

**HOW OPTIMAL IS GHANA'S SINGLE-DIGIT INFLATION
TARGETING? AN ASSESSMENT OF MONETARY POLICY
EFFECTIVENESS IN GHANA**

BY

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DECLARATION

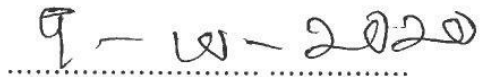
I declare that this thesis is the result of my research work carried out at the Department of Economics, University of Ghana, Legon under the supervision of Professor Eric Osei-Assibey and Dr. Richard K. Ayisi.

All references cited in this work have been duly acknowledged.



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ABSTRACT

High and rising inflation is not good news with a resultant general dislike for it. Indeed, Inflation has very significant effects on the economy and the welfare of the population. It is generally accepted that when inflation is too high it has detrimental effects such as wiping away savings and even redistributing incomes among others. However, when it is too low too it could discourage the investments required to propel economic growth and increase welfare. Monetary policy has been the main tool used to fight inflation and policymakers have over the years sought to find that ideal inflation rate which could balance tradeoffs that exist between inflation and other critical macroeconomic variables to promote welfare.

Likewise, the Bank of Ghana has declared that a Single-Digit Inflation target over the medium term is ideal for the economy of Ghana. For that matter, this study employed data such as Per Capita GDP, Gross Capital Formation, Broad Money, and Inflation spanning the period 1965 to 2019 to estimate optimal inflation for Ghana and assess whether the single-digit inflation target by the Bank of Ghana, which is its monetary policy objective is indeed optimal.

This study employs two different econometric methods i.e. Autoregressive Distributed Lag (ARDL) and Threshold Regression Models both of which were corroborative in the results. The study estimated a range of 5 – 7 percent inflation as the optimal inflation for Ghana, thereby confirming the Single-Digit Inflation targeting by the Bank of Ghana as optimal. Based on this finding, the study goes on to urge the central bank to continue pursuing its single-digit inflation targeting. Again, the Central Bank should commit to increased transparency in terms of its policymaking to bring stakeholders on board to help it achieve the goal.

DEDICATION

This work is dedicated to my wife Salomey and children Dede and Othniel who had to bear with my periodic absence, when doing this work.

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LIST OF ABBREVIATIONS

1.	ADF	Augmented Dickey-Fuller
2.	ARDL	Autoregressive Distributed Lag
3.	COICOP	Classification of Individual Consumption by Purpose
4.	CPI	Consumer Price Index
5.	CUSUM	Cumulative Sum of Squares
6.	DGP	Data Generation Process
7.	DSGE	Dynamic Stochastic General Equilibrium
8.	ERP	Economic Recovery Program
9.	GCF	Gross Capital Formation
10.	GDP	Gross Domestic Product
11.	GSS	Ghana Statistical Service
12.	HQIC	Hannan-Quinn Information Criterion
13.	IRF	Impulse Response Functions
14.	IT	Inflation Targeting
15.	KPSS	Kwiatkowski-Phillips-Schmidt-Shin
16.	LM	Lagrange Multiplier
17.	MPC	Monetary Policy Committee
18.	MPR	Monetary Policy Rate
19.	OLS	Ordinary Least Squares
20.	PCI	Per Capita Income
21.	SBIC	Schwarz-Bayesian Information Criterion

- | | | |
|-----|-----|------------------------------|
| 22. | TAR | Threshold Auto-regression |
| 23. | VAR | Vector Auto-regression |
| 24. | WDI | World Development Indicators |
| 25. | ZLB | Zero Lower Bound |

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

High and rising Inflation is not good news. When people buy or sell, they come face to face with changing prices, sometimes very rapidly and other times no so rapid. So long as changing prices are very obvious, people would tend to think about it and even feel it in some way. For that matter, one can argue that inflation should be of great personal interest to many. To corroborate this assertion, Shiller (1997, p. 16) has opined that there is a general dislike for inflation, such that when some of its effects are considered, inflation becomes a national problem. High and rising inflation may be a problem because of the many adverse effects on individuals and the economy as a whole. Rising inflation not only causes further price increases but could lead to income redistribution and reduce international competitiveness of locally manufactured goods and services, and distort the tax system(Cooley & Hansen, 1989).

