NON-LINEAR INFLATION AND FINANCIAL DEVELOPMENT NEXUS IN

SUB-SAHARAN AFRICA

By

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DECLARATION

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I, *Witness Nyasha Bandura*, declare that the work presented in this dissertation entitled "*Non-linear inflation and financial development nexus in sub-Saharan Africa*" is my own, except where acknowledged and it has not, either in part or as a whole, been submitted for a degree or diploma to any other university.

Signature of candidate: Date: 01/02/2021

DEDICATION

To my late father, Kennedy Bandura.

ACKNOWLEDGEMENT

ABSTRACT

The study analyses the inflation and financial development nexus in sub-Saharan Africa over the period 1982-2016 with 5-year averaged data. This is particularly key as there has not been a study which has attempted to determine the non-linear connection between inflation and financial development with particular focus on the region which can ensure more informed policy guidance. The pure cross-section method is utilised to determine both the linear and non-linear relationship between inflation and financial development. Secondly, the non-linear approaches to determine the inflation threshold on financial development following Seo and Shin (2016) and Hansen (1999) on dynamic and non-dynamic panel threshold, respectively, are also utilised. The results reveals strong evidence of a negative impact of inflation on financial development and that the negative impact also increases with a rise in inflation from pure cross-section and threshold techniques utilised. Inflation threshold ranging between 4.85% and 6.62% was also established below which a positive impact on financial development is found which supports the existence of the short-run Philips curve. There is, however, a negative relationship beyond the threshold. It is, therefore, recommended that low and stable inflation levels below the observed threshold be ensured in the region so as to facilitate sustainable financial sector development. The desired inflation rates may be achieved through adopting and enforcing inflation targeting framework.

Key terms: Inflation, financial development, pure cross-section method, panel threshold techniques, sub-Saharan Africa

ACRONYMS/ABBREVIATIONS

AfDB…………………………………………………………..……African Development Bank

ARDL…………………………………………………...….Autoregressive distribution lag

ATM …………………………………………………………………...Automated Teller Machine

CPI………………………………………………………………….……Consumer Price Index

GDP………………………………………………………………….....Gross Domestic Product

GMM……………………………………………………………...Generalised Method of Moment

IMF…………………………………………………………………..International Monetary Fund

MENA……………………………………………………………..Middle East and North African countries

MMT……………………………………………………………………Modern Monetary Theory

NRF…………………………………………………..National Research Foundation of South Africa

OLS………………………………………………………….…………Ordinary Least Squares

PPP…………………………………………………………………….. Purchasing Power Parity

RC-FGLS…………………………….....Random Coefficients-Feasible Generalised Least Squares

SSA……………………………………………….......................................sub-Saharan Africa

SUR-FGLS…………………...Seemingly Unrelated Regression-Feasible Generalised Least Squares

UNISA…………………………………………………………….…….University of South Africa

VAR……………………………………………………………….………Vector Auto Regressive

VEC……………………………………………………………………Vector Error Correction

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CHAPTER 1

INTRODUCTION

1.1 Context and Background

Despite extensive contributions on inflation and financial development nexus (see Mahawiya et al., 2020; Ehigiamusoe et al., 2019; Tinoco-Zermeno et al., 2018; Tsaurai, 2017; Kim and Lin, 2010; Korkmaz, 2015; Almalki and Batayneh, 2015; Abbey, 2012; Wahid et al., 2011; Kim and Lin, 2010; Khan et al., 2006; Boyd et al., 2001), no satisfactory conclusion has been reached with a particular focus on sub-Saharan Africa (SSA). This study stands to fill in this gap by examining the non-liner impact of inflation threshold on financial development in the region over a unique period associated with a host of external shocks which includes global financial crises, unstable exchange rates and volatile commodity prices.

The episodes of global financial crises, with the most recent one which intensified in the year 2008, have distractive effects on the conventional behavior of the macroeconomic variables such as a drastic changes in credit creation, a rapid rise in non-performing loans as well as subdued levels of economic development. Financial crises can be described as a major external shock for the Sub-Sharan Africa region as it emerges from the developed economies and affect the region through contagion effects (see Park and Song, 1998).

Besides, the study is key as it investigates how to ensure sustainable development in the financial sector with respect to inflation in the region. This is particularly worrisome taking cognisance that the banking system in the region has been described as less prominent in the role of giving credit to firms comparative to the rest of the world (see IMF, 2016; AfDB, 2013). As such, the study will determine the acceptable levels of inflation that could aid in ensuring development in the ailing financial sector of the SSA in order to ensure its sustainable development. The results are expected to vary from other case studies as the region has its own special economic characteristics.

Unique panel dynamic threshold technique as suggested by Seo et al. (2019) and Seo and Shin (2016) is utilised to determine the non-linear nature of the inflation and financial development relationship. The approach is more versatile as it can allow the threshold variable (inflation) to be endogenously determined amongst other explanatory variables. This is particularly important as inflation is more likely to be endogenously determined in the model specifications to be used and

hence minimising biased results. Besides, a non-dynamic methodological approach to panel threshold following Hansen (1999) is also utilised for the robustness of the findings. The need to consider the non-linear nature of the relationship is supported by the general appreciation that the relationship between inflation and financial development is much more complex and cannot be effectively determined by common linear regressions.

Sahay et al. (2015) categorise the financial development into financial institutions and financial markets to which each category was further sub-divided into depth (i.e., size and liquidity of markets), access (i.e., ability of individual to access financial services) and efficiency (i.e., ability of institutions to provide financial services at low cost and with sustainable revenues, and the level of activity of capital markets). From the financial institutions, (1) depth includes private credit; pension fund assets; mutual funds; and insurance premiums, life and non-life all as a share of GDP, (2) access includes branches (i.e., commercial banks) per 100,000 adults; and ATMs per 100,000 adults, and (3) efficiency includes net interest margin; lending-deposits spread; non-interest income to total income; overhead costs to total costs; return on assets; and returns on equity.

The financial markets, on the other hand, (1) stock markets capitalisation to GDP; stocks traded to GDP; international debt securities government to GDP; total debt securities of nonfinancial corporation to GDP; and total debt securities of financial corporation to GDP represents the financial markets depth, (2) financial markets access is represented by percent of market capitalisation outside of top 10 largest companies; total number of issuers of debt (i.e., domestic and external, nonfinancial corporations, and financial corporations), and (3) financial markets efficiency is represented by stock market turnover ratio (i.e., stocks traded/ capitalisation).

Due to the unavailability of the conclusive financial development data in the African region (less developed economies) especially that for the financial markets, this study only pay attention to the financial institutions' depth (i.e., size and liquidity of markets) category indicators. The proxies are, however, justified by the observation raised by Sahay et al. (2015) that depth category is still relevant and significant as a proxy for financial development since the financial stability of most economies highly depends on it.

As reiterated in the literature, financial development facilitates credit rationing to the most productive sectors which ensures rapid and sustainable economic growth. It has been described as the engine to economic activities through credit creation and their allocation to the most productive

sectors (see Levine et al., 2000; King and Levine, 1993b). Financial development provides a market for trading financial services which makes it easier to link financial resources with the areas they are needed the most for the purposes of sustainable development (see Modigliani and Miller, 1963). Besides, the credit creation and its economic allocation promotes innovation as stressed by Schumpeter (1982).

It is argued that financial development increases the resilience and boost economic growth for the economies as it mobilises savings, promotes information sharing, ensures efficient allocation of resources as well as the facilitation of diversification and management of risk (see Sahay et al., 2015). Financial development then promotes financial stability to the extent that deep and liquid financial systems with diverse instruments help dampen the impact of shocks. As such, the development in the financial sector has a direct impact on economic growth. The vital role played by the financial system has remained attractive to the larger group of economic stakeholders despite recent evidence of an evolving indefinite to negative relationship between financial development and growth since the 1990s (see Rousseau and Wachtel, 2011).

The weakening value addition of the financial sector to development is largely attributed to excess credit growth which followed the global financial crises since mid-1990s. The quality of the financial resources has been jeopardised and its dreadful connotations are explained by Mehl and Winkler (2003). Besides, Sahay et al. (2015) also provided evidence that rapid financial development leads to economic and financial instability by encouraging greater risk-taking and high leverage, if poorly regulated and supervised.

On the other hand, a direct inflation-growth nexus has been largely linked to unfavorable economic environment which is created by high inflation and consequently deters investor confidence leading to a stagnant or declining economic growth (see Ndoricimpa, 2017, Kremer et al., 2013; Leshoro, 2012). As such, the variables (inflation and financial development) are key to the macroeconomic stability of any economy as implied by Boyd et al. (1996). Despite evidence of a positive relationship in the short run through the Philips curve, a negative long run relationship has dominated the conclusions on inflation and growth in the literature. Nevertheless, inflation also affect growth through its influence on financial development (see Huang et al., 2010; Rousseau and Wachtel, 2002).

There is also evidence of the existence of a threshold below which inflation would be insignificant or positively contribute to the finance-growth nexus on the non-linear approaches. The impact of financial development is determined to be most effective in low inflation economies (see Bandura, 2020; Hung, 2003; Barro, 1996; Fischer, 1993; Bruno and Easterly, 1998). The study by Ehigiamusoe et al. (2018) on 16 West African countries showed that the interaction term between financial development and inflation has a negative impact towards economic growth. They concluded that the impact of financial development on growth varies from positive to negative with varying inflation rate. Keho (2010), however, found no evidence of any influence of inflation on finance-growth nexus and no significant connection of finance and economic growth in time series analysis of 7 African countries.

Interesting findings on the connection between inflation and financial development have been presented in the literature with studies by Almalki and Batayneh (2015) on Saudi Arabia, Aboutorabi (2012) on Iran, Wahid et al. (2011) on Bangladesh and Zaman et al. (2010) on Pakistan establishing negative linear relationships. On the other hand, Korkmaz (2015) found no evidence of a direct relationship between inflation and financial development on 10 European countries. The evidence of non-linear relationship (threshold) has also been provided by Khan et al. (2006) in a cross country sample of industrialised and developing economies. Boyd et al. (2001) on developing and developed countries found evidence of both the linear and non-linear relationship. Naceur and Ghazouani (2005), however, observed a negative linear association on inflation and financial development connection but with an insignificant threshold relationship in 11 Middle East and North African countries (MENA).

The mechanism through which inflation affects financial development is highly linked to credit market friction on the financial markets. A rise in inflation drives down the real rate of returns from the financial markets, leading to high credit rationing. There would be consequently fewer loans disbursements, ineffective resource allocation and capital investment is also affected by diminishing intermediary activities (see Huybens and Smith, 1999). The long run economic performance and financial sector development would then be negatively affected by the decline in capital formation. As such, the rise in inflation impedes the capacity of the financial sector to effectively allocate resources.

Meanwhile, the connection from financial development to inflation can best be explained by the supply-leading hypothesis (see Patrick, 1966) since inflation is a major indicator of economic development which in turn can be influenced by the level of financial development. A stable and contained level of inflation is associated with sustainable growth while volatile and soaring inflation leads to deterioration in economic growth. Boyd et al. (1996) also view financial development as a normal good and that it is naturally created by economic growth. On the other hand, the impact of financial development on inflation can also be explained by quantity theory of inflation which states that the inflation rate is in line with the change in money supply minus change in growth rate of aggregate output, that is, excess supply of credit in relation to its productivity would be reflected in soaring inflation rate (see Mishkin, 2012, p. 113).

There is, however, also theoretical evidence of a positive association between inflation and financial development. The first argument is hinged on the need to expand financial services following a rise in inflation as consumers would prefer holding cash balances than incurring high transaction costs (see English, 1999). Secondly, the corporate liquidity channel states that the financial constraint for investment projects is loosened by increase in inflation which increases liquidity creation for such projects with high expected future returns (see Zhou, 2019).

Taking heed of how critical the financial sector development could be, its dynamics in SSA and the rest of the world over the recent period has drawn the researcher' attention. Regional comparison over the period 2000 and 2016 shows that the region exhibits the least developed financial sector (with exception of the low income countries) as reflected by credit to the private sector ratio as shown in Figure 1.1. The region also experienced depressed financial development as measured by deposit money bank assets as a ratio of GDP and liquidity liability as a ratio of GDP as shown in Figure 1.1. Depressed financial sector development is likely to cause fragile financial system in SSA which is associated with primitive financial systems who may not withstand shocks. Fragile financial systems and/or least developed financial systems would find it difficult to allocate credit to the most productive sectors both in good and bad times which degrades economic development. As such, this raises economic worries as it can lead to destructive consequences to the progress of the region.

