era was characterised by huge debt levels of over 60% of GDP. In the latter part of the period, the country suffered economic sanctions which impacted foreign investor confidence, hence the impact to the stock market.

In President Kibaki's era, the oil price index, debt-to-GDP ratio and the stock market index were significant in the long run, as well as the interaction variable for inflation. The oil prices at the time were a major factor in world commodity markets. The regime took over a huge debt burden from the Moi regime which it had to address as well. The stock market thrived in this era as it had a number of listings.

As for President Kenyatta's era, the oil price index and debt-to-GDP ratio were significant in the long run. In the short run, interest rates were significant. The influence of OPEC<sup>13</sup> countries on world oil prices could not be ignored. The President Kenyatta era had a significant rise in debt to finance the capital-intensive infrastructure projects. Additionally, the implementation of a new constitution brought about devolution of government functions which was an expensive process. This era also witnessed the introduction of Kenya to the Eurobond market.

When the ECM was run for the regimes of the various CBK Governors, the adjustment to inflation remained significant at 1% level of significance. In the eras of Governor Cheserem, Governor Nyagah and Governor Mullei, only the interaction term for inflation was significant in the long run.

Under the Governor Ndung'u regime, the stock market index and the debt-to-GDP ratio were significant in the long run. The interaction term for inflation was significant as well at 1% level of significance. This reflects the situation at the time. The period was characterised by stock market listings and increased debt levels within the President Kibaki era.

Lastly, for the Governor Njoroge regime, the oil price index, the debt-to-GDP ratio and the interaction term for inflation were significant in the long run. This is consistent with President Kenyatta's era as it was the time in which there was increased public debt as well as supply shocks in the oil sector.

**Figure 16** seems to suggest that on the basis of the coefficient of determination, the Moi and Kibaki regimes seem to have had a greater influence on the rate of inflation. It also suggests that the Mullei era of CBK governance appears to have had considerable influence on inflation when compared to the other regimes.

Moreover, **Appendix 8** and **Appendix 9** show the different monetary and non-monetary factors with varying levels of significance. We can therefore conclude that governance regimes do have a moderating effect on the rate of inflation in Kenya.

### 5.3. Conclusions

The unique characteristics of developing countries warrant appropriate considerations. The participation of emerging markets in global finance is a major reason why they

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<sup>13</sup> Oil-Producing and Exporting Countries

have by now earned their own large body of research, but it also means that they remain highly prone to problems of asymmetric information, illiquidity, default risk, moral hazard and imperfect institutions (Frankel, 2010).

Having been identified for as long as money has existed, inflation is not a new phenomenon. There is a famous anecdote of Mansa Musa, the former ruler of the 14<sup>th</sup> century Mali Empire, who was so wealthy that he once single-handedly caused a global inflation of gold when he made a pilgrimage to Mecca and generously gave out large sums of gold along the way to the poor.

It is evident from literature that inflation continues to be an enigma for economists the world over in the 21<sup>st</sup> century. Policy formulation around inflation presents a challenge to most central banks. Blanchard (2017) observes that unlike a machine, the economy is composed of people and firms who try to anticipate what policy makers will do, and who react not only to current policy but also to expectations of future policy. He suggests the use of game theory as opposed to optimal control theory which was based on the view that the economy runs like a machine whereby actions of economic agents need to be guided.

The debate on the theoretical foundations of inflation, primarily between the monetarist view and the Keynesian view, rages on. According to the Keynesian viewpoint, inflation is a consequence of economic shocks such as oil price increases, while the monetarist point of view holds that “only money matters” and that inflation is the result of excess demand and inappropriate monetary responses to economic situations. The impact of money on inflation is most visible when governments finance spending in a crisis such as a civil war, by printing money excessively which may lead to hyperinflation.

We can conclude from this study that in the Kenyan context, inflation appears to be primarily influenced by prevailing interest rates as well as the most recent rates of inflation in the short run.

We had noted earlier that interest rate movements tend to have a conspicuous signalling effect on inflationary expectations in developing countries given the dominance of banking financial institutions in the economy. It appears Kenya is no different.

Other monetary factors such as foreign exchange rates and money supply do not generally have a significant influence on inflation in the long run but may have periods

in which their influence is observed. In this study, the moderating effect of governance regimes has demonstrated this.

Similarly, the non-monetary factors do not have a long run or short run impact on the level of inflation, but given the moderating effects of governance regimes, their influence may be felt sporadically.

The output of the Governor Njoroge regime shows the oil price index, the debt-to-GDP ratio and the interaction term for inflation as significant in the long run. This implies that global oil prices and public debt levels are emerging as major geopolitical factors influencing the rate of inflation. The study therefore emphasises the importance of good governance to ensure consistency of policy across regimes in order to maintain price stability.

This study is significant as it provides support for the New Neoclassical Synthesis (NNS) theory by demonstrating the importance of considerations other than monetary factors.

#### **5.4. Recommendations**

Given the demonstrated influence of governance regimes, one of the recommendations of the study is that institutions discharge their mandate effectively. In this case, the CBK as the main body charged with controlling inflation should ensure that policy measures are put in place to curb significant increases in inflation.

Given the significance of interest rates and inflation, the CBK should ensure that timely reports are issued to the public to signal inflation movements. This could serve to minimise overreaction of economic agents in the economy. The CBK should also be accorded the necessary independence to operate more effectively. This would serve to maintain policy consistency across regimes.

The misalignment of the policy rate and short-term rate is a problem that the CBK needs to address. The inefficiencies in the interbank market, largely attributed to segmentation and the lack of transparency in commercial bank loan pricing, could be addressed through looking into recent inflation and interest rates as a guide.

With debt levels emerging as a significant determinant of inflation in more recent regimes, it is worth noting the concern around increased public debt levels. The Kenyan government should ensure that debt levels do not rise exorbitantly as this affects the confidence of economic agents.