The inflation experience of many countries has been anything but turbulent especially in the recent past(Andrés & Hernando, 1999). Consequently, achieving low and stable inflation is an economic and socially desirable goal of monetary policy for many Central Banks. This is so because Economists and even Politicians believe that the costs of inflation cannot be overlooked. So, for sustainable economic growth to be realized inflation should be kept under control.

This notwithstanding, there is often a tradeoff between sustained economic growth and lower unemployment in the pursuit of low and stable inflation at least in the short run. This implies that Central Banks can expand economic growth and employment levels with high and rising inflation

as the effect thereof- as depicted by the Phillips curve concept. However, it is known that even though the tradeoffs between unemployment and economic growth may be weaker in the long run, in the short to medium term it is stronger (Schubert & Turnovsky, 2018).

Yet, there is this great consensus among monetary policymakers i.e. central banks - the world over - that stability in the general price level should be the main goal of monetary policy (Mishkin, (1999). This is corroborated by Hernández and Muñoz (2017) who assert that price stability has become a much-coveted policy objective that central banks pursue. Many of these monetary authorities do so by indicating an explicit or implicit inflation target and use instruments available to them to pursue it. This practice of directly seeking to achieve a certain inflation target has become known as Inflation Targeting.

According to Ball and Sheridan (2004), economists have searched for an ideal monetary policy strategy for a while but it was during the early 1990s that Inflation Targeting was considered to be the one. In the literature, Inflation Targeting is described as a monetary policy strategy where a monetary authority sets an 'acceptable' inflation rate as the target for price stability objective. The authority is expected to publicise this inflation rate as the official rate through which it affirms the desire to pursue a low and stable inflation monetary policy. The policy framework helps to promote transparency by making the target known to all agents in the economy.

By employing such a framework, the policymaker would be said to be following rules instead of discretions. To that extent, Kydland and Prescott (1977) have indicated that discretions in policymaking generates greater amounts of inefficiencies. In support of this, Clarida, Gali, and

Gertler (1999) point out that commitment to policy rules, as in a forward-looking manner enables policymaker to shape the behavior and conduct of agents in the economy. For this reason, Inflation Targeting should enable policymakers to commit to rules leading to more efficient outcomes for the economy.

With the high inflation rates of the recent past and inflation rates now generally trending low especially in advanced economies, the matter of concern now should be the appropriate level of inflation to target. At some point in time, the United States Congress was said to have contemplated mandating the Federal Reserve to pursue a zero-inflation target (Aiyagari, 1990). Could this point to a zero inflation rate as the ideal target? But Aiyagari (1990) has argued that when other options are considered, a zero-inflation policy is not an efficient choice. Additionally, most economists agree that an inflation rate of zero or lower is not good because of the detrimental effects of falling prices.

Within the Inflation Targeting framework, the inflation rate targeted anchors expectations of economic agents concerning their decision-making processes. The specific target set is very critical as it has consequences for the larger economy's outlook and society's general welfare. An inflation target provides a path for the price level to follow which agents in the economy work towards. Such a transparent move would likely make agents behold lower inflationary expectations over a period of time.

Still, inflation target misses may be commonplace among Inflation Targeting countries. According to Albagli and Schmidt-Hebbel (2003), if institutions are weak, the central bank is not independent,

and risk premiums are high then inflation targets would be missed very often. Indeed, inflation target misses could breed a general lack of credibility for policies with undesirable consequences for the economy as a whole. Announcing and publicising inflation targets provides the public with some information and also affects their expectations (Walsh, 1999). If the public's expectation of the path of the general price level is affected by targets set by policymakers, then continuously missing inflation target could engender a loss of policy credibility. It, therefore, behooves the policymaker to strive to achieve its targets.

However, can one argue that there should exist an optimal inflation rate to be targeted by the monetary policy authority? This optimal inflation rate could then be described as ideal inflation rate, relative to some desirable economic outcome that could be realized or expected.

In the literature, there is some attempt to define what an optimal inflation rate is. Some have argued that the optimal inflation rate is negative when considering optimal nominal interest rate to be zero (Friedman, 1977). Nonetheless, in the real world no economy would target a negative inflation, so this becomes a second-best condition. Other views consider optimal inflation rate to be an inflation rate that generates optimum economic growth (Khan & Sanhadji, 2001) or any relevant macroeconomic variable like per capita income, employment, and seigniorage revenue (Quartey, 2010). Yet others see the optimal inflation rate in terms of the rate that minimizes society's losses and gives maximum welfare (Billi & Kahn, 2008).