On the other hand, SSA also stood with the highest level of inflation as measured by annual growth in Consumer Price Index (CPI) over the period 2000 to 2016 as shown in Figure 1.1. This has a

destructive impact to the economies as it brings high economic risk which scare away potential investment as well as deter progress of the existing economic players in the region. Besides, increase in inflation also leads to high rationing of credit which compromises the private credit ratio. As such, the region risks a stagnant or declining economic growth in relation to other regions with better macro-economic environment.
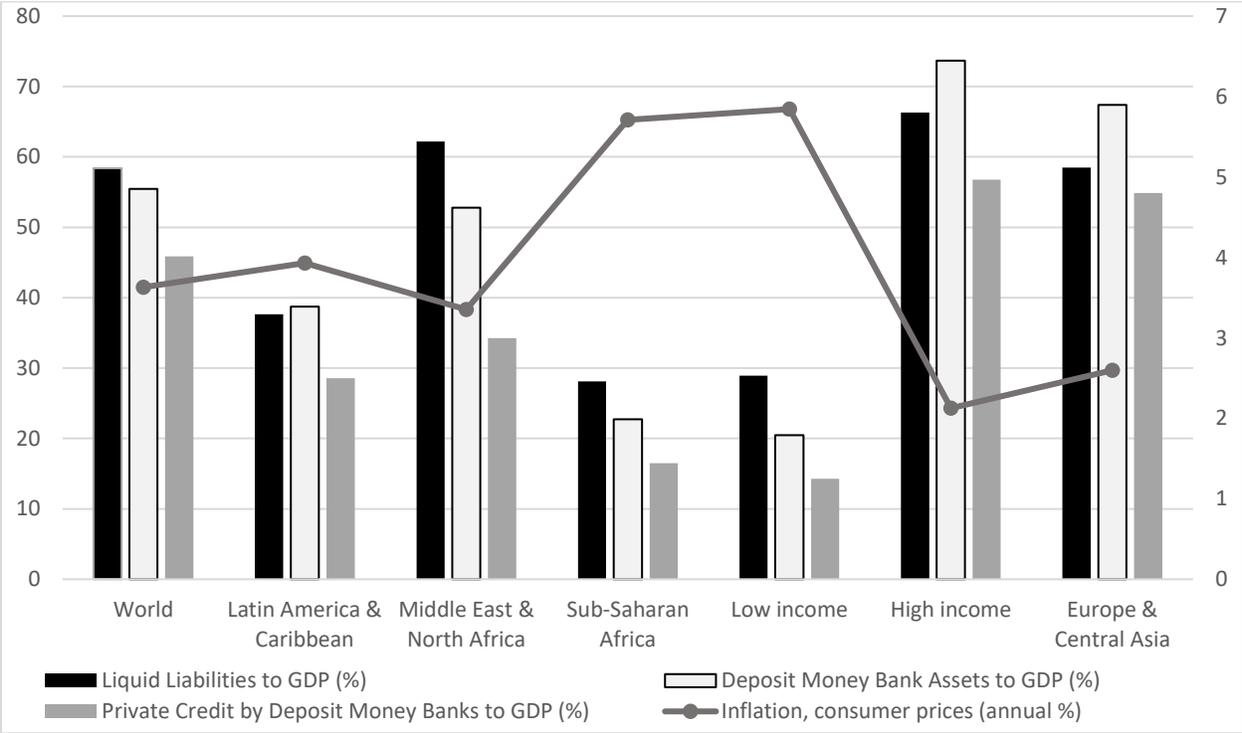
Figure 1.1: Average inflation and financial development by region for the period 2000-2016. Source: Author's own computations based on 'World Development Indicators' and 'Financial Development and Structure Dataset' (2019).

As shown in Figure 1.2, there is no clear relationship between financial development indicators and inflation over the period 2007 and 2016. This made the relationship between inflation and financial development in the region less obvious. This then proves the need to effectively analyse the significance of the association between the variables over the recent period ending in the year 2016. However, there has been a steady increase in the value of financial development indicators from the year 2013 to 2016, while inflation displayed a trend on the opposite direction over the same period until 2015 before a sudden rise in 2016. This might provide a sign of an inverse relationship between financial development indicators as measured by private credit, liquidity liabilities and deposit money bank assets and inflation.
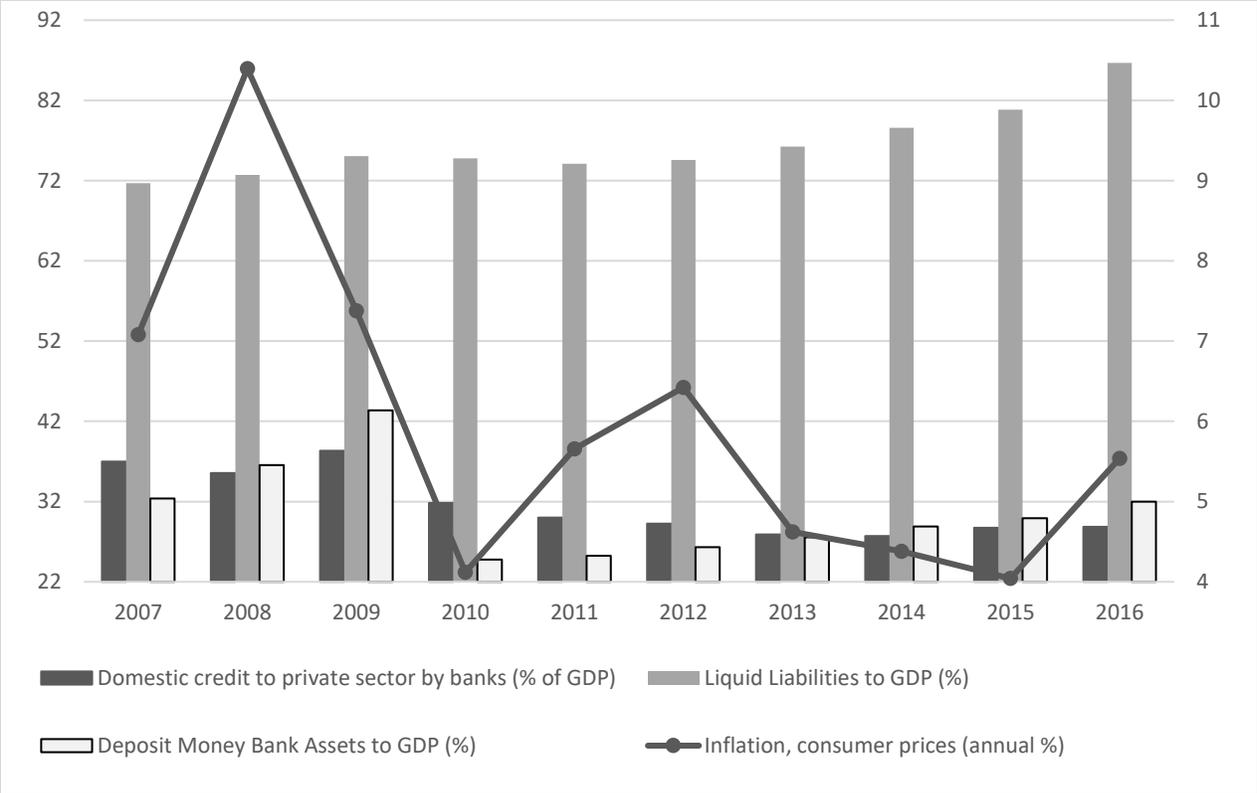
Figure 1.2: Inflation and financial development for SSA over the period 2007-2016.

Source: Author's own computations based on 'World Development Indicators' and 'Financial Development and Structure Dataset' (2019).

On the other hand, the study also constructed the scatter plot for inflation and financial development in the SSA averaged over the period 1982 to 2016, as shown in figure 1.3. There is evidence of nonlinear relationship between the variables, as shown in Figure 1.3. This support the idea that the relationship between inflation and financial development is more complex to be effectively analysed using the general linear regressions. A positive correlation can be seen in lower inflation levels while a negative relationship is also clear at higher inflation levels. This is a sure reflection of the existence of a non-linear relationship and hence the need to keep inflation levels below a certain threshold which would be appropriate to ensure stability and development of the financial sector.
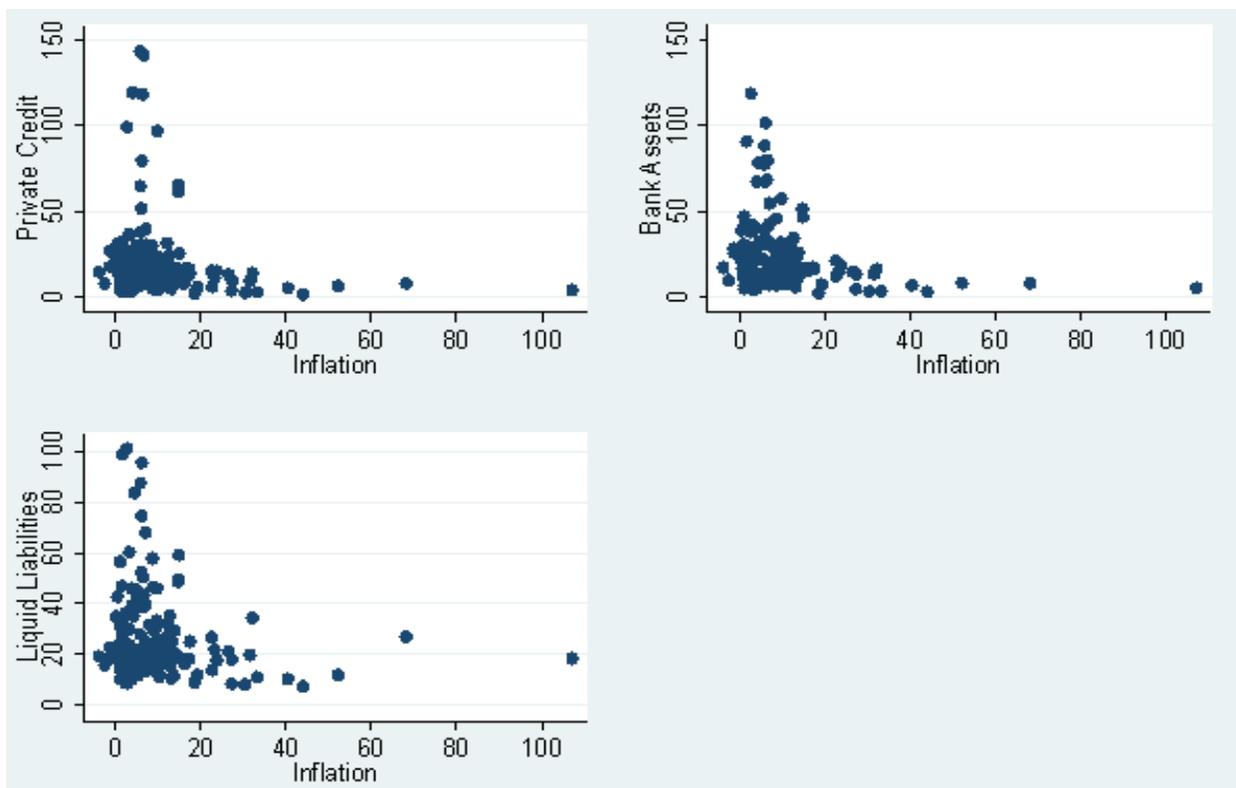
Figure 1.3: Financial development and inflation scatter plots for SSA over the period 1982-2016. Source: Researchers' own computations based on dataset from 'World Development Indicators' and 'Financial Development and Structure' (2019).

On individual country bases, countries with the lowest annual inflation (consumer price index percentage) as averaged over the period 2007 and 2016 comprise of Zimbabwe (1.10%), Senegal (1.76%), Niger (1.87%), Burkina Faso (1.98%), Cabo Verde (2.13%), Côte d'Ivoire (2.17%) and Mali (2.24%). The slump in the commodities prices mainly for oil and food has been the major pointer of the subdued inflation in African countries which includes Zimbabwe. The countries with relatively high annual inflation over the same period 2007 to 2016 are South Sudan (66.60%), Sudan (21.20%), Ethiopia (16.85%), Malawi (15.60%), Guinea (13.59%), Angola (13.54%) and Ghana (13.48%).

The soaring inflation level in South Sudan is highly attributed to civil war since 2013 while in Sudan inflation has been a product of the economic challenges which started from losing 3 quarters of its oil earnings to South Sudan since 2011. In Angola the inflation has been driven by the effort of the government to reduce parallel and official exchange rate through kwanza devaluation and a slump in commodity prices. Food inflation in the light of maize shortages and the need for food

aid was the main driver of inflation in Malawi. Other major economies in the region over the same period 2007 to 2016 reported an average of 10.65% for Nigeria, 8.91% for Tanzania, 9.81% for Kenya, 6.28% for Namibia and 6.13% for South Africa.

Within the same region over the period 2007 to 2016, countries with highly developed financial sectors as measured by private credit ratio provided by deposit money banks in the region includes Liberia (369.20%), Mauritius (89.33%), South Africa (68.50%), Cabo Verde (57.36%), Namibia (47.29%), Sao Tome and Principe (28.99%), Senegal (1.76%), Botswana (27.21%) and Kenya (27.19%), respectively. The countries with the least developed financial sectors over the same year comprise of South Sudan (1.23%), Congo Dem Rep (4.12%), Chad (4.66%), Sierra Leone (5.34%), Guinea (5.50%), Equatorial Guinea (7.69%), Congo Rep (7.86%) and Guinea-Bissau (7.92%). The depressed financial infrastructure which resulted in limited borrowing options can be attributed to depressed financial development in Congo. Guinea-Bissau is also associated with political instabilities which led to suspension in donor flows in 2016. The weak financial development in South Sudan can also be attributed to civil war since 2013 which jeopardises the major economic activities.