The impact of inflation is felt mostly by those in the bottom of the pyramid. The government could consider giving them incentives to ensure that they are cushioned from the impact of adverse inflation. These could be through tax exemptions and subsidies to enable the poor in society to access basic needs.

The world economy has a reliance on oil. With oil as the main energy source, it is worth considering that the world moves towards alternative sustainable energy sources. This would serve to ensure the world economy is not affected by the harsh effects of global oil price shocks. This would in turn also reduce the impact of inflation.

While carrying out the study, it became apparent that there is a shortage of consistent reliable data for research. Most of the websites of the entities referenced in this study seems to have a challenge of data, especially in the 1990s. Research institutes such as KIPPRA and other think tanks could work with other such entities to collate and refine the data for researchers, for the benefit of improving on policy and decision-making. The presence of a single source of reliable data could prove useful in bolstering the availability of data in Kenya, a developing country. The ultimate result of this efforts would be a marked improvement in the quality of research output.

### **5.5. Limitations of the Study**

Admittedly, when it comes to matters inflation, Kenya seems over-researched. However, there is a challenge with regard to availability of consistent reliable data over a long period of time. Most studies have focused on few variables or short time horizons. It was a challenge to obtain data particularly for the 1990s. The same would likely be a problem across Africa and other developing regions of the world.

Fiscal policy tools such as taxes and subsidies were not covered in this study as part of non-monetary factors. This is because taxes and subsidies tend to be subjective depending on the dynamics of the country in question. This study aimed to provide an understanding of inflation with findings that could be applicable universally.

Nascent issues in finance such as cryptocurrencies were not considered in this study, though they are likely to become significant once more data becomes available in the future. Their significance is emerging since they influence money supply globally and could serve as an option to address inflation in future.

The global coronavirus (COVID-19) pandemic has also had far-reaching effects. This phenomenon impacted economies globally with an observed rise in inflation rates.

Central bankers had gone to great lengths to manage inflation given the lockdowns of the global economy. This study however does not consider much of the period as it occurred at the tail-end of the period under study.

## **5.6. Recommendations for Further Studies**

A number of the recommendations for further studies relate to the limitations of this study. Firstly, fiscal policy tools such as taxes and subsidies were not covered in this study as part of non-monetary factors. It would be important to consider country-specific dynamics with regard to inflation. Further studies on fiscal policy effects on inflation are also worth considering further. This would be useful to test the finding by Misati et al. (2012) of the dominant role of fiscal policy on both prices and output.

Given that cryptocurrencies have not been examined, it would be great to get an understanding of their impact on inflation on a global scale. This presents an exciting area of study since it is relatively nascent.

This study did not delve deeper into external shocks as such as the global financial crisis and more recently, the global COVID-19 pandemic that create uncertainties for economic agents (MPC, 2021). It would be necessary to carry out event studies of their impact on inflation as more information becomes available.

More specifically relating to this study, one could also adopt a similar research study based on other geographical regions, perhaps similar developing countries. Emerging markets present an opportunity for study to identify the different nuances.

A researcher could also consider a panel analysis by examining inflation concurrently for various countries, economic blocs or currency zones. A comparative study would be good to identify the differences and could serve to contribute to literature.

The determinants of inflation examined in this study are by no means exhaustive. The ECM results demonstrate a coefficient of determination of about 44%, which means that there are other factors that could explain the level of inflation that are worth investigating. Others are unique to certain countries, for instance, availability of natural resources, mobile money penetration and other cashless payment systems.

One could also consider adopting ARDL in the study of inflation in other countries, as Dahiru and Sulong (2017) did for Nigeria. Most researchers tend to opt for OLS regression, but this may prove spurious since, in most cases, the data could be non-stationary. Adopting ARDL could serve to verify the findings achieved through other methods.

The ARDL method of studying non-stationary data has proven particularly useful. One could also adopt it for studying other economic phenomena such as exchange rate crises and oil price movements.

There are other statistical methods that could be applied to study inflation instead of ARDL. The most ideal would be non-parametric methods such as Autoregressive Integrated Moving Average (ARIMA), An Autoregressive Integrated Moving Average with Explanatory Variable (ARIMAX), Autoregressive Conditional Heteroskedasticity (ARCH) and Generalised Autoregressive Conditional Heteroskedasticity (GARCH), Autoregressive Fractionally Integrated Moving Average (ARFIMA) and Markov Switching models, to mention but a few.

Another consideration for further studies is by adopting longer time horizons. This study has been carried out based on data spanning twenty-five years. Applying a longer time horizon, contingent on availability of data, would likely yield more robust results.



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## Appendices

### *Appendix 1: Letter of Introduction*

C/O Sangale Rd, Madaraka Estate,  
P.O. Box 59857 00200, Nairobi, Kenya,  
Cell: +254 703 414/6/7, Twitter: @SBSKenya  
Email: info@sbs.ac.ke or visit www.sbs.strathmore.edu



13<sup>th</sup> July 2022

To Whom It May Concern,

**RE: FACILITATION OF RESEARCH – SOLOMON ATURA MAONGA**

This is to introduce Solomon Atura Maonga, a Master of Science in Development Finance (MDF) Student at Strathmore University Business School, admission number MDF/66134/18. As part of our MDF Programme, Solomon is expected to do applied research and undertake a project. This is in partial fulfilment of the requirements of the MDF course. To this effect, he would like to request for appropriate data from your organization.

Solomon is undertaking a research paper on “Determinants of Inflation in Kenya and the Moderating Effects of Governance Regimes.” The information obtained shall be treated confidentially and shall be used for academic purposes only.

Our MDF Programme seeks to establish links with industry, and one of the ways of doing so is directing our research to areas that would be of direct use to industry. We would be glad to share our findings with you after the research, and we trust that you will find them of great interest and of practical value to your organization.