The optimal level of inflation to target for an economy has engaged the attention of many academics and policymakers in both developed and developing economies alike. From the onset,

it must be reiterated that the goal of policymakers is to keep inflation low and not really to get to a zero-inflation rate. Now with many of the advanced economies pursuing inflation targets of around 2 percent (Krugman, 2014), to what extent would an inflation rate of 2 percent for instance be optimal for a developing country like Ghana. Since developing countries in general tend to have high production costs and an urgent need to expand output to accelerate economic growth, would such an inflation rate be consistent with their economic structure and growth aspirations? The search for that optimal inflation rate becomes very crucial and Ball (2014, p. 1) has described this quest as a “classic question in monetary economics”

In May of the year 2007 Ghana began implementation of Inflation Targeting as the official Monetary Policy framework. The adoption of this framework has been described as good and appears to have brought some stability in the overall macroeconomic environment. As the body mandated to conduct Monetary Policy in Ghana, the Bank of Ghana aims at ensuring price stability and also to support the government’s goals for a stable economy. Therefore the Bank has set a Single-Digit Inflation target of 8% as the optimal inflation rate for Ghana. This study will among other things assess the optimality of this Single-Digit inflation objective.

1.2 Statement of the Problem

According to Grier and Grier (2006) inflation has very significant effects on the economy as a whole. Milton Friedman has said that “Inflation is always and everywhere a monetary phenomenon”, which is put differently as inflation being “too much money chasing too few goods”. This implies that a reduction in the quantity of money may be necessary to tame inflation. Lucas (2001) has also said that holding of money generate utility to the bearer which could be lost

due to inflation. Again, while some economists believe that inflation in itself is very bad and should be eliminated, others have indicated its outright elimination may not necessarily be prudent (Dowd, 1994). This assertion is affirmed by Ball (1994) who says that there is a loss of output for any reduction in inflation. Also, Dotsey and Sarte (2000)¹ asserts that highly variable inflation could have a positive impact on growth. They further argue that agents who strongly dislike risk will increase their savings at times that inflation is high creating an extra amount of liquidity for investment and growth may ensue. So in effect, judging from these statements some amount of inflation is required to “grease the wheels of the economy”. There is however no consensus on how little or how large inflation should be to obtain these benefits. Hence the justification for an empirical study to be undertaken in that direction.

In a bid to finding the appropriate level of inflation, many countries have sought to set an explicit inflation target that could be said to be ideal, of which Ghana is included. Indeed, Ghana’s medium-term inflation target is single-digit annual inflation of 8% with a 2% band that is to say from 6 – 10%. Ghana has recorded single-digit inflation rates of 8.72 percent and 7.12 percent in 2011 and 2012 respectively, even though actual inflation has varied between 10 to 20 percent since the year 2007 when the Inflation Targeting Policy was officially adopted. Again, considering the implementation for IT and per the sampled data for this study, the average annual inflation declined from 16.03% in 2002 -2006 to 13.38% in 2007 – 2014. Moreover, Bleaney, Morozumi, and Mumuni (2019) also indicate that observed inflation exceeded the target by about 4 percentage points averagely between 2007–2017.

¹ Using a cash-in-advance modeling to reveal that higher inflation promoted growth by way of the expanded savings.

It is based on these that some economist have asserted that Ghana's performance under this 'Single-Digit' inflation targeting regime has not been very successful. Frimpong and Oteng-Abayie (2010) also say there has been some level of 'consistency' with which the inflation target is missed. More also Ahortor, Aadenekan, and Ohemeng (2011) have lamented that the implementation of the West African Monetary Union has been hampered because of the inability of the member nations including Ghana to achieve a lower digit inflation target, a key requirement for monetary union. All these points to a fundamental problem with achieving the said inflation target.

In view of this, it would be prudent to undertake a study with a view to assessing whether the inflation targets of the Bank are appropriate or not. A very good way to undertake this assessment would be to consider the effect that inflation has on economic growth one of the most important macroeconomic indicators of progress for an economy and find the level of inflation that would enhance growth. In so doing, one would be able to clearly establish whether the inflation target by the policymaker is optimal or not so as to make claims on the overall monetary policy performance of the policymaker.