1.2 Problem Statement

Research in the sub-regional level such as SSA has attracted unsatisfactory attention in the literature and conclusions are being made on the aggregated behavior of whole globe and/or on country specific level which may not be a true reflection of what is actually transpiring in such sub-regions. The connection between financial development and inflation has been sidelined in the region such that the non-linear inflation and financial development relationship is not known, hence the need to fill in this literature gap.

Besides, there has been significant advancement in the panel threshold techniques (see Seo et al., 2019, Seo and Shin, 2016; Hansen, 1999) to effectively examine the non-linear relationship for panel analysis. This then calls for the re-visitation of relevant economic studies for more effective and informed conclusions and policy guidance. Inflation is more likely to be endogenously determined on the methodology of this study and hence the need to utilise the threshold approach by Seo et al. (2019) and Seo and Shin (2016) which allows for the threshold variable (i.e., inflation) to be endogenous among other explanatory variables. This then minimise model misspecification and biased results. Besides, the need to consider the non-linear nature of the relationship is

supported by the general appreciation that the relationship between inflation and financial development is much more complex and cannot be effectively determined by the general linear regressions. This idea is applicable in SSA as shown on the scatter plot in Figure 1.3.

The study also consider different measures of financial development which are the private sector credit by deposit money banks as a ratio of GDP (Private Credit), Liquid liabilities as a ratio of GDP (Liquidity Liabilities) and deposit money bank assets as a ratio of GDP (Bank Assets). The variables are measured differently from early indicators of financial development which have been criticised for failing to effectively deflating the indicators (see Boyd et al., 2001; Kim and Lin, 2010). Besides, the different indicators used are all encompassing in scope and reach with respect to with respect to credit distribution (private credit) and the size of the financial sector (liquid liabilities and bank assets) which ensures conclusive findings.

More so, the fact that the SSA exhibited the lowest level of financial development and the highest inflation level as compared to other regions (with exception of the low income countries) over the period 2000 and 2016 as shown in Figure 1.1 also raised great concern on the development prospects of the region. Particularly, the region experienced an increase in inflation from 4.04% in 2015 to 5.56% in 2016 before a marginal decline of less than 2.5% in 2017 as shown by IMF (2018). The volatility in inflation reflects the economic risk being retained within the region and hence jeopardising the development prospects of the financial sector (see Huybens and Smith, 1999). Besides, given the indefinite relationship from the trends in Figure 1.2, the study seeks to empirically determining the significance of underlying relation between inflation and financial development in the region for more informed decision making. This is particularly appalling taking cognisance that the financial sector acts as an engine to the success of any economy (see Levine et al., 2000; King and Levine, 1993b).

1.3 Research Objectives

The study aims to determine the non-linear relationship between inflation and financial development in SSA. As such, the non-linear approaches to be used to determine the inflation threshold on financial development follows Seo and Shin (2016) and Hansen (1999) on dynamic and non-dynamic panel threshold technique, respectively. The inflation threshold is critical as it gives policy makers the bound beyond which inflation significantly influence financial

development in a particular way or direction. The threshold would guide policy makers with the acceptable level of inflation so as to maintain the expected levels of financial development.

The specific or sub-objectives for the study are as follows:

    i.   Examining whether the non-linear relationship between inflation and financial development exists in SSA

    ii.   Determining the numeric value of inflation threshold on financial development in SSA

1.4 Research Questions

The following research questions are to be answered in this study:

1. Is the relationship between inflation and financial development non-linear?
2. If the relationship is non-linear, what is the inflation threshold?

1.5 Significance of the study

The study would be highly significant to the central banks and the ministries of finance in the SSA as well as other authorities or policy makers to regulate inflation rates which are conducive to the development of the financial sector in the region. No satisfactory research on the inflation and finance nexus in the SSA has been done before. This is particularly critical given the drastic evolvement on robust methodological approaches over time for effective academic findings and conclusions. As such, this study would also chip in and establish the nature of the connection between these major variables. The findings in this study in terms of the level of inflation threshold would set as a baseline/benchmark in the design and setting of the macro-economic objectives in the region for sustainable development.

Besides, the episodes of financial crises with the most recent one which took its pick in 2008 also provided us with an incentive to carry out this study. This is so as the shocks brought about by these global financial crises are minimised in countries with well-developed financial systems as such economies are most likely to have less to no external debt which is riskier. The idea was supported by Rajan and Zingales (1996) that countries with well-developed financial systems have reduced appetite to the much expensive external debts. As such, there would be less reliance on external borrowing and minimised production bottlenecks in bad times especially now that the recorded episodes of global financial crises largely emanate from the industrialised countries and

reach African countries (less developed countries) by contagion effects (see Park and Song, 1998). Besides, ensuring stronger financial system by controlling inflation would also cushion the region from external shocks which includes exchange rate fluctuations as argued by Aghion et al. (2009).

1.6 Outline of the study

Chapter 1 contains the introduction, study background, research objectives, hypothesis and the significance of the study. Chapter 2 and Chapter 3 would present the literature review and methodology, respectively. The results and discussion are presented in Chapter 4 while Chapter 5 concludes the study and also give recommendations and/or policy implications.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

Both the theoretical and empirical literature on inflation and financial development are analysed in this section. The first section of the chapters deals with the theoretical aspect of the study while the second section covers the empirical literature.

2.1 Theoretical Literature Review

Significant theoretical contribution on inflation and financial development with contradicting direction or nature of the relationship can easily be extracted from the wide literature base. The mechanism or channel through which inflation and financial development has also been proven to be non-monotonous as unveiled in this section. Reflecting on Fisher (2006) quantity theory of money (classical economist), we can boldly elucidate the association between inflation and credit creation or money supply from the quantity theory of inflation. The classical dichotomy made the analysis clearer by separating the real and nominal sides of the economy and states that output and factor prices are not a product of prices in the long run (see Mishkin, 2012, p. 113). This then imply a direct association of prices and money supply with a simple mathematical illustration as follows:

$$\%\Delta M + \%\Delta V = \%\Delta P + \%\Delta Y \dots \dots (2.1)$$

Where; $\%\Delta M$ is the percentage change in money supply, $\%\Delta V$ is the percentage change in velocity, $\%\Delta Y$ is the percentage change in income/output and $\%\Delta P$ is the percentage change in price which reflects inflation levels. By subtracting percentage change in income from both sides of the equation and making inflation the subject of the formula, we can come up with the following expression:

$$\pi = \%\Delta P = \%\Delta M + \%\Delta V - \%\Delta Y \dots \dots (2.2)$$

Assuming that velocity is constant, the following equation can effectively represent the inflation levels.

$$\pi = \%\Delta P = \%\Delta M - \%\Delta Y \dots \dots (2.3)$$

As such, the magnitude of inflation is strongly dependent on the difference between percentage change in money supply and percentage change in income or output. If the proportionate increase in money supply or credit creation is not complemented by a proportionate change in income then it would be inflationary while the opposite is also true. By intuition, the theory implies that the increase in the money in the financial system in the form of private credit, limited liabilities and bank assets may influence inflation levels.

Categorically, Boyd et al. (1996) also established a theoretical link for inflation and financial development through economic growth. They view financial development as a normal good and that it is naturally created by economic growth. As such, inflation and financial development may be correlated given that economic growth affect both. The possibility of a bilateral relationship between inflation and financial development can also be explained by the supply-leading hypothesis and demand-following hypothesis (see Patrick, 1966). The theory suggests contrasting possible channels linking financial development to macroeconomic indicators.

The supply-leading hypothesis states that economic growth is a function of financial development whilst the demand-following hypothesis (growth-led finance hypothesis) confirms economic growth will spark the demand for financial services. Given that economic growth and inflation are major macroeconomic indicators and that they have are closely correlated, inflation can as well represent the development status of any economy. By intuition from the theory, countries with low and stable inflation are generally associated with steady economic growth, hence the negative relationship. In this case we are, therefore, considering inflation instead of economic growth as the macroeconomic indicator of interest. The theory, therefore, implies possibility of bilateral association of macroeconomic indicators (inflation) and financial development.

Moreover, theoretical evidence of a negative relationship between inflation and financial development is also strongly supported by Boyd et al. (1996), Stiglitz and Weiss (1981) and Huybens and Smith (1998). They argued that financial markets efficiency with information asymmetries affects the allocation of savings and investment. As such, high inflation levels jeopardise the smooth flow of the financial system and enacts financial markets friction which consequently deteriorates the economic growth. Financial markets friction result when the business environment becomes volatile (e.g. rapid rising prices) which increases risks on returns

and emergence of increased incidence of non-performing loans which then forces reduced credit extensions by the financial systems and a consequent decline in portfolios.

It would be difficult to effectively assess projects viabilities and possible returns which leaves credit providers with high risks to take, hence forced to be more cautious on credit extension. The theory also further informs the presence of threshold effects with inflation levels beyond which the friction is severe on real activity in a particular steady state. Boyd et al. (1996), therefore, showed that as inflation rises beyond critical levels, it would be impossible to reach high activity steady state as financial market friction becomes more severe. Irrefutably, the theory demonstrated that high inflation levels would be associated with volatile equity returns and low returns to savings.

The theory behind inflation tax can also explain the relationship between inflation and financial development. Hu and Zhang (2017) showed that inflation is a perfect tax to cash transactions. This then calls for the individuals to shift from cash-intensive activities as inflation rises (see Cooley and Hansen, 1989; Lucas, 2001). This then means the substitution of cash holdings while there would be accumulation of real assets/ capital goods for money as a means of payment. This then implies an inverse relationship between inflation and financial development given that the indicators of financial development are largely made up of components of cash balance in circulation.

Inflation finance is proved to be inappropriate even when there is need for tax distortion to be levied so as to raise revenue by Kimbrough (1986) in support of the Friedman's (1969) optimum quantity of money rule. It is shown that developing economies often run into fiscal deficits in order to finance their expenditures through capital accumulation (see Tanzi, 1978). This then forces the financing of these deficits by central banks (through credit creation) in the absence of developed capital markets and external borrowing. As such, the reduction in the value of monetary unit is seen by Friedman (1942) and Bailey (1977) as a kind of tax on those who are holding cash.

This can best be defined as inflationary finance and it has been argued on the basis of the welfare cost of this source of public financing in relation to the alternatives following Bailey's contention. In that case, the government revenue from tax system becomes better than from inflationary finance. This idea of alternative sources of financing the deficit has been disparaged by Aghevli (1977) who argued that additional tax revenue may not be available in developing economies. The

comparison was cited between total cost of inflationary finance and benefits derived from the additional government spending such as future consumption.

Following Kimbrough (1986), the theory of inflation finance can also be mathematically illustrated. Assuming that inflation is at steady state π_t and that economic growth is zero or ignored, the desired real balance are equal to actual real balance, the degree of variation in inflation correspond to the variation in money supply which is also equivalent to the tax rate. Given that the tax base is equivalent to cash balances in possession, $\left(\frac{M}{P}\right)t$, the inflation tax revenue R_t^π will then be represented by equation 2.4.

$$R_t^\pi = \pi_t \cdot \left(\frac{M}{P}\right)t \ldots 2.4$$

$$R_t^\pi = (\pi_t + g) \cdot \left(\frac{M}{P}\right)t \ldots 2.5$$

The equation 2.4 represents revenue from the inflation tax. This then means that a proportionate change in money creation of financial development would lead to a proportional change in inflation when economic growth is at full capacity. Further assuming an economy growing at a rate represented by g, some additional balances will be required to meet the growth. Given that the income elasticity of demand for money is unity then the expression 2.4 changes to equation 2.5. Other studies, however, argued in support of inflation finance pointing out that inflation would be used to drive a wedge between marginal cost of producing money (usually taken to be zero) and the private sector marginal valuation of real balances (see Phelps, 1973; Marty, 1978; Siegel, 1978; Drazen, 1979; Helpman and Sadka, 1979). The government is then allowed to use distortion taxes to raise revenue which may be optimal in terms of private sector welfare.

The other arm of theory established total substitutability of financial development and inflation. A hump-shaped association between inflation and investment is enacted. The theory disqualify the Friedman rule as optimal and argued for a Tobin effect in the low inflation environment, a reverse-Tobin effect when inflation is high and the non-existence of the Fisher effect, which in line with Ahmed and Rogers (2000). Financial development reduces financial friction which makes credit available to absorb liquidity shocks while inflation can mitigate liquidity risks by loosening credit constraint through corporate liquidity (see Zhou, 2019). As such, inflation and financial

development can substitute each other. With well-developed financial sector, the positive effect of inflation fade away which explains why the threshold inflation for developing countries is higher as compared to that of the industrialised economies. This is so as there is more space in less developed economies for liquidity channel of inflation to work. As such, the detractions brought by inflation tax outweighs the positive contribution of liquidity channel in cases of high inflation.