We appreciate your support and shall be willing to provide any further information if required.

Yours sincerely,

A handwritten signature in black ink, appearing to be "Njoki Kiagiri".

**Njoki Kiagiri**  
Manager – Graduate Programmes.



## Appendix 2: Ethical Review Committee Approval



4<sup>th</sup> July 2022

Mr Maonga Solomon,  
solomon.maonga@strathmore.edu

Dear Mr Maonga,

### **RE: Determinants of Inflation in Kenya and the Moderating Effects of Governance Regimes**

This is to inform you that SU-ISERC has reviewed and approved your above SU Masters' research proposal. Your application reference number is SU-ISERC1412/22. The approval period is 4<sup>th</sup> July 2022 to 3<sup>rd</sup> July 2023.

This approval is subject to compliance with the following requirements:

- i. Only approved documents including (informed consents, study instruments, MTA) will be used
- ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by SU-ISERC.
- iii. Death and life-threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to SU-ISERC within 48 hours of notification
- iv. Any changes, anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to SU-ISERC within 48 hours
- v. Clearance for export of biological specimens must be obtained from relevant institutions.
- vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal.
- vii. Submission of an executive summary report within 90 days upon completion of the study to SU-ISERC.

Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology, and Innovation (NACOSTI) <https://research-portal.nacosti.go.ke/> and obtain other clearances needed.

Yours sincerely,

for: Dr Ben Ngoye,  
Secretary; SU-ISERC

Cc: Prof Fred Were,  
Chairperson; SU-ISERC




Appendix 3: Research License from NACOSTI

REPUBLIC OF KENYA  
NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION

Ref No: 699548

**RESEARCH LICENSE**




This is to Certify that Mr. Solomon Afura Maonga of Strathmore University, has been licensed to conduct research in Nairobi on the topic: **Determinants of Inflation in Kenya and the Moderating Effects of Governance Regimes for the period ending 19/July/2023.**

License No: NACOSTI/P/22/18931

Applicant Identification Number: 699548

Director General  
NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION

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**Appendix 4: The Presidents and Central Bank Governors since Independence**

<b>PRESIDENT OF KENYA</b>		<b>CENTRAL BANK GOVERNORS</b>	
<b>Name</b>	<b>In office</b>	<b>Name</b>	<b>In office</b>
Jomo Kenyatta	Dec 1963 – Aug 1978	Leon Baranski	May 1966* – Apr 1967
Daniel Toroitich arap Moi	Aug 1978 – Dec 2002	Duncan Ndegwa	May 1967 – Nov 1982
Mwai Kibaki	Dec 2002 – Apr 2013	Philip Ndegwa	Dec 1982 – Dec 1987
Uhuru Kenyatta	Apr 2013 – Aug 2022	Eric Kotut	Jan 1988 – July 1993
		Micah Cheserem	July 1993 – Mar 2001
		Nahashon Nyagah	Apr 2001 – Feb 2003
		Andrew Mullei	Mar 2003 – Feb 2007
		Njuguna Ndung'u	Mar 2007 – May 2015
		Patrick Njoroge Ngugi	June 2015 – present

\* Kenya attained independence in 1963. However, the CBK was established in 1966.