Indeed, there is a body of existing research work that show the relationship between economic growth and inflation is not linear. To the extent that growth is hindered at high levels of inflation but unaffected or even positive when inflation is lower (Barro, 1995; Bruno & Easterly, 1998; Frimpong & Oteng-Abayie, 2010). Some of these studies sought to find the inflation rate that promotes growth. Unfortunately however, studies with very in-depth evaluations of an optimal

inflation do not abound. Again, many of these studies employed a single methodology, which does not reveal a highly robust conclusion.

This present study therefore seeks to employ a variety of methods and tools to first establish the optimality of the single-digit inflation targeting and subsequently assess the effectiveness or otherwise of monetary policy in Ghana.

1.3 Objectives Of the study

Broadly, the study will estimate an optimal inflation rate for Ghana. Based on the estimated rate, the study will then investigate whether the inability of the central bank achieving its single-digit inflation target is due to an infeasible target rate or not.

Specifically, the study will;

1. Estimate an optimal inflation rate for Ghana.
2. Investigate the factors that account for the differences between observed and target inflation.
3. Assess whether differences between observed and target inflation could be attributed to monetary policy ineffectiveness.

1.4 Research questions

The following questions are expected to guide the study;

1. What is the optimal inflation rate for the Ghanaian economy?
2. What factors account for inflation target misses?
3. How effective is monetary policy practice in Ghana?

1.5 Justification of the study

Ghana's inflation trend is a puzzle and a source of debate among economists and policymakers.

According to Kwakye (2010), for the larger part of Ghana's history inflation has been very high.

However, it can be argued that since Ghana adopted the Inflation Targeting monetary policy framework in 2007, there has been some stability in inflation.

This notwithstanding, some economists have called on the Bank of Ghana (BOG) to relook its whole monetary policy practice and inflation targets. Some have referred to the lack of a greater impact of the Bank's policy rate on commercial bank lending rates to buttress, the claim that its policies are ineffective.

As previously indicated, Ghana's inflation target is 8% with a 2% band. This implies that the Central Bank of Ghana fundamentally aims at Single-Digit inflation and thereby undertakes to achieve that. Jahan (2012) opines that there is often a conflict between inflation and other macroeconomic objects such as interest rates, so whatever the monetary authority does with interest rates gives a clue as to what it wants to do with inflation hence more transparency under an Inflation Targeting regime. Indeed, transparency must go hand-in-hand with policy credibility. The credibility of policy is very important because it creates a solid foundation for policy actions to achieve its goals 'all other things being equal'. Crowe and Meade (2007) opine that Monetary Policymaking generally suffers from dynamic inconsistency especially with inflation expectations. This emanates from the fact that Political authority often promises to lower inflation in the future, but is unable to do so because lowering inflation may affect employment levels especially in short run, in view of the short-term nature of the political business cycle. This inherently creates a challenge for policymaking about how the public views policy and their response to it.

Admittedly, since the operationalization of Inflation Targeting in Ghana, achieving single-digit inflation has been difficult. The question that arises is whether the single-digit is optimal and achievable? Answering this question would require that we conduct empirical research to establish the optimality or otherwise of this single-digit inflation target.

In order to carry out this exercise, reference is made to the literature. The extant literature shows several research works aimed at determining optimal inflation in both developed and developing country settings, respectively, which gives some credence to the relevance of this current study. Several studies on Ghana have sought to determine a threshold inflation rate by examining how inflation impacts economic growth, such that the threshold inflation could also be deemed as optimal which generates optimum growth and welfare in general.

Frimpong, Oteng-Abayie (2010) uses the threshold regression model to estimate a threshold inflation for Ghana. Their data spanned the period from 1960 to 2008. They found a threshold inflation rate of 11% which meant that if inflation increased beyond this level, growth was expected to fall.

Ayisi, Minlah, Adu, and Sam (2013) find a 21 percent inflation threshold which is closely related to that of Quartey (2010) who estimated the inflation threshold of twenty-two (22) percent. Furthermore, Marbuah (2010) observed an inflation threshold of ten(10) percent above which inflation was detrimental to economic growth in Ghana. From the foregoing, one thing is quite clear in that the evidence of a generally observed inflation threshold rate as related to GDP growth

is lacking. From the foregoing it seems there is no agreement on the appropriate level of inflation that enhances growth.