A complete dichotomy to the long stretching and upheld theoretical evidence of an inverse linkage between inflation and financial development is the theory based on the transactions technology which postulates a positive association between inflation and financial sector development (see English, 1999). The model assumes that the economy has 3 types of firms, that is, the consumption goods sector firms, firms in the capital sector and firms in the transaction sector. The firms are all competitive. There are a range of goods in the economy which can be purchased by cash or incur a fixed cost to make the purchase without cash. Given that the cost of making a cashless payment is not dependent on the size of the transaction, agents prefer making cash payments for small transactions. Following a rise in inflation, the households would prefer holding cash and hence high demand of financial sector services to avoid costly cashless payments. Higher inflation would compel households to substitute purchased transactions services for money balances.

The study then argues that there would be a need for expanding banking services through bank tellers, building more branches and hiring more workers among other factors following an increase in inflation as this raises consumer appetite for holding money. As such, there would be a rapid growth in the financial sector development through a rapid increase in the demand of the financial services following a rise in prices. This may also push for new money creation and increased distribution of credit to the private sector or individuals. As such, there would be a positive response of financial services such as currency as well as demand deposits which are the major components making up broad money and private credit levels. The approach is synonymous to that by Whitesell (1989, 1992) on optimal use of cash purchases.

Lastly, the Modern Monetary Theory (MMT), which is commonly referred to as the unorthodox theory, supports the policies of fiscal spending funded by central bank money and running up budget deficits and public debt without fear of crises (Wray, 1998). The theory argues for a positive relationship between money creation and development which comprises a contained inflation level in the long run. The theory is built on the idea of Chartism which was coined by Georg Friedrich

Knapp which state that money is created by the state's attempt to direct economic activities (see Knapp, 1924).

This leftist economic view has evolved in recent years, supporting government spending which contrast with the neoliberal mainstream policies of austerity and minimum government intervention. The MMT complements with the Marxist theory in that both are endogenous theories of money which recognise money as not a veil over the real economy. According to the theory, the modern economy (capitalist) is rather a monetary one which contrast with the quantity theory of money by Milton Friedman. The demand for money is believed to be driven by "animal spirits" of individual agents according to MMT/Chartalists which is supported by the Keynesian, while the Marxist theory of money argues that the demand for money and its price is set by the rate of accumulation of capital and capitalist consumption.

2.2 Empirical Literature Review

The current contribution on the association of inflation and financial development from different backgrounds in the literature is paramount. In linear regressions, there is overwhelming evidence of a negative relationship (see Ehigiamusoe et al., 2019; Tinoco-Zermeno et al., 2018; Kim and Lin, 2010; Korkmaz, 2015; Almalki and Batayneh, 2015; Wahid et al., 2011) even though a selected number of studies which tried to disentangle the long-run from the short-run dynamics produced contrasting observations, that is, a negative and positive, respectively (see Abbey, 2012; Kim and Lin, 2010). Besides, varying observations which includes insignificant impact, low negative coefficient and positive impact of inflation on financial development at inflation level below the established inflation threshold is also common in the literature (see Mahawiya et al., 2020; Tsaurai, 2017; Khan et al., 2006; Boyd et al., 2001). Giving a detailed account of the empirics, we shall start with studies which investigates evidence of threshold impact of inflation on financial development. This would be followed by linear studies on inflation and financial development.

On non-linear studies, we shall start with African studies. Mahawiya et al. (2020) found single inflation threshold of 17.9% and 14.5% for ECOWAS and SADC, respectively. The smooth transition regression was utilised over the 1980 to 2011. A composite index was constructed to measure the financial sector development, the indicator was based on five key functions of the financial system namely;(i) producing information on investment and allocating capital, (ii)

monitoring and exerting corporate governance, (iii) facilitating trading and management of risk, (iv) mobilizing and pooling of risk and (v) easing exchange of goods and services.

The conditional least squares method was implemented by Abbey (2012) on Ghana over the period 1990 to 2008 with quarterly data for the threshold analysis of inflation on financial development. The existence of threshold ranging 11% to 16% was established below which the negative impact of inflation on financial development was statistically significant. Above the threshold there was, however, uncertain conclusion as most coefficients become insignificant. The study confirmed the long standing evidence of a negative relationship between inflation and financial development from the pair wise correlation analysis. The study also obtained negative and unidirectional causal effect from inflation to financial development from the Granger Causality. Conflicting findings with a positive relationship in the short run and no relationship at all in the long run were also observed. The lack of cointegration proves the non-existence of the long run relationship. As such, despite elementary contribution from the study, the conclusions of the positive short run relationship can be questionable given that there was no evidence of the long run relation as interpreted from lack of cointegration. The short run restriction are binding on non-existing long run relation. Inflation variable was based on the log consumer price index. The financial development indicators used include domestic credit of deposit money banks to GDP, private sector credit ratio, value traded to GDP and market capitalisation to GDP.

Besides, taking advantage of both market and bank based financial development indicators namely market capitalisation and private credit ratio, Naceur and Ghazouani (2005) also observed a negative association between inflation and financial development in 11 Middle East and North African countries (MENA). They considered market capitalisation and private credit ratio as financial development indicators while inflation was measured by the change in CPI. There was, however, no evidence of a threshold relationship as the changes in inflation demonstrated insignificant influence to financial variables. These findings were brought to light with the help to Generalised Method of Moment (GMM) technique. The regressions controlled for the possible simultaneity and omitted variable biases. The study was carried out over the period 1979 to 1999.

For non-linear studies which considers countries from both industrialised and less-industrialised economies, Tsaurai (2017) investigated the non-linear relationship between inflation and financial development over the period 1994 to 2014 on a panel of South-Eastern Asian emerging markets.

The study utilised the static panel threshold technique suggested by Bick (2010). The financial development indicators from banks, stock markets and bond sectors were utilised. A conclusion directed on the need to keep lower inflation levels so as to improve the financial sector was supported. Inflation threshold ranging from 4.43% to 6.17% was established.

Further to that, an inflation threshold of averaging between 3 to 6 percent was observed by Khan et al. (2006) in a cross country sample of industrialised and developing economies. They showed that in regime with inflation below the threshold, the impact of inflation on financial markets conditions is insignificant and/or small positive, and it vary with the indicators used. An unbalanced panel of 168 countries from the industrialised and developing economies was considered over the period 1960 to 1999. A host of financial development indicators considered includes private credit ratio, private credit ratio plus stock market capitalisation as a share of GDP (FD2) and FD2 plus private and public bond market capitalisation as a share of GDP (FD3). The study utilised the conditional least squares method which ensures that the least squares of inflation threshold is found by selecting the value of threshold which minimises the sum of squared residuals.

Strong evidence on the negative significant association between financial development and inflation was also presented by Boyd et al. (2001). The relationship was, however, nonlinear given that the additional impact of inflation on financial development diminishes rapidly. A threshold of 15 percent was established implying economies with higher than the threshold inflation experience a discrete drop in financial sector development. The study considered a 5 year averaged sample period from 1960 to 1995 on 65 to 97 countries, depending on data availability. Pure cross section method was utilised to determine the threshold analysis. The system GMM estimator which controls for potential biases induced by country-specific effects and endogeneity was also utilised with inflation and inverse of inflation as one of the explanatory variables. The dynamic approach confirms the negative impact of inflation on financial development. The financial development indicators used are banking institution credit to private sector as a ration of GDP, ratio of total assets of deposit money banks to GDP and ratio of liquid liabilities of the financial sector to GDP.

Moving on to studies which did not pay attention to non-linear or threshold relationships, I will also start with studies on African economies. Bi-directional causality between inflation and banking sector credit was found in SSA by Ikpesu (2021). A sample of 35 countries over the period

2000 to 2016 was considered. The panel vector error correction model was employed while domestic credit to the private sector by banks (% of GDP) was the financial development indicator used.

More so, a negative linear relationship was observed on a sample of 22 countries in SSA over the period 1980 to 2013 by Kagochi (2019). They concluded the need to ensure low inflation rates in the region so as to benefit from deeper and more effective financial sector. The study utilised the fixed effects model and the GMM dynamic approach. The indicators used to measure financial development were (1) ratio of liquid liabilities of the financial sector as a percentage of GDP, (2) ratio of total assets of deposit money banks (commercial banks and other deposit-taking banks) as a percentage of GDP and (3) value of loans made by deposit money banks and other financial institutions to the private sector as a percentage of GDP.

Furthermore, a negative relation between inflation and commercial bank liquidity in Namibia was observed by Sheefeni et al. (2016). The liquidity was measured by share of loans in total assets. A time series analysis was done over the period 2001 to 2014 using quarterly data. The regressions were developed under the ARDL bound test for cointegration and error correction framework.

Cascading down to liner analysis for developed and developing economies, while utilising the dynamic common correlated effects and dynamic panel system GMM on data from 125 countries from around the world, inflation was found to have a negative effect on financial development in high- and medium- inflationary countries (Ehigiamusoe et al., 2019). The financial sector development was measured by credit to private sector to GDP and liquid liabilities to GDP. The study used 5-year averaged non-overlapping data form 1981 to 2015.

A study by Tinoco-Zermeno et al. (2018) on 84 countries over the period 1980 to 2010 from the industrialised and less industrialised economies around the world found a negative and nonlinear impact of inflation on financial variables. The findings where particularly significant in full sample and in developing economies while not significant in developed economies. The study took advantage of the conditional distribution of financial development by employing the standard and fixed effects quantile regressions to show that the impact of inflation varies along the quantiles of the conditional finance distribution. The private credit as a ratio of GDP, liquid liabilities as a ratio of GDP, deposit money bank assets as a ratio of GDP as the financial development indicators.

In a study for 10 selected European countries by Korkmaz (2015), no connection was observed between financial development and inflation. The countries considered were Finland, France, German, Greece, Hungary, Italy, Poland, Spain, Turkey and United Kingdom which largely belong to the highly industrialised economies. The study was carried out with the main hypothesis that financial deepening facilitates the transferring of funds that are created by banks to the real sector and hence influencing the macro-economic variables. The impact of financial development on growth was, however, confirmed. The study was carried out over the period 2006 to 2012. The fixed effect method was utilised and the domestic credit (to the private sector) provided by banking sector as a ratio of GDP was the financial deepening indicator used.

Al-Nasser and Jackson (2012) made use of 5 year averaged data (non-overlapping) over the period 1978 to 2003 for 15 Latin American countries, a negative relationship with inflation was established on all bank-based indicators, market capitalisation and domestic value traded. The Fixed Generalised Least Square Model was used as it controls for both cross sectional heteroskedasticity and correlations between residuals. This was justified by the consideration of cross sectional panels with strongly different characteristics. The study made use of the major bank based and market based financial development indicators which were also utilised by Boyd et al. (2001) which includes liquidity liabilities, Bank Assets and Private Credit, total stock market capitalisation a ratio of GDP, value of trades as a ratio of GDP and value of trades as a ratio of value listed domestic shares.

Mixed observations were presented by Kim and Lin (2010) as they make use of pooled mean group estimator method on a panel of 87 countries from around the world over the period 1960 to 2005 to determine the relationship between inflation and financial development. They concluded a strong negative relationship between inflation and financial development in the long-run while a positive relationship was observed in the short-run. Inflation was measured by the percentage change in the CPI. The three financial development indicators considered were credits by financial intermediaries to the private sector as a ratio of GDP, the sum of currency and demand and interest-bearing liabilities of banks and non-bank financial intermediaries as a percentage of GDP and domestic assets of deposit money bank as a share of GDP.

Moving on to review of individual country studies with a focus on linear nexus between inflation and financial from beyond Africa, Almalki and Batayneh (2015) found a short run and long run

negative relationship between inflation and financial development in Saudi Arabia over the period 1982 to 2013. They utilised the autoregressive distribution lag (ARDL) bound testing approach. The indicator for financial development used was the private credit as ratio of GDP while natural logarithm of CPI was used to represents inflation.

Tinoco-Zermeno et al. (2014) also took advantage of the ARDL bound test approach to establish the long-run influence of inflation on private credit by banks and economic growth in Mexico over the period 1969 to 2011. They observed that while private credit contributes positively to GDP, inflation rates inversely influenced private credit, liquid liabilities and the financial development index. The study considered the inflation rate based on consumer price index while the natural log of deposit money bank assets in constant terms, natural log of broad money, natural log of private sector bank credit and financial development index as calculated with the method of principle component were the financial development indicators used.

Besides, utilising ARDL approach, the study by Aboutorabi (2012) also concluded that high inflation rate deters the development of financial sector and hence a negative relationship. The research investigated the effect of inflation on financial markets performance in Iran over the period 1973 to 2007. A multivariate index which represents the financial development indicator used in the study was constructed by utilising the Principle Component Analysis. The use of financial development index may, however, not be effective when determine the mechanism through which the transitions occurs for direct policy implications.