## Appendix 5: Descriptive Statistics

### (i) Mean, Standard Deviation, Minimum and Maximum

Variable	Obs	Mean	Std. Dev.	Min	Max
year	100	2008	7.247431	1996	2020
quarter	100	2.5	1.123666	1	4
qtrtly	100	50.5	29.01149	1	100
lninfl	100	-2.703362	.5501885	-4.135167	-1.662839
lnfx	100	4.384203	.1792226	3.991265	4.695863
lnms_m3	100	13.73713	.8952304	12.44038	15.19057
lntbill	100	-2.461669	.616944	-4.46107	-1.319197
lnall_index	100	4.57616	.4354874	3.759454	5.296165
lndeb2gdp	100	-1.5652706	.1623885	-1.8722739	-1.239527
lnnse20	100	8.052586	.3844838	6.95024	8.63864
gchesm	100	.21	.4093602	0	1
gnyag	100	.08	.2726599	0	1
gmlei	100	.15	.3588703	0	1
gndng	100	.33	.4725816	0	1
gnjrg	100	.23	.4229526	0	1
gchesm_lni~1	100	-.5436677	1.086443	-3.922073	0
gchesm_lnf	100	.8755603	1.707752	0	4.368815
gchesm_lnm~3	100	2.658522	5.182558	0	12.78797
gchesm_lnt~1	100	-.3637876	.7265164	-2.357464	0
gchesm_lna~x	100	.8385118	1.635534	0	4.165677
gchesm_lnd~p	100	-.0792105	.1618192	-.4926583	0
gchesm_ln~20	100	1.660147	3.237501	0	8.163405
gnyag_lninfl	100	-.276248	.9552875	-4.135167	0
gnyag_lnf	100	.3490475	1.189643	0	4.375421
gnyag_lnms~3	100	1.026739	3.499407	0	12.91338
gnyag_lntb~1	100	-.18625	.6371025	-2.607617	0
gnyag_lnal~x	100	.3230086	1.101192	0	4.18704
gnyag_lnde~p	100	-.0372202	.1277584	-.5141645	0
gnyag_lnn~20	100	.5748654	1.959803	0	7.412848
gmlei_lninfl	100	-.371586	.9078929	-3.203987	0
gmlei_lnf	100	.6487119	1.552093	0	4.391027
gmlei_lnms~3	100	1.971856	4.717894	0	13.37967
gmlei_lntb~1	100	-.4710058	1.161165	-4.46107	0
gmlei_lnal~x	100	.6743711	1.615381	0	4.764117
gmlei_lnde~p	100	-.0900485	.2206926	-.8301131	0
gmlei_lnn~20	100	1.216219	2.911869	0	8.63864
gndng_lninfl	100	-.8585498	1.27265	-3.767923	0
gndng_lnf	100	1.445862	2.07151	0	4.541911
gndng_lnms~3	100	4.64103	6.649923	0	14.68836
gndng_lntb~1	100	-.8615349	1.263271	-4.005235	0
gndng_lnal~x	100	1.655955	2.373699	0	5.296165
gndng_lnde~p	100	-.2402337	.3467867	-.8722739	0
gndng_lnn~20	100	2.756851	3.949484	0	8.602422
gnjrg_lninfl	100	-.6533101	1.207086	-3.174859	0
gnjrg_lnf	100	1.065021	1.958532	0	4.695863
gnjrg_lnms~3	100	3.438979	6.324338	0	15.19057
gnjrg_lntb~1	100	-.5790911	1.068871	-2.774992	0
gnjrg_lnal~x	100	1.084313	1.994607	0	4.886023
gnjrg_lnde~p	100	-.1185576	.2218868	-.7174399	0
gnjrg_lnn~20	100	1.844503	3.39439	0	8.498228
pmoi	100	.28	.4512609	0	1
pkib	100	.41	.4943111	0	1
puhr	100	.31	.4648232	0	1
pmoi_lninfl	100	-.7970091	1.331892	-4.135167	0
pmoi_lnf	100	1.181164	1.905045	0	4.375421
pmoi_lnms_m3	100	3.556127	5.73154	0	12.89039
pmoi_lntbill	100	-.5239614	.869742	-2.503356	0
pmoi_lnall~x	100	1.11965	1.805499	0	4.165677
pmoi_lnde~p	100	-.1124409	.1893834	-.5141645	0
pmoi_lnnse20	100	2.161183	3.488768	0	8.163405
pkib_lninfl	100	-1.034965	1.302596	-3.767923	0
pkib_lnf	100	1.780197	2.147027	0	4.541911
pkib_lnms_m3	100	5.577721	6.731021	0	14.37892
pkib_lntbill	100	-1.16485	1.463511	-4.46107	0
pkib_lnall~x	100	1.969847	2.384329	0	5.296165
pkib_lnde~p	100	-.2767929	.3433832	-.8722739	0
pkib_lnnse20	100	3.366067	4.062196	0	8.63864
puhr_lninfl	100	-.8713874	1.312784	-3.174859	0
puhr_lnf	100	1.422842	2.133848	0	4.695863
puhr_lnms_m3	100	4.603278	6.903319	0	15.19057
puhr_lntbill	100	-.7728579	1.162797	-2.774992	0
puhr_lnall~x	100	1.486662	2.231435	0	5.134799
puhr_lnde~p	100	-.1760367	.2718263	-.7339692	0
puhr_lnnse20	100	2.525335	3.790717	0	8.567053

**(ii) Median, Skewness and Kurtosis**

stats	year	quarter	qrtly	lninfl	lnfx	lnms_m3	lnbill	lnall_~x	lndebt~p
p50	2008	2.5	50.5	-2.753576	4.36742	13.65479	-2.490183	4.675218	-.5551259
skewness	0	0	0	-.2073456	-.1678298	.1693183	-.8143017	-.2460642	.093255
kurtosis	1.796154	1.64	1.79976	2.764131	2.350211	1.523578	4.81961	1.822238	2.413987

stats	lnnse20	gchesm	gnyag	gmlei	gndng	gnjrg	gches~fl	gches~fx	gchesm~3
p50	8.08497	0	0	0	0	0	0	0	0
skewness	-.8216429	1.423983	3.096281	1.960392	.723077	1.283171	-1.618345	1.428282	1.42428
kurtosis	3.313687	3.027728	10.58696	4.843137	1.52284	2.646527	3.9799	3.047088	3.029058

stats	gches~ll	gches~ex	gchesm~p	gches~20	gnyag~fl	gnyag~fx	gnyag~_3	gnyag~ll	gnyag~ex
p50	0	0	0	0	0	0	0	0	0
skewness	-1.605721	1.428408	-1.71548	1.426949	-3.238977	3.096304	3.09636	-3.136191	3.099266
kurtosis	3.884419	3.047421	4.260804	3.040922	11.77077	10.58716	10.58764	10.9318	10.61274

stats	gnyag~p	gnyag~20	gmlei~fl	gmlei~fx	gmlei~_3	gmlei~ll	gmlei~ex	gmlei~p	gmlei~20
p50	0	0	0	0	0	0	0	0	0
skewness	-3.171382	3.099202	-2.124963	1.96077	1.960909	-2.221449	1.970538	-2.161336	1.966458
kurtosis	11.22535	10.61221	5.78367	4.845326	4.846131	6.445946	4.901576	6.047608	4.878271

stats	gndng~fl	gndng~fx	gndng~_3	gndng~ll	gndng~ex	gndng~_p	gndng~20	gnjrg~fl	gnjrg~fx
p50	0	0	0	0	0	0	0	0	0
skewness	-.9276393	.72594	.7265852	-.8874675	.7290578	-.7752456	.7254682	-1.315634	1.283312
kurtosis	2.113295	1.530951	1.532877	2.073645	1.539717	1.678634	1.529631	2.778731	2.647113

stats	gnjrg~_3	gnjrg~ll	gnjrg~ex	gnjrg~_p	gnjrg~20	pmoi	pkib	puhr	pmoi~fl
p50	0	0	0	0	0	0	0	0	0
skewness	1.283527	-1.307403	1.285439	-1.407975	1.288338	.9799579	.3659777	.8216336	-1.218788
kurtosis	2.648007	2.741499	2.655913	3.181282	2.667812	1.960317	1.13394	1.675082	2.828988