But then in order for this present study to depart, to some extent, from the previous works which employed a single methodology, this study would employ multiple methods. Therefore, this study builds on these previous works but expands on it by employing a multiplicity of methods to estimate that ideal inflation for Ghana.

For the sake of emphasis, it can be seen that studies that have sought to find an “optimal” inflation rate for developing economies have looked more at inflation’s relationship with GDP growth by exploring some dimensions involved in this relationship. Thus these studies have come to establish there is some level of inflation at which the growth of the economy is progressive while at higher inflation rates, growth is hampered.

By way of policy rationalisation for this study, firstly findings of this study should show the difference between the inflation target used for policy purposes in Ghana and the inflation rate estimated. So that in view of the Single-Digit inflation targeting of the Central Bank and in its bid to promote sustainable economic growth this research should shed some light on the appropriateness of monetary and fiscal policies being applied, as to whether indeed they can create opportunities for higher economic growth without destabilizing the economy.

Furthermore, with the objective of monetary policy being the achievement and maintenance of price stability, the monetary authorities should then be minded that there are trade-offs inherent in

the most macroeconomic indicators so as to be well-informed in choosing inflation targets balances these trade-offs.

Again, should the inflation rate estimated in this study be it higher or lower than the official target; would provide an empirical basis for making further analysis and recommendations. Such that if this study suggests that the inflation target for policy purposes in Ghana is higher than the official target then a more relaxed monetary policy should be pursued, while a tighter stance should be pursued if otherwise.

1.6 Scope of the study

The study seeks to determine the optimal inflation rate for the economy of Ghana. To examine the phenomenon, a growth model with inflation is estimated using a couple of econometric methodologies. This enables the study to delve into optimal inflation rate for the Ghanaian economy and to further account for the factors that have led to inflation target misses. The study then examined the effectiveness of monetary policy practice in Ghana. Suggestions as to how to give a basis for the inflation target of the bank of Ghana are then given.

1.7 Organization of chapters

The research is organized into five main chapters. Chapter one deals with an introduction including background to the study, objectives of the study and research questions. Furthermore, statement of the problem and a justification for the study are provided therein.

Chapter two has a review of literature related to the study. Under the literature review, literature related to the study has been reviewed under themes developed from the objectives of the study as well as the research questions. This was done after the theoretical and empirical foundations had been established.

Chapter three gave an overview of monetary policy and other key concepts mainly within the Ghanaian context. A review of themes such as inflation, Inflation Targeting, inflation target misses and Monetary Policy Practice in Ghana was done.

Chapter four is divided into two parts. The first part discussed the methodology of the study; the sources and type of data that will be used, the years that will be covered and the models that will be used in estimation. The second part dealt with estimation of data and analysis of results. Here the model is estimated and the optimal inflation rate is determined.

Chapter five is also divided into two parts. The first part contained the conclusion and summary of the work. The second part dealt with policy recommendations and the best way forward. Conclusions are drawn and recommendations made based on the results from the analysis.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter is composed of two main parts. The first reviews theoretical literature on optimal inflation, inflation targeting framework and looks into how economic growth and inflation may be interconnected. The second part analyses empirical literature on the relationship between inflation and economic growth and concludes with literature about how optimal inflation has been estimated generally.

2.2 Inflation and the search for the best level of inflation

Unstable and high Inflation is of one the many challenges that any economy faces. It permeates many aspects of the lives of a people, thus making it quite unpopular (Shiller, 1997). So how inflation affects economic performance is very important indeed, notwithstanding complexities therein. According to Braumann (2000), inflation creates contractions in critical macroeconomic variables like GDP, investment and employment, as well as affecting the optimal allocation of resources, retarding growth, weakening the external competitiveness of the economy and lowering internal savings.

However, some economist have argued that inflation may not always be detrimental. For instance Tobin (1972) has observed that inflation lubricates the economy such that in situations where firms for instance, are unable to reduce wages in higher inflation environments, real wages can make necessary modifications in minimising adverse shocks on firms. Williams (2009) has also

indicated that slightly higher than average inflation may be necessary to stimulate growth when monetary policy is restrained by the “Zero Lower Bound” on interest rate.

From the foregoing arguments, the point being canvassed is that some amount of inflation may be necessary, enough to “grease the wheels” of the economy so that the general public can be confident to spend, without depleting the value of money and creating a vagueness about how incomes will be in the near future. In other words, low and stable inflation can make planning by businesses and consumers alike much easier thereby giving them certainty going into the future. Again lower and more stable inflation environment may go a long way to help achieve other goals of economic policy.