Bittencourt (2011) examined both the time series and panel analysis of the relationship between inflation and financial development in Brazil over the period 1985 to 2002. The panel analysis dimension was made up of 10 cross sections from the regions within Brazil. Financial development was measured by M2/GDP, M3/GDP, private credit provided by public and private financial institutions to firms and private credit provided by public and private financial institutions to individuals. The study utilised the Seemingly Unrelated Regression-Feasible Generalised Least Squares (SUR-FGLS), Random Coefficients-Feasible Generalised Least Squares (RC-FGLS) and Fixed Effects methods used for the panel analysis while time series analysis was done with Ordinary Least Squares (OLS). A strong negative relationship between inflation and financial development was observed.

Utilising ARDL bound testing and error correction method, Wahid et al. (2011) determined the direct impact of inflation on financial development in Bangladesh over the period 1985 to 2005. The private credit ratio was the financial development indicator used while CPI growth was considered for inflation indicator. Their findings concluded that high trends of inflation inhibit the performance of the financial sector both in the short-run and long-run.

Lastly, a short-run and long-run unidirectional relationship running from inflation to financial development was established by Zaman et al. (2010) in Pakistan over the period 1974 to 2007. The presence of long-run relation was determined by Johansen and F-bound cointegration tests with ARDL framework. The Vector Error Correction (VEC) Granger causality, impulse response and variance decomposition were constructed under the Vector Auto Regressive (VAR) framework. The financial development indicators used were broad money supply/M2, private sector credit and bank deposits liabilities as a ratio of GDP while inflation was based on Consumer Price Index (CPI).

Table 2.1: Empirical Literature Summary

Author(s)	Country	Time period	Variables used as measure of Financial Development	Technique	Findings
Mahawiya, S., Haim, A., & Eric Fosu, O. A. (2020).	11 countries in ECOWAS and 10 countries SADC	1980 to 2011	A composite index was constructed to measure the financial sector development, the indicator was based on five key functions of the financial system namely; (i) producing information on investment and allocating capital, (ii) monitoring and exerting corporate governance, (iii) facilitating trading and management of risk, (iv) mobilizing and pooling of risk and (v) easing exchange of goods and services.	smooth transition regression	single inflation threshold of 17.9% and 14.5% for ECOWAS and SADC, respectively
Boyd, J. H., Levine, R., & Smith, B. D. (2001).	65 to 97 countries (industrialised and developing economies)	1960 to 1995 (5 year average)	Private credit ratio, Liquid Liabilities ratio, Bank Assets ratio, Market Capitalisation ratio, Value Traded, Stock Turnover, Stock Market Volatility, Equity Returns.	Pure cross section method & Panel system GMM	(-) relationship & 15 percent threshold
Khan, M.S., Senhadji, A. S., & Smith, B. D. (2006).	168 countries (industrialised and developing economies)	1960 to 1999 (annual)	Private credit ratio (FD1), FD1 plus stock market capitalisation as a share of GDP (FD2) and FD2 plus private and public bond market capitalisation as a share of GDP (FD3).	Conditional least squares method	Inflation threshold about 3 to 6 percent

Tsaurai, K. (2017)	South-Eastern Asian emerging markets	1994 to 2014 (annual)	Stock market turnover as a share of GDP, private credit by banks as a share of GDP and outstanding domestic private debt securities as a ratio of GDP.	Static panel threshold technique as suggested by Bick (2010).	(-) relationship between inflation and financial development. Inflation threshold ranging from 4.43% to 6.17% was established.
Abbey, E. N. (2012).	Ghana	1990 to 2008 (quarterly)	Domestic credit of deposit money banks to GDP, private sector credit ratio, value traded to GDP and market capitalisation to GDP	Cointegration approach and Granger Causality test, conditional least squares method	(-) unidirectional from inflation to financial development, (+) short-run and no relationship in long-run. Inflation threshold on financial development ranging from 11% to 16%.
Naceur, S. N, & Ghazouani, S. (2005).	11 Middle East and North African countries (MENA).	1979 to 1999 (annual)	(Stock market capitalisation) total market value of all listed shares divided by GDP, domestic credit to private sector divided by GDP.	Generalised Method of Moment (GMM)	(-) linear inflation and financial development but no threshold relationship between inflation and financial development
Kim, D. H., & Lin, S. C. (2010).	87 countries (industrialised and	1960 to 2005 (annual)	Credits by financial intermediaries to the private sector as a ratio of GDP, the sum of currency and demand and interest-bearing liabilities of banks and	pooled mean group estimator	Mixed observations. (-) in the long-run & (+) in the short-run

			non-bank financial intermediaries as a percentage of GDP and domestic assets of deposit money bank as a share of GDP.		
Kizito Uyi Ehigiamusoe & Vinitha Guptan & Narayanan, Suresh (2019).	125 countries from around the world	1981 to 2015 (5-year average)	credit to private sector to GDP and liquid liabilities to GDP	dynamic common correlated effects and dynamic panel system GMM	Inflation has a negative effect on financial development in high- and medium- inflationary countries
Tinoco-Zermeno, M. A., Venegas Martinez, F. & Torres Preciado, V. H. (2018)	84 countries (industrialised and developing economies)	1980 to 2010 (annual)	Private credit as a ratio of GDP, liquid liabilities as a ratio of GDP, deposit money bank assets as a ratio of GDP	standard and fixed effects quantile regressions	(-) and nonlinear impact of inflation on financial variables in full sample and in developing economies while not significant in developed economies.
Al-Nasser, O. O. & Jackson, D. (2012).	15 Latin American countries (industrialised and	1978 to 2003 (5 year average)	Liquidity liabilities, Bank Assets and Private Credit, total stock market capitalisation a ratio of GDP, value of trades as a ratio of GDP and value of trades as a ratio of value listed domestic shares.	Fixed Generalised Least Square Model	(-) relationship on all bank-based indicators as well as market capitalisation and domestic value traded.

	developing economies)				
Korkmaz, S. (2015).	10 European countries (industrialised economies)	2006 to 2012 (annual)	Domestic credit to the private sector provided by banking sector as a ratio of GDP	fixed effect method	Insignificant finance-inflation nexus & (+) finance-growth nexus.
Bittencourt, M. (2011).	Britain and 10 cross sections from its regions.	1985 to 2002 (annual)	M2/GDP, M3/GDP, private credit provided by public and private financial institutions to firms and private credit provided by public and private financial institutions to individuals.	SUR-FGLS, RC-FGLS and Fixed Effects methods, OLS.	(-) relationship between inflation and financial development
Wahid, A. N., Shahbaz, M., & Azim, P. (2011).	Bangladesh	1985 to 2005 (annual)	Private credit ratio	ARDL bound testing and error correction	(-) relationship between inflation and financial sector development
Almalki, A. M., & Batayneh, K. I. (2015).	Saudi Arabia.	1982 to 2013 (annual)	Credit to the private sector as percentage of GDP	ARDL bound testing approach	(-) short-run and long-run relationship between inflation and financial development
Tinoco-Zermeno, M. A., Venegas-Martínez, F.,	Mexico	1969 to 2011 (annual)	Natural log of deposit money bank assets in constant terms, natural log of broad money, natural log of private sector bank credit and financial	ARDL bound test approach	(-) relationship between inflation and private credit, liquid liabilities and the

& Torres-Preciado, V. H. (2014).			development index as calculated with the method of principle component.		financial development index
Aboutorabi, M. A. (2012).	Iran	1973 to 2007 (annual)	Multivariate index by principle component analysis	ARDL approach	(-) relationship between inflation and financial development
Kagochi (2019).	22 countries in SSA	1980 to 2013 (annual)	(1) ratio of liquid liabilities of the financial sector as a percentage of GDP, (2) ratio of total assets of deposit money banks (commercial banks and other deposit-taking banks) as a percentage of GDP and (3) value of loans made by deposit money banks and other financial institutions to the private sector as a percentage of GDP.	fixed effects model and the GMM dynamic approach	negative linear relationship
Sheefeni, J. P., & Nyambe, J. M. (2016).	Namibia	2001 to 2014 (quarterly)	Share of loans in total assets	ARDL bound test for cointegration and error correction framework	(-) relation between inflation and commercial bank liquidity
Zaman, K., Ikram, W., & Ahmed, M. (2010).	Pakistan	1974 to 2007 (annual)	Broad money supply/M2 as a share of GDP, private sector credit as a share of GDP and bank deposits liabilities as a ratio of GDP	Johansen and F-bound cointegration, VEC Granger	(-) unidirectional relationship running from inflation to financial development

				causality, impulse response, variance decomposition.	
Ikpesu (2021).	35 countries in SSA	2000 to 2016 (annual)	domestic credit to the private sector by banks (% of GDP)	panel vector error correction model	bi-directional causality between inflation and banking sector credit

2.3 Literature Gap

Unlike previous studies, the focus of this research is to determine the threshold relationship for inflation and financial development relationship in the SSA. For this noble cause, the study institute the extent to which a rise in inflation will proportionately affect financial development in the region. The research, therefore, seek to explicitly establish the inflation threshold value beyond which the inflation-finance nexus significantly changes for SSA. Along with other threshold methods, the study pays more attention to the most advanced dynamic panel threshold approach by Seo and Shin (2016). The method builds on the work by Hansen (1999). There is not yet any study on the inflation-financial development nexus in the SSA which has utilised this most recent and advanced approach. Kremer et al. (2013) developed a dynamic approach which allows the inclusion of the lag of the dependent variable to control for model under-specification and a consequent loss of important information. The approach also uses forward orthogonal deviations transformation which is free from serial correlation of the transformed error term.

On the other hand, the dynamic panel threshold regression method by Seo and Shin (2016) is more versatile with respect to whether both the threshold variable and other explanatory variables are endogenous. The approach is most effective as it pays attention to whether the threshold variable (i.e., inflation) is endogenous or exogenously determined. This has been necessitated by high probability of inflation being endogenously determined by other macroeconomic variables included in the model such as GDP per capita which might lead to biased findings if not controlled for. Besides, need to consider the non-linear nature of the relationship is supported by the general appreciation that the relationship between inflation and financial development is much more complex and cannot be effectively determined by the general linear regressions.

Besides, for the robustness of the study, different measures of financial development indicators are also considered which represents credit distribution (private credit ratio) and financial sector size (liquidity liabilities ratio and deposit money bank assets ratio) for a more informed policy guidance in the region. Above all, this study stands to fill in the literature gap of inflation and financial development connection in SSA. The research will also take advantage of the most recent data set which covers the most recent global financial crises which intensifies in 2008. This has been motivated by the general observation of drastic changes in the behavior of the long held major macroeconomic variables.

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2.4 Conclusion

The main focus of this section was to critical dispose the theoretical and empirical literature review of the study. Discrete evidence from linear to non-linear and positive to negative associations has been presented in the literature. It can, however, be noted that unsatisfactory attention has been brought on the inflation and finance nexus with special focus on SSA.

CHAPTER 3

RESEARCH METHODOLOGY

3.0 Introduction

The methodological approaches utilised and the data used are discussed in this section. The bases for determining both the linear and non-linearity nature of the relationship between inflation and financial development are established. Data sources and their frequencies are also explained in this chapter.

3.1 Model specification and estimation technique

The empirical panel model to be estimated in this study takes the following form:

$$Finacial\ Development_{ti}$$
$$= f(Inflation_{ti}, Trade_{ti}, GDP\ per\ capita_{ti}, Initial\ Income_{ti}, Education_{ti}, GFCF_{ti}, GOV_{ti}) \dots (3.1)$$

Where; $GFCF_{ti}$, represents gross fixed capital formation, and GOV_{ti} represent government spending. Due to availability of data and a technique specific requirements used, not all the variables which are considered as function of financial development would be included in every model specification. The evolution of the econometric methods for determining panel threshold analysis has been diverse and interesting. Static and dynamic approaches have been developed and perfected so that `the best of econometric results can be obtained. Even though we give a detailed account of how the data with cross section has been modelled over time in this section, the study findings centers on the panel specific dynamic and static threshold techniques.

To start with, the research utilises pure cross section method as baseline regressions for the countries in SSA. The cross section analysis of threshold regressions for inflation level with 5 year averaged data over the period 1982 to 2016 as elaborated by Boyd et al. (2001) will also help us to determine the long run relationship as the data is free from temporary business cycles. The pure cross section model takes the form:

$$FD = \phi + aInf + bInfd + cInfd * Inf + dx + \emptyset \dots (3.2)$$

Where; "FD" represents the financial development indicator, "Inf" is the inflation rate, $Infd$ is the inflation dummy with 1 for inflation above the threshold and 0 if below the threshold. If inflation is greater than the threshold then the coefficient of inflation would be "a+c" but when it is below

then it would be "a"; if inflation is greater than the threshold, the intercept would be $"\varphi + c"$ while it would be φ if less than the threshold. $"x"$ represents the vector of control variables which includes initial income, initial human capital investment, government consumption and trade openness.

For the robustness checks of the findings, the study will further confirm the non-linearity of the relationship between inflation and financial development by replacing inflation with its inverse on cross-section method set-up. The findings from this nonlinear transformation will confirm the expected non-linear nature of the relationship from the threshold regressions. For the exploitation of the time series dimension of the data and doing away with econometric problem associated with cross section regressions such as heterogeneity of groups, the study will take advantage of static and dynamic panel approach as developed by Hansen (1999) and Seo and Shin (2016). The dynamic approach was developed perfecting the pioneering work of Hansen (1999) who developed a non-dynamic panels with individual specific effects and Caner and Hansen (2004) who advanced early studies by considering instrumental variable estimation of a threshold model.