stats	pmoi~fx	pmoi~_l~3	pmoi~_ll	pmoi~_ex	pmoi~_l~p	pmoi~_20	pkib~fl	pkib~fx	pkib~_l~3
p50	0	0	0	0	0	0	0	0	0
skewness	.9849313	.9803321	-1.167348	.9836814	-1.218622	.9906171	-.6132143	.3681249	.3717105
kurtosis	1.977372	1.961603	2.610551	1.973015	2.705156	1.996343	1.673241	1.138421	1.145957

stats	pkib~ll	pkib~_ex	pkib~_l~p	pkib~_20	puhr~fl	puhr~_fx	puhr~_l~3	puhr~_ex	puhr~_l~p
p50	0	0	0	0	0	0	0	0	0
skewness	-.6317166	.3894578	-.523755	.3717822	-.8516845	.8228249	.8225955	.8283793	-1.002406
kurtosis	1.804252	1.18184	1.454185	1.145791	1.767045	1.678724	1.678039	1.696194	2.237991

stats	puhr~_20
p50	0
skewness	.8286395
kurtosis	1.696442

**Appendix 6: Comparison of Information Criteria for Lag Selection**

Variable	AIC	HQIC	SBIC*
lninfl	4	4	4
lnfx	3	1	1
lnms_m3	4	4	2
lntbill	2	2	2
lnall_index	2	2	2
lndebt2gdp	1	1	1
lnnse20	3	3	3
gchesm	1	1	1
gnyag	1	1	1
gmlei	1	1	1
gndng	1	1	1
gnjrg	1	1	1
pmoi	1	1	1
pkib	1	1	1
puhr	1	1	1
gchesm_lninfl	1	1	1
gchesm_lnfx	1	1	1
gchesm_lnms_m3	1	1	1
gchesm_lntbill	2	2	2
gchesm_lnall_index	1	1	1
gchesm_lndebt2gdp	4	1	1
gchesm_lnnse20	1	1	1
gnyag_lninfl	3	3	3
gnyag_lnfx	1	1	1
gnyag_lnms_m3	1	1	1

Variable	AIC	HQIC	SBIC*
gnyag_lntbill	1	1	1
gnyag_lnall_index	1	1	1
gnyag_lndebt2gdp	4	1	1
gnyag_lnnse20	1	1	1
gmlei_lninfl	1	1	1
gmlei_lnfx	1	1	1
gmlei_lnms_m3	1	1	1
gmlei_lntbill	2	2	2
gmlei_lnall_index	1	1	1
gmlei_lndebt2gdp	1	1	1
gmlei_lnnse20	1	1	1
gndng_lninfl	1	1	1
gndng_lnfx	1	1	1
gndng_lnms_m3	1	1	1
gndng_lntbill	1	1	1
gndng_lnall_index	1	1	1
gndng_lndebt2gdp	1	1	1
gndng_lnnse20	1	1	1
gnjrg_lninfl	1	1	1
gnjrg_lnfx	1	1	1
gnjrg_lnms_m3	1	1	1
gnjrg_lntbill	2	1	1
gnjrg_lnall_index	1	1	1
gnjrg_lndebt2gdp	1	1	1
gnjrg_lnnse20	1	1	1

Variable	AIC	HQIC	SBIC*
pmoi	1	1	1
pkib	1	1	1
puhr	1	1	1
pmoi_lninfl	4	1	1
pmoi_lnfx	1	1	1
pmoi_lnms_m3	1	1	1
pmoi_lntbill	1	1	1
pmoi_lnall_index	1	1	1
pmoi_lndebt2gdp	1	1	1
pmoi_lnnse20	1	1	1
pkib_lninfl	1	1	1
pkib_lnfx	1	1	1
pkib_lnms_m3	1	1	1
pkib_lntbill	3	3	1
pkib_lnall_index	1	1	1
pkib_lndebt2gdp	1	1	1
pkib_lnnse20	1	1	1
puhr_lninfl	2	1	1
puhr_lnfx	1	1	1
puhr_lnms_m3	1	1	1
puhr_lntbill	1	1	1
puhr_lnall_index	1	1	1
puhr_lndebt2gdp	1	1	1
puhr_lnnse20	1	1	1

*Appendix 7: Optimal Lag Structure for ARDL Regressions with Interaction Terms*

	Lag Structure for monetary and non-monetary determinants	INTERACTION TERMS						
		Inflation	FX	Money Supply	Interest rates	Oil Prices	Debt ratio	Stock Market
<b>Presidents</b>								
Moi	1,0,0,1,0,0,0	1	0	0	0	0	0	0
Kibaki	1,0,0,1,0,0,0	1	0	0	1	0	0	0
Kenyatta	1,0,0,1,0,0,0	0	0	0	0	0	0	0
<b>CBK Governors</b>								
Cheserem	1,0,0,1,0,0,0	0	0	0	0	0	0	0
Nyaga*	1,0,0,1,0,0,0	0	0	0	0	N/A	N/A	N/A
Mullei	1,0,0,1,0,0,0	1	0	0	1	0	0	0
Ndung'u	1,0,0,0,0,0,0	0	0	0	0	0	0	0
Njoroge	1,0,0,1,0,1,0	0	0	0	0	0	0	0

\*\*Interaction terms for non-monetary factors (oil prices, debt-to-GDP ratio and stock market index) eliminated due to collinearity