Monetary policy authorities often pursue a variety of goals. The Federal Reserve Bank of the United States for instance is mandated to facilitate adequate levels of employment, stabilize the general price level and cause interest rates which are moderate over the long term (Steelman, 2011). Horská (2004) has indicated that majority of economists now affirm monetary policy’s core function as maintenance of price stability associated with a low and stable inflation. This assertion is supported by Bernanke, Laubach, Mishkin, and Posen (2018), who observe that since the 1990s the mandate of price stability- that is low and less variable inflation has become one of the most important objects of monetary policy. It is believed that even advances in academic research has also created a strong theoretical and empirical foundation for the pursuance of price stability. It is in all these that Sarwat(2012) says Inflation Targeting has now come handy to aid the realization of this goal

Inflation targeting practitioners need to target a certain inflation rate which is deemed as relatively appropriate and for that matter Billi and Kahn (2008) have indicated that the matter that require investigation is what rate of inflation can be deemed as low and stable. The inflation rate to target is so critical since monetary authorities pursuing price stability have adopted specific numerical inflation rates or range as the objective of the monetary policy framework. The ability of the authority to set an appropriate target for inflation hinges on understanding how various inflation rates influence economic stability and general economic performance (Billi & Kahn, 2008).

So it is in the search for the 'best' level of inflation to target that the famous Alan Greenspan² opines that a zero inflation rate is what would foster achievement of other policy goals. He further affirms the fundamental role that monetary policy plays in ensuring that prices are stable (Rasche & Thornton, 2006). Conversely, Aiyagari (1990) observes that a zero inflation rate is not efficient. This is because if other policy goals are taken into account a zero rate of inflation policy is not good. When inflation is above zero it makes nominal interest rates higher on the average, ensuring that when there are shocks the economy can better accommodate.

Consequently, any inflation objective so specified as target is supposed to balance trade-offs that might exist among economic policy goals. To be able to identify such an inflation rate or range would require some empirical analysis, hence this study.

² Alan Greenspan is an economist and served as Chairman of the Federal Reserve Bank of the United States from 1987 to 2006.

2.3 Defining optimal inflation

How the optimal inflation is defined is very important. Indeed, there are some alternative theories that define optimal inflation. First, Friedman (1977) says optimal inflation rate should be negative so that steady-state real interest rate becomes positive to equalize the social and private cost of producing money – this has become known as the Friedman rule. Stated differently, it implies that when nominal interest rate is zero then optimal inflation should be lower than zero (negative), which is not a very common phenomenon in itself. Then there are the New Keynesian models which also indicate that optimal inflation is zero because it is this rate of inflation that can remove the costs of price adjustments (Coibion, Gorodnichenko, & Wieland, 2012)

Phelps (1973) analyzes optimal inflation from the perspective of optimal taxation. He opines that an above zero inflation rate would lead to a removal of any distortions in the tax system, thereby asserting that optimal inflation rate should be above zero i.e. positive. This stems from the rationale that governments would choose deficit financing and increase the cost of money (Acocella, Tirelli, & Di Bartolomeo, 2010).

In a nutshell, these definitions reflect the idea that an optimal inflation rate as the ideal inflation rate should generate optimum per capita GDP, optimal taxation, optimal economic growth (Bruno and Easterly (1998) thus an inflation rate that generates optimal values of critical macroeconomic indicators.

Indeed, Central Banks of advanced economies have generally pursued optimal inflation goals of around 2 percent annually whereas developing countries have targeted between 6 – 10 percent

annual inflation rates (Schmitt-Grohé & Uribe, 2010). Some economists argue that Central Banks should consider raising their medium to long term inflation targets (Ball 2014, Williams 2016). These calls are enabled by inflation target misses. For some of the Central Banks missing an inflation target comes with consequences on the bank. Bernanke and Mishkin (1997) have said that how much central bank managers are held accountable for monetary policy outcomes relating to inflation differs from country to country. In New Zealand for instance, the tenure of the Reserve Bank's Governor depends largely on the ability to realise inflation targets (Mishkin, 2001). A monetary authority that keeps missing inflation targets may suffer some damage to its reputation and prestige.