To start with, Hansen (1999) developed a non-dynamic panels with individual specific effects using 565 United States companies over the period of 15 years (1973 to 1987) to test how investment decisions are influenced by financial constraints. The least squares estimation of the threshold regression slopes using fixed effects transformation was utilised. The method developed non-standard asymptotic theory of inference which allows the construction of confidence intervals and hypotheses testing. They observed strong evidence of double threshold effect which separates the firms based on their debt to assert ratio. Unlike early studies particularly by Fazzari et al (1988), Hansen (1999) was able to quantify the extent of financial constraint rather than assuming the degree of such constraint. Besides, the paper considers regression models which require explanatory variables to be endogenous and an exogenous threshold variable. The two-stage least squares estimator of the threshold parameter and a generalised method of moments estimator of the slope parameters was developed. The Monte Carlo simulation was used to investigate the distribution theory that indicates the applicability of the method. The structural equation of interest as suggested by Hansen (1999) takes the form

$$y_{it} = u_i + \beta_1' x_{it} I(q_{it} \leq \gamma) + \beta_2' x_{it} I(q_{it} > \gamma) + \varepsilon_{it} \dots (3.3)$$

Where $I(.)$ is the indicator function, an intuitive way of writing (3.3) is

$$y_{it} = \begin{cases} u_i + \beta_1' x_{it} + \varepsilon_{it}, & q_{it} \le \gamma \\ u_i + \beta_2' x_{it} + \varepsilon_{it}, & q_{it} > \gamma \end{cases}$$

Another compact representation of 1 is to set

$$x_{it}(\gamma) = \begin{pmatrix} x_{it} I(q_{it} \le \gamma) \\ x_{it} I(q_{it} > \gamma) \end{pmatrix}$$

And $\beta = (\beta_1' \; \beta_2')'$ so that 1 equals

$$y_{it} = u_i + \beta' x_{it}(\gamma) + \varepsilon_{it} \;\ldots\ldots (3.4)$$

The observations are divided into two regimes depending on whether the threshold variable q_{it} is smaller or larger than the threshold γ. The regimes are distinguished by differing regression slopes, β_1 and β_2. For the identification of β_1 and β_2, it is required that the elements of x_{it} are not time invariant. We also assume that the threshold variable q_{it} is not time invariant. The error ε_{it} is assumed to be independent and identically distributed (iid) with mean zero and finite variance σ^2. The analysis is asymptotic with fixed T as n reaches infinite. One traditional method to eliminate the individual effect u_i is to remove individual-specific means. While straightforward in linear models, the nonlinear specification (3.3) calls for a more cautious treatment. Note that taking averages of (3.3) over the time index t produces

$$\bar{y}_{it} = u_i + \beta_1' \bar{x}_{it}(\gamma) + \bar{\varepsilon}_{it} \;\ldots (3.5)$$

Taking the difference between (3.4) and (3.5) yields

$$y_{it}^* = u_i + \beta_1' x_{it}^*(\gamma) + \varepsilon_{it}^*$$

Where

$$y_{it}^* = y_{it} - y_{it}^*$$

$$x_{it}^*(\gamma) = x_{it}(\gamma) - \bar{x}_{it}(\gamma)$$

$$\varepsilon_{it}^* = \varepsilon_{it} - \bar{\varepsilon}_{it}$$

Under the null hypothesis of no threshold, the model is

$$y_{it} = u_i + \beta_1' x_{it} + \varepsilon_{it}$$

After fixed-effects transformation;

$$y_{it}^* = u_i + \beta_1' x_{it}^* + \varepsilon_{it}^*$$

The regression parameter β_1 is estimated by OLS, yielding $\tilde{\beta}_1$, residuals $\tilde{\varepsilon}_{it}^*$ and sum of squared errors $\tilde{\varepsilon}_{it}^{*\prime} \tilde{\varepsilon}_{it}^*$

Shifting from the non-dynamic to dynamic panel threshold approach, the first developed dynamic panel threshold approach was developed by Kremer et al. (2013) who uses the GMM type estimators to control for endogeneity problems. The dynamic approach take advantage of orthogonal transformation which does not violate the distribution theory for panel data. The dynamic panel threshold model takes the form:

$$y_{it} = u_i + \beta_1' z_{it} I(q_{it} \le \gamma) + \beta_2' z_{it} I(q_{it} > \gamma) + \varepsilon_{it} \dots (3.6)$$

Where u_i represents country specific fixed effect, ε_{it} is the composite error term which is independent and identically distributed with mean 0 and constant variance, $I(.)$ Is the indicator function indicating the regime defined by the threshold variable q_{it}, the threshold level is represented by γ, z_{it} is m-dimensional vector of explanatory regressors which may include lagged values of y and other exogenous variables. The model requires suitable set of instrumental variables greater or equal to m. The forward orthogonal deviation transformation subtracts the average of all future available observations of a variable unlike the subtracting the previous observation from the contemporaneous one (first-differencing) or the mean from each observation (within transformation). The error term of forward orthogonal deviations transformation which is free from serial correlation of the transformed error term takes the form:

$$\varepsilon_{it}^* = \sqrt{\frac{T-t}{T-t+1}} \left[\varepsilon_{it} \frac{1}{T-t} (\varepsilon_{i(t+1)} + \cdots + \varepsilon_{iT}) \right] \dots (3.7)$$

And hence this allows for the estimation procedure by Caner and Hansen (2004) for cross section model on dynamic panel equation:

$$Var(\varepsilon_i) = \sigma^2 I_T \Rightarrow Var(\varepsilon_i^*) = \sigma^2 I_{T-1}$$

Seo and Shin (2016) advances the work of Hansen (1999) where endogenous variables for both the threshold variable and regressors are allowed on nonlinear asymmetric dynamics and cross sectional heterogeneity. They came up with first differenced two step least squares and first

differenced GMM methods depending on whether the threshold variable is strictly exogenous or not. The first differenced two step least squares is ideal for strictly exogenous threshold variable while the first differenced GMM is best with endogenous threshold variable. As they provide the asymptotic distribution for both estimators, they also use bootstrap based test to check if there is any threshold effect as well as exogeneity test of the threshold variable. The approach takes the following form:

$$y_{it} = (1, x_{it}')\emptyset_1 I(q_{it} \leq \gamma) + (1, x_{it}')\emptyset_2 I(q_{it} > \gamma) + \varepsilon_{it}, \qquad i = 1, \dots, n; t = 1, \dots, T, (3.8)$$

Where, y_{it} is a scalar stochastic variable of interest, x_{it} is the $k_1 \times 1$ vector of time-varying regressors (may include lag of y_{it}, $I(.)$ Is an indicator function, and q_{it} is the transition variables. The threshold parameter is represented by γ, the slope parameters associated with different regimes are $\emptyset_1$ and $\emptyset_2$. The regression error ε_{it} consists of the error components:

$$\varepsilon_{it} = \alpha_i + v_{it}$$

Where, α_i is an unobserved individual fixed effect and v_{it} is a zero mean idiosyncratic random disturbance. In particular, v_{it} is assumed to be a martingale difference sequence for the expositional simplicity,

$$E(v_{it}|\mathcal{F}_{t-1}) = 0$$

Where, $\mathcal{F}_t$ is a natural filtration at time t, it should be noted that there is no assumption that x_{it} or q_{it} are to be measurable with respect to $\mathcal{F}_{t-1}$, thus allowing endogeneity in both the regressors, x_{it} and the threshold variable, q_{it}.

Among other approaches, this study takes advantage of the most recent user friendly Stata command by Seo et al. (2019) for panel threshold which allows for endogenous threshold variable and other advanced components. Seo et al. (2019) developed Stata command (xthenreg) to implement the first differenced GMM estimator which was proposed by Seo and Shin (2016) for dynamic panel threshold model. Seo et al. (2019) also developed asymptotic variance formula for a kink constrained GMM estimator and also include an estimation algorithm. They also propose a bootstrap algorithm which is fast to implement the bootstrap for the linearity test.

3.2 Discussion of variables used

The study considers a sample of countries in SSA over the period 1982 to 2016 with 5 year averaged data. Due to the need for strongly balanced data for the execution of selected threshold approaches, only 23 countries are included from the region. Besides, the period considered would give us informed information on the recent evolution on the association between inflation and financial development, taking cognisance of the drastic credit growth changes in the region following the recent global financial crises which intensified in 2008, fluctuating African currencies against the United States dollar and volatile commodity prices. For the exploitation of long run dynamics, 5 year non-overlapping data is constructed. The 5-year non-overlapping data for the period 1982 to 2016 are 1982-1986, 1987-1991, 1992-1996, 1997-2001, 2002-2006, 2007-2011 and 2012-2016.

The private sector credit by deposit money banks as a ratio of GDP (Private Credit), Liquid liabilities as a ratio of GDP (Liquidity Liabilities) and deposit money bank assets as a ratio of GDP (Bank Assets) are the financial development indicators used. The private credit ratio variable represents the distribution of credit between the public sector and the most productive private sector. The variable has been popularised in the major studies by King and Levine (1993a, b, c). The early measurement of the variable was, however, criticised for failing to effectively deflating the financial development indicators (Boyd et al., 2001 and Kim and Lin, 2010). An alternative measure of credit distribution (private credit by deposit money banks to GDP) which was originally compiled by Beck et al. (2000) is considered in this study.

The liquidity liabilities ratio and deposit money bank assets ratio are the other financial development indicators used. The measures do not determine the distribution of credit but they denotes the size of the financial sector. Liquidity liabilities of the financial sector as a ratio of GDP is made up of currency, demand and interest bearing liabilities of the (banks and non-banks) financial intermediaries relative to the economy. The data was also utilised by Boyd et al. (2001) and Kim and Lin (2010).

The deposit money bank assets ratio is the total assets of deposit money banks which are commercial banks and other deposit taking banks all as a ratio of GDP. They are claims on domestic real non-financial sector by deposit money banks as a ration of GDP. The variable determines the same measure of financial sector size as with liquid liabilities ratio. The dataset

was also approved by Beck et al. (2000), Boyd et al. (2001) and Kim and Lin (2010). Inflation, on the other hand, is measured by Consumer Price Index (CPI) annual growth used in the study and is expected to have an inverse relationship with financial development. The indicator was also utilised by Tinoco-Zermeno et al. (2014) and Zaman et al. (2010).

On the control variables, the actual value of secondary school enrollment as a percentage of gross is used and is expected to positively contribute to financial development. The variable has been popularised in the literature by studies which includes Al-Nasser and Jackson (2012) and Naceur and Ghazouani (2005). Initial income as derived from GDP per capita (Constant 2010 USD) is included in the study following Boyd et al. (2001) and Kim and Lin (2010). The log of initial per capita GDP is expected to have a positive impact on financial development. The inclusion of such real activity measures controls for the fact that such macro-economic development influences the level of financial depth (Ductor and Grechyna, 2015 and Kim and Lin, 2010). Alternatively, the actual value of real GDP per capita is also used following Ehigiamusoe, et al. (2018), Almalki et al. (2015), Wahid et al. (2011), Khan et al. (2006) and Naceur and Ghazouani (2005). The variable is largely supported given that panel threshold techniques used only allow time varying variables.

Besides, trade as a ratio of GDP was used to account for the external shocks. The openness to trade of goods may also imply openness to trade in financial services (Kim and Lin, 2010). The variable also accounts for the external economic shocks which are usually reflected on the external accounts for the economy through trade volumes. The variable is expected to have either a positive or negative relationship with financial development following (Kim et al., 2012 and Rajan and Zingales, 2003).

Government consumption as a ratio of GDP is also utilised. The variable is the most accessible as compared to the most effective budget deficit and it controls for macro-economic stability. High government expenditure may affect the incentive of the government to repress the financial system and hence its inclusion in the regressions (Kim and Lin, 2010). It is also shown that since inflation and financial development have a negative relationship probably because they are both correlated with fiscal policy (Boyd et al., 2001). The variable was also utilised by Bittencourt (2011). Lastly, gross fixed capital formation as a ratio of GDP is also expected to have a positive relationship with financial development. The variable was also utilised by Raheem and Oyinlola (2015) and Tinoco-Zermeno et al. (2014).

3.3 Data and data sources

Table 3.1: Variables and their source

Variable	Source
Private credit by deposit money banks to GDP - (Private Credit)	Financial Development and Structure Dataset
Liquid liabilities as a ratio of GDP - (Liquidity Liabilities)	Financial Development and Structure Dataset
Deposit money bank assets as a ratio of GDP - (Bank Assets)	Financial Development and Structure Dataset.
Annual percentage growth of consumer price index	World Development Indicators
Initial value of secondary school enrollment as a percentage of gross	World Development Indicators
Secondary school enrollment as a percentage of gross	World Development Indicators
GDP per capita	World Development Indicators
Initial income as derived from GDP per capita (Constant 2010 USD)	World Development Indicators
Trade as a ratio of GDP	World Development Indicators
Government consumption as a ratio of GDP	World Development Indicators
Gross fixed capital formation as a ratio of GDP	World Development Indicators

3.4 Conclusion

The study took advantage of 5-year averaged data over the period 1982 to 2016 on 23 countries in SSA. The threshold beyond which the impact of inflation on financial development will significantly change is determined by static and dynamic approaches from Hansen (1999) and Seo and Shin (2016), respectively.