## Appendix 8: ECM Output for the Presidents

### President Moi:

D.lninfl	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
ADJ						
lninfl						
L1.	-.5273306	.0930202	-5.67	0.000	-.7123774	-.3422838
LR						
lnfx	3.05467	1.695301	1.80	0.075	-.317824	6.427164
lnms_m3	-.5329183	.338607	-1.57	0.119	-1.206516	.1406789
lntbill	-.2321276	.2148747	-1.08	0.283	-.6595818	.1953266
lnall_index	.4923793	.4104225	1.20	0.234	-.3240819	1.30884
lndebt2gdp	-4.074428	1.379419	-2.95	0.004	-6.818533	-1.330324
lnnse20	-1.403438	.4359928	-3.22	0.002	-2.270766	-.5361093
pmoi_lninfl	1.195077	.4224865	2.83	0.006	.3546164	2.035537
pmoi_lnfx	-5.019675	2.937491	-1.71	0.091	-10.86328	.823931
pmoi_lnms_m3	1.605399	1.752215	0.92	0.362	-1.880315	5.091114
pmoi_lntbill	-.2432094	.5803293	-0.42	0.676	-1.397669	.9112504
pmoi_lnall_index	-.7067204	1.804676	-0.39	0.696	-4.296796	2.883355
pmoi_lndebt2gdp	4.567888	1.916677	2.38	0.019	.7550064	8.38077
pmoi_lnnse20	1.168099	.971906	1.20	0.233	-.7653318	3.101529
SR						
lntbill						
D1.	.3512786	.1268265	2.77	0.007	.0989802	.603577
pmoi_lninfl						
D1.	.2433803	.1072091	2.27	0.026	.0301072	.4566534
_cons	-1.467796	2.970185	-0.49	0.623	-7.37644	4.440849

### President Kibaki:

D.lninfl	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
ADJ						
lninfl						
L1.	-.4108253	.082251	-4.99	0.000	-.5744789	-.2471717
LR						
lnfx	-.0910409	1.380117	-0.07	0.948	-2.837041	2.654959
lnms_m3	-.6020171	.3237832	-1.86	0.067	-1.246244	.0422099
lntbill	-.5210064	.6028776	-0.86	0.390	-1.720544	.6785308
lnall_index	1.309404	.612861	2.14	0.036	.0900025	2.528805
lndebt2gdp	2.519142	.9789436	2.57	0.012	.5713507	4.466932
lnnse20	.9077091	.3957206	2.29	0.024	.1203493	1.695069
pkib_lninfl	1.164047	.2674048	4.35	0.000	.6319949	1.696098
pkib_lnfx	.6874695	2.375458	0.29	0.773	-4.038947	5.413886
pkib_lnms_m3	.6617239	.9193112	0.72	0.474	-1.167417	2.490865
pkib_lntbill	.457092	.636405	0.72	0.475	-0.8091542	1.723338
pkib_lnall_index	-1.530525	1.217537	-1.26	0.212	-3.953042	.891991
pkib_lndebt2gdp	-2.43504	2.042748	-1.19	0.237	-6.499467	1.629388
pkib_lnnse20	-.3121315	.7635034	-0.41	0.684	-1.831264	1.207001
SR						
lntbill						
D1.	.7550577	.1589069	4.75	0.000	.4388828	1.071233
pkib_lninfl						
D1.	.5382756	.1247428	4.32	0.000	.2900766	.7864745
pkib_lntbill						
D1.	-.7796062	.1411222	-5.52	0.000	-1.060395	-.4988172
_cons	-2.857171	1.915292	-1.49	0.140	-6.668003	.9536597

### President Kenyatta:

D.lninfl	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
ADJ						
lninfl						
L1.	-.3626923	.0743662	-4.88	0.000	-.5105776	-.214807
LR						
lnfx	-1.575008	2.364117	-0.67	0.507	-6.276315	3.126298
lnms_m3	-1.569384	.86763	-1.81	0.074	-3.294761	.1559934
lntbill	-.2444252	.2445897	-1.00	0.321	-.7308187	.2419682
lnall_index	3.150344	1.195576	2.64	0.010	.7728099	5.527878
lndebt2gdp	2.787925	1.39429	2.00	0.049	.0152264	5.560624
lnnse20	-.4642193	.6649286	-0.70	0.487	-1.786503	.8580641
puhr_lninfl	1.914336	1.032237	1.85	0.067	-.1383795	3.967052
puhr_lnfx	1.930336	8.245928	0.23	0.815	-14.4676	18.32827
puhr_lnms_m3	.7463429	2.709412	0.28	0.784	-4.641619	6.134305
puhr_lnall_index	-2.565403	1.901869	-1.35	0.181	-6.347478	1.216672
puhr_lndebt2gdp	-2.454416	6.292117	-0.39	0.697	-14.96698	10.05815
puhr_lnnse20	-.2132255	1.976673	-0.11	0.914	-4.144057	3.717606
SR						
lntbill						
D1.	.3845465	.1579786	2.43	0.017	.0703887	.6987043
_cons	5.6151	3.503931	1.60	0.113	-1.352851	12.58305

## Appendix 9: ECM Output for the CBK Governors

### Governor Cheserem:

	D.lninfl	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
ADJ	lninfl L1.	-.3982085	.0750589	-5.31	0.000	-.5474976	-.2489195
LR	lnfx	1.768212	2.693309	0.66	0.513	-3.588671	7.125095
	lnms_m3	-.2582794	.521698	-0.50	0.622	-1.295916	.7793569
	lntbill	-.5374595	.276115	-1.95	0.055	-1.086641	.0117221
	lnall_index	.8284258	.648401	1.28	0.205	-.4612176	2.118069
	lndebt2gdp	-2.079003	1.94677	-1.07	0.289	-5.95105	1.793045
	lnnse20	-.5253413	.590901	-0.89	0.377	-1.70062	.6499369
	gchesm_lninfl	1.975469	.8279194	2.39	0.019	.3287708	3.622167
	gchesm_lnf	-3.626738	5.534696	-0.66	0.514	-14.63503	7.381549
	gchesm_lnms_m3	1.648462	3.206532	0.51	0.609	-4.729202	8.026126
	gchesm_lntbill	-.5393801	.922009	-0.59	0.560	-2.373219	1.294459
	gchesm_lnall_index	-2.076689	3.293577	-0.63	0.530	-8.627482	4.474103
	gchesm_lndebt2gdp	4.594509	3.288204	1.40	0.166	-1.945596	11.13461
	gchesm_lnnse20	1.297325	2.195846	0.59	0.556	-3.070124	5.664774
SR	lntbill D1.	.4007043	.1530227	2.62	0.010	.0963483	.7050602
	_cons	-3.719045	3.296408	-1.13	0.262	-10.27547	2.837378