2.4 Inflation measurement

The composition of the general price level whose change over time determines the inflation rate is measured by the use of a price index. Generally, GDP deflator and Consumer Price Index (CPI) are the commonest price indexes used to measure inflation. However, Personal Consumption Expenditure (PCE) Index is also used in some jurisdictions, especially by the Federal Reserve Bank of the US (Langdana, 2009). It is important to note that whatever method is used to measure inflation would have its own merits and demerits and so policymakers should pay attention to which of the inflation measures is good for this jurisdiction. To that extent, the choice of an appropriate price index needs to be carefully considered so that the monetary authority can be able to grapple with two important issues of controllability and credibility (Schaechter, Ugolini, & Stone, 2004).

2.4.1 The GDP Deflator

The GDP deflator measures inflation by the price of the country's Gross Domestic Product (GDP) 'basket'. In actual computations of this measure all goods and services in GDP and the respective prices are used to compute the deflator. It could be argued that this measure cannot reflect the goods consumed by the 'ordinary person' since most of the goods included in GDP are not regularly consumed. It is in this direction that other measures like the CPI are employed to measure inflation, especially at the level of the consumer.

2.4.2 The Consumer Price Index (CPI)

According to Schaechter et al. (2004), the Consumer Price Index (CPI) seems popular and most up-to-date price index available. Many inflation-targeting countries often announce inflation targets that are based on the Consumer Price Index (CPI). The CPI considers only the rate of change in price of a relatively fixed bundle of goods ("market basket") over time. This market basket is designed to represent the goods and services consumed by a typical consumer. As such the CPI can measure how cost of living changes, and it is the final cost of consumer goods and services that should really matter. If inflation targets anchors the public's inflation expectations then the CPI can be very relevant as it can be directly incorporated into decisions and contracts.

In summary, estimating inflation from the varied measures may produce different rates in absolute terms, but are expected to move in the same direction over time. Moreover, irrespective of what source that inflation rate is calculated from, it is usually fairly similar in value. In theory, there is a significant difference between the abilities of each method to capture consumer's consumption choices when a change in price occurs, thus providing the basis for controversies. Using the

Consumer Price Index to estimate inflation should always be accompanied by the statistical deviations of the estimates. Statistically, these estimates give credence to validness or otherwise of estimates.

2.5 What Is Inflation Targeting?

The experience that many countries have had with inflation especially the very high kind has not been good. Then in the 1970s there was the use of monetary aggregates and exchange rates as intermediate targets of monetary policy which ushered the era of direct controls in monetary policy practice. In the early 1990s some countries broke away to consider the inflation rate itself as the object of monetary policy instead of using the intermediate targets. According to Debelle, Masson, Savastano, and Sharma (1998) this way of conducting monetary policy by concentrating on the inflation rate has become known as Inflation Targeting. Over this period of time many more Central Banks have come to adopt this framework as the official ‘charter’ for policymaking, with about 27 countries implementing it fully or partially as of 2012(Hammond, 2012)

Several definitions of inflation Targeting abound, but one that sticks out for me is by Green (1996). According to Green (1996) inflation targeting is a way of monetary policymaking where actions are based largely on expected inflation. He further indicates that the monetary authority has to announce the inflation target going into the medium to long term time horizon. In effect, the expected inflation turns to be the intermediate target of monetary policy.

2.5.1 Features of inflation targeting

According to Mishkin(2000), inflation targeting is a monetary policy strategy that encompasses five main elements:

- (i) the public announcement of medium term numerical targets for inflation;
- (ii) an institutional commitment to price stability as the primary goal of monetary policy, to which other goals are subordinated;
- (iii) an information inclusive strategy in which many variables, and not just monetary aggregates or the exchange rate, are used for deciding and setting of policy instruments;
- (iv) increased transparency of the monetary policy strategy through communication with the public and the markets about the plans, objectives, and decisions of the monetary authorities; and
- (v) increased accountability of the central bank for attaining its inflation objectives.(p. 105)

Notwithstanding, King (2005)has said that inflation targeting is underpinned by two fundamental factors, one being the determination of a specific inflation rate as target and the other being a mechanism to enable policymakers respond to short term shocks to the economy.

Albagli and Schmidt-Hebbel (2004) indicate that research has revealed Inflation Targeting has contributed immensely to much better monetary policy practice and stabilized inflation and inflation expectations.