CHAPTER 4

EMPIRICAL RESULTS AND DISCUSSION

4.0 Introduction

The empirical results and their discussion are presented in this 4th Chapter. The results are based on 23 countries in the SSA with 5-year averaged data over the period 1982 to 2016. The findings are solidified by the summary statistics of the data as well as the correlation matrix of the variables.

4.1 Summary Statistics

It is shown in the Table 4.1 that the study utilised balanced panels with 161 observations, with exception of secondary enrolment data which has only 140 observations. As such, the variable for secondary enrolment was not included in all threshold methods which requires the data to be strongly balanced, that is, with no missing observation for all the variables in the model.

Table 4.1: Summary Statistics

	Unit of Measurement	Obs	Mean	Std. Dev	Min	Max
Private Credit	Private credit by deposit money banks and other financial institutions (% of GDP)	161	19.25	23.32	1.23	143.37
Private Credit Banks	Private credit by deposit money banks (% of GDP)	161	16.82	15.34	1.23	99.17
Liquid Liabilities	Liquid liabilities (% of GDP)	161	26.38	17.39	7.36	100.98
Bank Assets	Deposit money bank assets (% of GDP)	161	22.63	19.79	2.17	118.68
Inflation	Percent	161	9.72	12.54	-3.90	107.12
Trade	Total exports and imports (% of GDP)	161	67.18	33.26	13.80	206.00
GDP per capita	Constant 2010 US$	161	2264.02	2971.88	224.05	12825.14
Initial income	GDP per capita (constant 2010 US$)	161	1945.79	2690.20	294.91	12172.55
Sec Enrolment	School enrollment, secondary (% gross)	140	36.05	25.64	3.44	113.87
GFCF	Gross fixed capital formation (% of GDP)	161	20.02	8.59	3.70	64.40
GOV	General government final consumption expenditure (% of GDP)	161	14.67	6.39	1.39	40.90

Note: The table is based on 5 year averaged data from 1982 to 2016 with exception of initial income which is invariant (averaged between 1982 and 1984) for 23 countries in SSA.

Source: Author's own computation

Financial development indicator shows mean values within the range of 16.82 and 26.38 as a percentage of GDP, which is relatively lower than the average maximum global level of financial development which is known for bringing positive impact on economic growth which ranges from 90% to 100% (Law et al., 2018). This reflects the need to analyse the factors which determines the development in the financial sector as it is a prerequisite for the success of any economy. Inflation,

on the other hand, showed a mean rate of 10% which could be high in relationship to the acceptable level on inflation which facilitates development in the region. Averaged over the period 1982 and 2016, the low levels of financial development, at the background of high inflation rates, might be a signal of a close negative relationship on the variables. As such, this study is key as it tries to identify the connection between these critical economic variables.

4.2 Correlation matrix

Table 4.2 shows the correlation for the variables used in the study. It can be noted that there is a negative correlation between inflation and all the financial development indicators considered. This is a reflection of a strong negative relationship which exist between the variables which implies the weakening power that inflation has on financial development. The negative correlation is much stronger on liquid liabilities and followed by bank assets. Inflation also show a negative relationship with the rest of the control variables used in the study. These control variables reflect the macroeconomic stability of the economies. The control variable used are trade openness, real GDP per capita, initial income, secondary school enrolment, gross fixed capital formation and government consumption. As a result, it can be concluded that inflation is a threat to economic development.

Table 4.2: Correlation matrix

	Private Credit	Private Credit Banks	Liquid Liabilities	Bank Assets	Inflation	Trade	GDP per capita	Initial income	Sec Enrolment	GFCF	GOV
Private Credit	1.0000										
Private Credit Banks	0.9203	1.0000									
Liquid Liabilities	0.5872	0.7397	1.0000								
Bank Assets	0.8138	0.8989	0.9126	1.0000							
Inflation	-0.1475	-0.1956	-0.2222	-0.2207	1.0000						
Trade	0.1420	0.2569	0.5663	0.4156	-0.1225	1.0000					
GDP per capita	0.4433	0.4492	0.5781	0.6042	-0.1683	0.5895	1.0000				
Initial income	0.3601	0.2903	0.2849	0.3792	-0.1843	0.3909	0.8888	1.0000			
Sec Enrolment	0.5695	0.5632	0.6860	0.7042	-0.0416	0.4914	0.7300	0.5463	1.0000		
GFCF	0.0267	0.0657	0.2331	0.1637	-0.0739	0.4495	0.4006	0.3284	0.3337	1.0000	
GOV	0.1932	0.1698	0.3908	0.3560	-0.1655	0.3897	0.4543	0.3321	0.3984	0.0872	1.0000

Note: For 23 countries in SSA with 5 year averaged data over the period 1982 to 2016.

4.3 Pure cross-section regressions

The Table 4.3 shows results from the pure cross section regressions. It should be restated that "Inf" is the inflation rate, InfD is the inflation dummy with 1 for inflation above the threshold and 0 if

below the threshold. If inflation is greater than the threshold then the coefficient of inflation would be "a+c" which is "Inf + InfD*Inf" but when it is below then it would be "a" which is "Inf". After realizing the presence of heterogeneity in the errors by utilising the White's heteroskedasticity and Breusch-Pagan / Cook-Weisberg test for heteroskedasticity, the regression are then done which robust specification to relax the normality assumptions. As such, the t-statistics and p-values are robust for more effective conclusions.

Table 4.3: Pure Cross-section Regressions

Variable	Inflation	InfD	InfD*inf	INV-INF	GOV	Trade	Initial Income	Sec Enrolment	Constant	R^2	Obs
				Threshold Regressions							
			(V) Threshold Regression with 6% inflation threshold (robust)								
Private Credit	2.1231 (1.536)	13.2791** (5.892)	-2.8686* (1.528)		-0.0330 (0.291)	-0.1590* (0.087)	0.0010 (0.001)	0.5675*** (0.156)	4.2404 (4.908)	0.37	140
Liquid Liabilities	-0.1041 (0.679)	3.8920 (2.980)	-0.4585 (0.670)		0.2053 (0.251)	0.1602*** (0.044)	-0.0016*** (0.000)	0.4406*** (0.071)	1.4740 (4.111)	0.59	140
Bank Assets	0.7245 (0.895)	5.4215 (3.954)	-1.3336 (0.882)		0.1910 (0.282)	0.0361 (0.054)	-0.0005 (0.001)	0.5315*** (0.103)	-0.0610 (4.663)	0.52	140
			(W) Threshold Regression with 7% inflation threshold (robust)								
Private Credit	3.2492** (1.373)	8.2173 (5.247)	-3.6697*** (1.365)		0.0687 (0.288)	-0.1593* (0.084)	0.0012 (0.001)	0.5249*** (0.145)	2.0803 (5.045)	0.43	140
Liquid Liabilities	0.6385 (0.553)	1.9482 (3.047)	-1.0564* (0.554)		0.2431 (0.246)	0.1589*** (0.045)	-0.0015*** (0.000)	0.4240*** (0.070)	0.3037 (4.055)	0.61	140
Bank Assets	1.4538* (0.774)	1.9965 (3.857)	-1.8468 (0.770)		0.2566 (0.272)	0.0357 (0.053)	-0.0003 (0.001)	0.5040*** (0.099)	-1.4023 (4.601)	0.57	140
			(X) Threshold Regression with 8% inflation threshold (robust)								
Private Credit	1.8103* (1.016)	6.4721 (4.971)	-2.2922** (1.018)		-0.0403 (0.290)	-0.1529* (0.086)	0.0009 (0.001)	0.5652*** (0.155)	5.2741 (4.485)	0.41	140
Liquid Liabilities	0.3743 (0.483)	0.6037 (2.956)	-0.7618 (0.491)		0.2152 (0.248)	0.1610*** (0.045)	-0.0016*** (0.000)	0.4327*** (0.069)	0.9994 (4.050)	0.61	140
Bank Assets	0.6421 (0.651)	0.6208 (3.760)	-1.0539 (0.655)		0.1925 (0.280)	0.0396 (0.054)	-0.0005 (0.000)	0.5272*** (0.100)	0.4462 (4.639)	0.55	140
			(Y) Linear Regression (robust)								
Private Credit	-0.4199*** (0.149)				-0.1026 (0.295)	-0.1509* (0.090)	0.0008 (0.001)	0.6037*** (0.164)	11.703*** (3.661)	0.37	140
Liquid Liabilities	-0.4364*** (0.090)				0.1917 (0.249)	0.1613*** (0.045)	-0.0017*** (0.000)	0.4475*** (0.071)	3.0366 (3.765)	0.61	140
Bank Assets	-0.4891*** (0.107)				0.1597 (0.281)	0.0399 (0.054)	-0.0006 (0.001)	0.5479*** (0.102)	3.2508 (4.139)	0.54	140
			(Z) Regression with inflation replaced by INV-INF (robust)								
Private Credit				0.2483 (1.150)	-0.0369 (0.289)	-0.1447 (0.089)	0.0010 (0.001)	0.5843*** (0.161)	6.8925* (3.790)	0.36	140
Liquid Liabilities				0.5110 (0.809)	0.2572 (0.251)	0.1671*** (0.046)	-0.0014*** (0.000)	0.4278*** (0.071)	-1.9946 (3.863)	0.57	140
Bank Assets				0.2007 (0.607)	0.2372 (0.276)	0.0474 (0.055)	-0.0003 (0.001)	0.5251*** (0.101)	-2.3415 (4.228)	0.51	140

Note: robust standard errors in parentheses, *** indicates significance at 1%, ** significance at 5% and * significance at 10%, respectively. The results are for 23 sub-Saharan African countries with 5 year averaged data over the period 1982 to 2016.

There is evidence of both linear and non-linear relationship between inflation and private credit. There is indication of increasing negative impact of impact of inflation on private credit with respect to increase in inflation threshold (7% to 8%) which concurs with observations by Boyd et al. (2001). This shows how detriment high inflation rates could be to the financial sector development of the region. This idea is also supported by the obtained significant negative impact of inflation on private credit for inflation level above the threshold 7% and 8%. The negative coefficients are -0.4205 and -0.4819, respectively as obtained by summing up 'a' and 'c' from the cross section equation.

There is, however, evidence of a positive impact of inflation on private credit at inflation level below the threshold 7% and 8% as shown in Table 4.3. This is shown by interpreting the coefficient of inflation only, that is, 'a' from the pure cross section equation. Besides, there is also evidence of a stronger positive impact at lower inflation than it is on the higher inflation levels. As such, the positive impact of inflation at 7% is 3.2492 which is bigger than 1.8103 obtained at 8% inflation threshold. The positive relationship shows how low inflation rates can drive the development of the financial sector in the SSA which can be explained by the short-run Philip's curve. Even though the same results can be concluded for liquid liabilities and bank assets, the majority of the coefficients are statistically insignificant.

As shown in Table 4.3 at section "Y" of the results, there is also strong evidence of a negative linear relationship between inflation and all the financial development indicators used in the study. There is, however, no evidence of a significant impact of inflation inverse (INV-INF) on all measures of financial development as shown on the section "Z" of the results. The findings from this nonlinear transformation is contrary to the expected non-linear nature of the relationship which has been demonstrated by the threshold regressions. The coefficients are, however, positive which support the theory underpinning the inverse of inflation and financial development.

The control variable in Table 4.3 are, however, showing mixed evidence. There is evidence of positive and significant impact of human capital development (secondary school enrolment) on financial development as expected from the literature. Government spending was insignificant on financial development which was also found by Boyd et al. (2001). Besides, initial income was largely insignificant with selective negative significant impact on financial development. The negative impact on financial development can be attributed to convergence theory which shows

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that countries with higher initial growth tend to have better financial systems which intern led to a decreased rate of financial sector development as compared to countries with lower initial income.. Trade openness was also found to have a negative impact on financial development which is in line with findings by Kim et al. (2012) and Rajan and Zingales (2003).

4.4 Threshold regressions

Table 4.4 shows results for the threshold effect in non-dynamic panels for the inflation and financial development relationship following Hansen (1991).