### Governor Nyagah:

	D.lninfl	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
ADJ	lninfl L1.	-.5127964	.0871167	-5.89	0.000	-.6859787	-.3396141
LR	lnfx	.2979153	1.260092	0.24	0.814	-2.207065	2.802896
	lnms_m3	-.3302893	.291879	-1.13	0.261	-.9105256	.249947
	lntbill	.0172003	.1473732	0.12	0.907	-.275768	.3101685
	lnall_index	.4143831	.4068876	1.02	0.311	-.3944827	1.223249
	lndebt2gdp	-1.196183	.8904529	-1.34	0.183	-2.966345	.5739783
	lnnse20	-.9705066	.425239	-2.28	0.025	-1.815854	-.1251593
	gnyag_lninfl	1.733998	.7431164	2.33	0.022	.256731	3.211264
	gnyag_lnf	9.372977	40.84695	0.23	0.819	-71.82807	90.57402
	gnyag_lnms_m3	-3.263856	14.35152	-0.23	0.821	-31.79373	25.26602
	gnyag_lntbill	-2.309609	3.727425	-0.62	0.537	-9.719483	5.100266
SR	lntbill D1.	.3929441	.1434372	2.74	0.007	.1078004	.6780877
	_cons	3.051772	2.423711	1.26	0.211	-1.766405	7.869949

### Governor Mullei:

	D.lninfl	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
ADJ	lninfl L1.	-.3307814	.0766856	-4.31	0.000	-.4833616	-.1782012
LR	lnfx	-.4866072	1.91181	-0.25	0.800	-4.29051	3.317295
	lnms_m3	-.3478237	.4531506	-0.77	0.445	-1.249451	.5538038
	lntbill	-.3557575	.4035753	-0.88	0.381	-1.158746	.4472308
	lnall_index	.7837937	.6180787	1.27	0.208	-.4459891	2.013576
	lndebt2gdp	1.664761	1.211625	1.37	0.173	-.7459923	4.075514
	lnnse20	.4741481	.5137049	0.92	0.359	-.5479636	1.49626
	gmlei_lninfl	1.98256	1.074083	1.85	0.069	-.1545292	4.119649
	gmlei_lnf	10.46391	11.56709	0.90	0.368	-12.55097	33.4788
	gmlei_lnms_m3	-7.490066	5.926192	-1.26	0.210	-19.28133	4.301198
	gmlei_lntbill	-1.009015	.9523259	-1.06	0.293	-2.903845	.8858145
	gmlei_lnall_index	8.328771	7.360637	1.13	0.261	-6.316587	22.97413
	gmlei_lndebt2gdp	-2.196912	6.454744	-0.34	0.734	-15.03983	10.646
	gmlei_lnnse20	1.935694	4.044176	0.48	0.633	-6.110948	9.982336
SR	lntbill D1.	.7275852	.1597738	4.55	0.000	.4096855	1.045485
	gmlei_lninfl D1.	.4460332	.2134312	2.09	0.040	.0213721	.8706943
	gmlei_lntbill D1.	-.8076559	.1993753	-4.05	0.000	-1.20435	-.4109617
	_cons	-1.001788	2.107808	-0.48	0.636	-5.195665	3.192088

## Gubernur Ndung'u:

D.lninfl	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
ADJ						
lninfl L1.	-.5068201	.0801924	-6.32	0.000	-.6662914	-.3473488
LR						
lnfx	1.44317	1.407495	1.03	0.308	-1.355789	4.242129
lnms_m3	-.6734066	.3154334	-2.13	0.036	-1.300681	-.0461326
lntbill	-.0487769	.161762	-0.30	0.764	-.3704583	.2729045
lnall_index	1.16754	.6764304	1.73	0.088	-.1776156	2.512697
lndebt2gdp	2.091551	.9994389	2.09	0.039	.1040567	4.079044
lnnse20	.7760844	.3606876	2.15	0.034	.0588175	1.493351
gndng_lninfl	1.577507	.42533	3.71	0.000	.7316912	2.423322
gndng_lnf	-.7370659	2.57424	-0.29	0.775	-5.856225	4.382093
gndng_lnms_m3	.4341778	1.172397	0.37	0.712	-1.897262	2.765618
gndng_lntbill	-.2940343	.4567655	-0.64	0.522	-1.202363	.6142939
gndng_lnall_index	-.9984761	1.117468	-0.89	0.374	-3.220684	1.223732
gndng_lndebt2gdp	-1.369045	4.529202	-0.30	0.763	-10.37586	7.637769
gndng_lnnse20	.5182399	1.797849	0.29	0.774	-3.056981	4.093461
SR						
_cons	-5.200632	2.407046	-2.16	0.034	-9.987306	-.413958

## Gubernur Njoroge:

D.lninfl	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
ADJ						
lninfl L1.	-.362436	.0755377	-4.80	0.000	-.5127045	-.2121675
LR						
lnfx	-3.464874	2.776385	-1.25	0.216	-8.987989	2.058242
lnms_m3	-.0893105	.7725868	0.12	0.908	-1.447611	1.626232
lntbill	-.2813833	.2509698	-1.12	0.265	-.7806423	.2178756
lnall_index	1.588814	.827388	1.92	0.058	-.0571245	3.234752
lndebt2gdp	2.78008	1.408651	1.97	0.052	-.0221748	5.582335
lnnse20	-.5346426	.6951181	-0.77	0.444	-1.917454	.8481687
gnjrg_lninfl	1.979434	1.126643	1.76	0.083	-.2618174	4.220685
gnjrg_lnf	2.327479	11.82315	0.20	0.844	-21.19253	25.84749
gnjrg_lnms_m3	-.1113329	3.932191	-0.03	0.977	-7.933714	7.711048
gnjrg_lntbill	.6516989	2.321953	0.28	0.780	-3.967404	5.270802
gnjrg_lnall_index	.7971314	3.395909	0.23	0.815	-5.958414	7.552677
gnjrg_lndebt2gdp	-5.88604	8.174909	-0.72	0.474	-22.14854	10.37646
gnjrg_lnnse20	-1.033287	2.57135	-0.40	0.689	-6.14852	4.081947
SR						
lntbill D1.	.4826921	.164004	2.94	0.004	.1564359	.8089483
lndebt2gdp D1.	-1.786728	.9004711	-1.98	0.051	-3.578052	.0045962
_cons	3.302486	3.078471	1.07	0.287	-2.821573	9.426545



**Appendix 10: Shapiro-Wilks Test Results on all Variables**

<b>Variable</b>	<b>Obs</b>	<b>W</b>	<b>V</b>	<b>z</b>	<b>Prob&gt;z</b>
<b>Determinants</b>					
lninfl	100	0.98334	1.376	0.708	0.239500
lnfx	100	0.95683	3.564	2.820	0.002400
lnms_m3	100	0.90347	7.970	4.605	0.000000
lntbill	100	0.89470	8.694	4.797	0.000000
lnall_index	100	0.93466	5.395	3.739	0.000090
lndebt2gdp	100	0.98411	1.312	0.603	0.273260
lnnse20	100	0.94066	4.900	3.525	0.000210
<b>Presidents</b>					
pmoi_lninfl	100	0.92101	6.522	4.160	0.000020
pmoi_lnfx	100	0.78729	17.562	6.357	0.000000
pmoi_lnms_m3	100	0.77511	18.568	6.481	0.000000
pmoi_lntbill	100	0.93259	5.565	3.808	0.000070
pmoi_lnall~x	100	0.78556	17.705	6.375	0.000000
pmoi_lnde~p	100	0.92744	5.991	3.972	0.000040
pmoi_lnnse20	100	0.79436	16.978	6.282	0.000000
pkib_lninfl	100	0.95221	3.946	3.045	0.001160
pkib_lnfx	100	0.76022	19.797	6.623	0.000000
pkib_lnms_m3	100	0.77073	18.929	6.524	0.000000
pkib_lntbill	100	0.92627	6.087	4.007	0.000030
pkib_lnall~x	100	0.79388	17.018	6.288	0.000000
pkib_lnde~p	100	0.93999	4.955	3.550	0.000190
pkib_lnnse20	100	0.76888	19.082	6.541	0.000000
puhr_lninfl	100	0.92388	6.284	4.078	0.000020
puhr_lnfx	100	0.77506	18.572	6.481	0.000000
puhr_lnms_m3	100	0.77534	18.549	6.479	0.000000
puhr_lnall~x	100	0.79064	17.286	6.322	0.000000
puhr_lnde~p	100	0.94318	4.691	3.429	0.000300
puhr_lnnse20	100	0.78922	17.403	6.337	0.000000
<b>CBK Governors</b>					
gchesm_lni~l	100	0.86856	10.853	5.289	0.000000
gchesm_lnfx	100	0.78502	17.749	6.381	0.000000
gchesm_lnm~3	100	0.77425	18.639	6.489	0.000000
gchesm_lnt~l	100	0.89169	8.943	4.860	0.000000
gchesm_lna~x	100	0.78433	17.807	6.388	0.000000
gchesm_lnd~p	100	0.88992	9.089	4.896	0.000000
gchesm_ln~20	100	0.78149	18.041	6.417	0.000000
gnyag_lninfl	100	0.71268	23.722	7.024	0.000000
gnyag_lnfx	100	0.69082	25.527	7.187	0.000000
gnyag_lnms~3	100	0.69143	25.477	7.183	0.000000
gnyag_lntb~l	100	0.75622	20.127	6.660	0.000000
gmlei_lninfl	100	0.84394	12.885	5.670	0.000000
gmlei_lnfx	100	0.76044	19.779	6.621	0.000000
gmlei_lnms~3	100	0.76104	19.729	6.615	0.000000
gmlei_lntb~l	100	0.80642	15.983	6.148	0.000000
gmlei_lnal~x	100	0.77258	18.777	6.506	0.000000
gmlei_lnde~p	100	0.81406	15.352	6.059	0.000000
gmlei_lnn~20	100	0.77025	18.969	6.528	0.000000
gndng_lninfl	100	0.94046	4.916	3.533	0.000210
gndng_lnfx	100	0.77832	18.303	6.449	0.000000
gndng_lnms~3	100	0.78123	18.063	6.420	0.000000
gndng_lntb~l	100	0.89912	8.329	4.702	0.000000
gndng_lnal~x	100	0.78482	17.766	6.383	0.000000
gndng_lnde~p	100	0.92111	6.513	4.157	0.000020
gndng_lnn~20	100	0.77689	18.420	6.463	0.000000
gnjrg_lninfl	100	0.92203	6.437	4.131	0.000020
gnjrg_lnfx	100	0.77469	18.602	6.485	0.000000
gnjrg_lnms~3	100	0.77654	18.450	6.467	0.000000
gnjrg_lntb~l	100	0.91715	6.841	4.266	0.000010
gnjrg_lnal~x	100	0.78303	17.914	6.401	0.000000
gnjrg_lnde~p	100	0.90814	7.584	4.495	0.000000
gnjrg_lnn~20	100	0.78803	17.501	6.350	0.000000