Table 4.4: Non-dynamic Panel Threshold Analysis following Hansen (1999)

Financial development indicator	Private Credit	Bank Assets	Liquid Liabilities
Threshold estimator $\hat{\gamma}$	6.52%**	6.52%*	6.39%
95% confidence interval	[6.3941-6.5451]	[6.1325-6.5451]	[6.3890-6.5157]
Impact of inflation			
$\hat{\beta}_1$	1.5637*** (0.388)	1.0934*** (0.397)	0.7326* (0.400)
$\hat{\beta}_2$	-0.0569 (0.070)	-0.0914 (0.071)	-0.0282 (0.070)
Impact of covariates			
GOV	0.8982*** (0.217)	0.9141*** (0.222))	0.2533 (0.218)
GFCF	0.0380 (0.110)	0.1980* (0.112)	0.2430** (0.111)
Trade	-0.0865** (0.041)	-0.1275*** (0.042)	-0.0111 (0.0411)
GDP per capita	0.0073*** (0.001)	0.0079*** (0.001)	0.0051 (0.001)
Constant	-7.2467 (4.505)	-0.0914 (4.617)	6.1596 (4.541)
Observations	161	161	161
Countries	23	23	23

Note: standard errors in parentheses, *** indicates significance at 1%, ** significance at 5% and * significance at 10%, respectively. The results are for 23 sub-Saharan African countries with 5 year averaged data over the period 1982 to 2016.

There is evidence of a single threshold for all model specifications. The threshold estimator shows a range between 6.39% and 6.52% level of inflation above which there would be a significant shift in the inflation and financial development relationship. As such, there is evidence of a significant

positive impact of inflation of financial development at low inflation rates (below the threshold) while the relationship turns negative and significant at high inflation rates (above threshold). The results support the idea that low inflation increases the development in the financial sector while there is high chances of endangering the same sector at inflation levels above the threshold. The estimated threshold is slightly above the one obtained by Khan et al. (2006) of a range between 3% to 6% for the industrialised and developing economies from around the world while utilising the conditional least squares method. The difference can be related to the general observation that inflation threshold is higher in less industrialised economies such as the majority of SSA than in developed economies.

On the control variables in Table 4.4, it can be noted that there is strong evidence of a positive and significant impact of gross fixed capital formation, GDP per capita and government spending on financial development when inflation is below the threshold while a negative relationship is displayed on inflation levels above the threshold. These findings are in line with the expected results. There was, however, a negative and significant impact on the relationship between trade and financial development in the region which is not commonly expected as the world as well as African continent are pushing towards regional integration to ensure sustainable development. The results were also observed by Kim et al. (2012) in poorer countries and concluded that developing economies may not fully engage in gainful trading with more technologically advanced economies. Besides, this may be explained by the need for ensuring simultaneous opening of both the trade and the capital flow so that the financial sector would benefit from globalisation as suggested by Rajan and Zingales (2003).

Besides, Table 4.5 shows results for the threshold effect in dynamic panels for the inflation and financial development relationship following Seo et al. (2019) and Seo and Shin (2016). Dynamic threshold approach allows inclusion of the lagged dependent variable which reduces the chances of model under-specifications unlike in the case with static method. The regressions are done restricting inflation as an endogenously determined variable. The dynamic approach estimated lower threshold as compared to the non-dynamic threshold approach. The dynamic approach also estimated below and above threshold coefficients for all the variables in the model including the control variables.

There is evidence of a significant threshold for all model specifications as reflected by rejecting the null hypothesis of linearity by bootstrap p-value for linearity test. The threshold estimator ranges between 4.85% and 5.45% level of inflation where there would be a significant shift in the inflation and financial development relationship. The threshold in dynamic approach is slightly lower than that on the non-dynamic technics which can be attributed to many differences in the methodological frameworks such as the inclusion of lagged dependent variable and the restriction of inflation to be endogenously determined in the dynamic models.

Table 4.5: Dynamic Panel Threshold Analysis following Seo et al. (2019) & Seo and Shin (2016)

Financial development indicator	Private Credit	Bank Assets	Liquid Liabilities
Threshold estimator $\widehat{\gamma}$	5.45%	4.85%***	4.85%*
Bootstrap p-value for linearity test	0	0	0
Impact of inflation			
$\widehat{\emptyset}_1$	2.4950*** (0.793)	3.4637*** (1.182)	3.0630*** (0.599)
$\widehat{\emptyset}_2$	-2.6776*** (0.771)	-3.6872*** (1.188)	-3.0838*** (0.545)
Impact of covariates below threshold			
Lag dependent variable	0.8364*** (0.104)	0.1188 (0.227)	0.8587*** (0.137)
GOV	-0.1802 (0.505)	2.4344** (0.952)	1.5650*** (0.450)
Trade	0.1395*** (0.052)	0.1470*** (0.031)	0.0352 (0.035)
Impact of covariates above threshold			
Lag dependent variable	0.0859** (0.038)	0.8123*** (0.243)	-0.0556 (0.125)
GOV	0.9696*** (0.357)	-2.3663** (0.952)	-1.1082*** (0.304)
Trade	-0.3278*** (0.058)	-0.2640 (0.067)	-0.0703* (0.042)
Constant	2.4950*** (5.017)	36.1108*** (7.651)	23.7759*** (3.837)
T	7	7	7
N	23	23	23

Note: standard errors in parentheses, *** indicates significance at 1%, ** significance at 5% and * significance at 10%, respectively. The results are for 23 sub-Saharan African countries with 5 year averaged data over the period 1982 to 2016.

The estimated threshold from the dynamic threshold method is, however, close to the findings by Khan et al. (2006) who obtained a threshold ranging from 3% to 6% for the industrialised and developing economies from around the world while utilising the conditional least squares method. There is evidence of significant positive impact of inflation at inflation level below the threshold while there is a negative and significant relationship at inflation level above the threshold. The results support the idea that low inflation positively drives financial sector development while high inflation rates would jeopardise the sector. On the control variables in Table 4.5, it can be noted that there is strong evidence of a positive impact of trade and government spending on financial development when inflation is below the threshold while a negative relationship is displayed on inflation levels above the threshold. These findings are in line with the expected results.

Overly, it can be noted that from both the static and dynamic approaches utilised in this study, the threshold established ranges between 4.85% and 6.62%. The estimated minimum threshold of 4.85% is slightly above the 3% obtained by Khan et al. (2006) on industrialised and less industrialised economies. The difference can be related to the general observation that inflation threshold is higher in less industrialised economies such as the majority of SSA than in developed economies. Besides, the maximum average threshold obtained in this study of 6.62% is also higher than that obtained by Khan et al. (2006) of 6% which can also be attributed to the differences in average inflation levels from the developed to the developing economies. On the other hand, the inflation threshold obtained in this study is way lower than the range observed by Boyd et al. (2001) who provided evidence of 15% threshold in developed and developing countries. This can be attributed to the differences in the methodological approach used as the study by Boyd et al. (2001) did not use a specific panel threshold method.

For the robustness of the findings, the study also constructed a scatter plot for inflation and financial development in the SSA averaged overaged over the period 1982 to 2016. There is also evidence of nonlinear relationship between the variables as shown in Figure 1.3. A positive correlation can be seen in lower inflation levels while a negative relationship is also clear at higher inflation levels. This is a sure reflection of the need to keep inflation levels below a certain level which would be appropriate to ensure stability and development if the financial sector. This idea is strongly supported in the literature as the friction created by inflation have destructive force on the much needed financial development when it reaches a certain level.

Generally, the positive impact of inflation on financial development found in the SSA at inflation levels below the ranges between 4.85% and 6.62% supports the existence of the short-run Philips curve. This implies that productivity is associated with slight rise in prices which largely emanate from the demand side (demand-pull inflation). The type of this inflation is closely linked with the demand of factors of production as well as consumption demand which pushes up prices. This happens both in the financial sector and in the real economy, either as independent or as a product of each other.

During a boom, particularly in less-industrialised economies like the majority of countries in SSA, the brisk business in the real sector would also spur the demand of financial services which pushes up their prices too. As such, there would be a resultant rise in general commodity prices as well as increased real sector productivity and financial sector development which implies a positive relationship between inflation and financial development. There is, however, a point reached when the rise in prices would become an obstacle to the development of the financial sector and hence a negative relationship which is found in SSA at inflation level above below the range of 4.85% to 6.62%. The market friction which comes with information asymmetry and inefficient market allocation of financial resources would jeopardise the financial sector development.

It is also worth noting that the obtained direct inflation threshold on financial development in SSA is lower than the established 31% on the indirect impact of inflation on financial development and economic growth nexus in the same region (see Bandura, 2020). This shows that inflation can directly influence financial development at lower rates than it takes for the indirect impact on growth through financial development.

4.5 Conclusion

This chapter was specifically meant to present and discuss the obtained results. It was found that inflation has a negative impact on financial development and that the negative impact rises with an increase in inflation. Besides, inflation threshold ranging between 4.85% and 6.62% beyond which inflation begins to negatively influence financial development from positive was established.

CHAPTER 5

CONCLUSION, RECOMMENDATIONS AND POLICY IMPLICATIONS

5.1 Conclusion and key findings

This study considers a sample of countries in sub-Saharan African over the period 1982 to 2016 with 5 year averaged data to determine the inflation threshold on financial development in the region. The pure cross-section method is utilised to determine both the linear and non-linear relationship between inflation and financial development. Besides, non-linear approaches are also utilised to non-linear relationship between inflation and financial development following Seo and Shin (2016) and Hansen (1999) for dynamic panel threshold and non-dynamic panel threshold, respectively.

On the pure cross-section results, there is evidence of both linear and non-linear relationship between inflation and private credit. Strong evidence of a negative impact of inflation of financial development is obtained. There is also evidence of increasing negative impact of inflation on private credit with respect to an increase in inflation threshold, that is, from 7% to 8%, respectively. There is, however, evidence of a positive impact of inflation on private credit at low inflation level (below 7% and 8% considered) from the cross-section regressions. Besides, there is also evidence of a stronger positive impact at lower inflation than it is on the higher inflation levels. As such, the positive impact of inflation at 7% is 3.2492 which is bigger than 1.8103 obtained at 8% inflation threshold.

Even though the same results can be concluded for liquid liabilities and bank assets, the majority of the coefficients are statistically insignificant. There is, however, no evidence of a significant impact of "inflation inverse" on all measures of financial development as shown on the section "Z" of the results. The findings from this nonlinear transformation is contrary to the expected non-linear nature of the relationship which has been demonstrated by the threshold regressions. The coefficients are, however, positive which support the theory underpinning the inverse of inflation and financial development.

From the panel threshold techniques utilised, it can be noted that from both the static and dynamic approaches utilised in this study, the threshold established ranges between 4.85% and 6.62%. This entails that at inflation rates below the observed range, there is confirmation of a positive impact

of inflation on financial development while there is evidence of a negative impact of inflation on financial development at inflation levels beyond the threshold determined. The positive impact of inflation on financial development found in the SSA at inflation levels below the threshold range supports the existence of the short-run Philips curve. This implies that productivity is associated with slight rise in prices which largely emanate from the demand side (demand-pull inflation). There is, however, a point reached when the rise in prices would become an obstacle to the development of the financial sector and hence a negative relationship which is found in SSA at inflation levels above the upper threshold range. The market friction which comes with information asymmetry and inefficient market allocation of financial resources would jeopardise the financial sector development.

5.2 Recommendations and policy implications

It is, therefore, recommended that the authorities adopt appropriate macroeconomic policies to ensure that inflation levels are kept well below the observed threshold to guarantee financial sector development in the region. Containing inflation levels below the range of 4.85% to 6.62% in the region would encourage sustainable development through the financial sector development. This is particularly important given that the financial systems are the engine to the success of every economy as they facilitate the efficient allocation of financial resources to the productive sectors. As such, inflation must be controlled to ensure the development of the much needed financial sector.

Given that the inflation threshold determined in the study is slightly higher than the average obtained in other case studies, particularly on industrialised economies, this is a sure reflection that there is still high potential for high production in the region. This is so (possibly) because there would be high demand for factors of production as well consumer products which calls for demand-pull inflation. The increased individual/household income form high demand of factors of production will lead to a consequent rise on the demand of consumer products as there would be an increase in disposable income. As a policy implication, the policy makers in SSA should take advantage of this and produce more without being limited much by lower inflation targets.

Besides, the adopted monetary policies in each respective nation within the region should be aligned to ensure a stable and low inflation level since high inflation is associated with weak financial development prospects. The countries adopting inflation targeting monetary policies

must reflect on these findings for inclusive development in the region since allowing higher inflation would have a negative effect on development prospects. Besides, ensuring stable productivity would also help in containing inflation by matching the demand and supply in the region. Smooth and sufficient domestic production flows, sustainably complemented by the net exports, would limit the demand induced spiral of consumer prices.

Given that inflation has a bearing on financial development, authorities are also encouraged to create value for the money in the economy so as to do away with monetary inflation. The printing and minting of money must be guided by the adoption capacity of the economy. This is critical as the creation of money without meaningful production taking place leads to inflation which would endanger the development in the financial sector.

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List of 23 sub-Saharan African countries considered

1) Burundi
2) Burkina Faso
3) Botswana
4) Cameroon
5) Central African Republic
6) Chad
7) Congo, Rep.
8) Côte d'Ivoire
9) Gabon
10) Gambia
11) Ghana
12) Kenya
13) Madagascar
14) Malawi
15) Mauritius
16) Niger
17) Nigeria
18) Rwanda
19) Senegal
20) Seychelles
21) South Africa
22) Sudan
23) Togo