2.5.2 Inflation Targeting Practice

It has been suggested that implementing Inflation as monetary policy framework is “technically difficult”, even though the principles that underlie it are well known (Svensson, 2000). According to Woodford (1999) monetary policy’s influence on inflation comes with a lag, hence to make inflation targeting successful there has to be an inflation forecast. The inflation forecast and inflation target are different. To that extent the Monetary Authority has to choose a mechanism usually, an interest rate mechanism which will enable it achieve the inflation forecast. The inflation forecast made within a period is a means to achieve the inflation target. The authority must approach the inflation target at an appropriate pace so that the economy is not overly disturbed.

The authority collects information on a regular basis so that it can review the plan and implement accordingly. Based on these descriptions, Svensson (2000, p.1) has described inflation targeting as “inflation-forecast targeting” which has become a means to resolve an inter-temporal economic issue.

2.5.3 How are inflation targets set?

The numerical value of Inflation targets as well as the entity that takes the decision to set the target varies. In some economies, central banks or the government alone sets while in others the central bank and the government jointly set. Horváth and Mateju(2011) have stated that the common practice in setting inflation targets is where government and central bank jointly set and these decisions are usually made by committees.

According to Hammond (2012) in places where Inflation Targeting as a monetary policy strategy, decisions on setting inflation targets among other things are done by voting or enhanced by a consensus whereby the majority of votes that goes for a certain decision are taken. Otherwise where the decisions of individual members of the monetary policy committee may have to be considered, that may be a recipe for confusion and inefficiency (Clinton et. al, 2015)

It is very obvious that authorities would take many factors into consideration when setting inflation targets. The overall welfare of the population would be paramount, while a stable general macroeconomic environment is being pursued.

2.5.4 Inflation Target Misses

In an economy where Inflation Targeting is practised, the announcement by monetary authorities of the numerical inflation target or target range for the expected inflation becomes an "intermediate target" for monetary policy (Green 1996). Consequently the public views the announced target as consistent with the ultimate policy objective of price stability, thereby anchoring their expectations as such.

Still, Inflation Target Misses may be common place among Inflation targeting countries, hence the existence of accountability clauses in the mandate of monetary policy authorities in some inflation targeting countries. According to Calderón and Schmidt-Hebbel (2003), there is some empirical evidence that institutional and macroeconomic credibility are major determinants of a country's ability to meet inflation targets, irrespective of whether it is a developed or developing country. This is supported by the emphasis that is put on policy credibility and good institutions in achieving low and stable inflation. Indeed, overall institutional quality, low country risk premiums, and

central bank independence help significantly and by sizeable magnitudes to bring inflation levels closer to targets.

Also, Crowe and Meade (2007) opine that Monetary Policymaking generally suffer from dynamic inconsistency especially with inflation expectations. Dynamic Inconsistency often emanates from the fact that political authority promises to achieve a certain inflation rate in the future, but is unable to do so. This inherently creates a challenge for policymaking as to how the public views policy and their response to it. Kydland and Prescott (1977) show that the inability of policymakers to commit themselves to such a low-inflation policy can lead to the overshooting of targets. The public's knowledge that policymakers have an incentive to inflate makes the expectation of a low inflation by the public impossible. The end result is that policymakers may seem to pursue a low inflation policy whereas the public do not believe it and so may promote other objectives giving rise to higher inflation and hence the issue of dynamic inconsistency.

Roger and Stone (2005) and Gosselin (2007) also identify exchange rate movements as key contributor to inflation target misses especially in developing countries. Many developing countries are highly import dependent as well as having a sizeable portion of their debts held in foreign entities. In the case of Ghana, Sanusi (2010) and Boamah (2013) have both affirmed the extent to which volatile exchange rate regimes affect inflation. According to Sanusi (2010) the pass-through effect of exchange rates on consumer prices is quite large, implying that the depreciation of the Ghanaian currency- which could be also be due to an external shock- determines the capacity of the policymakers to achieve inflation targets. Furthermore, although Boamah (2013) comes to a similar conclusion, He considers the pass-through effect of exchange

rates to consumer prices and thus inflation to be thorough, thereby creating difficulties for the monetary authorities to manage inflation. Moreover, many of these developing economies face frequent problems with capital flow making exchange rates unstable and consequently inflation. These would consequently lead to inflation targets being missed whenever exchange rate shocks materialize.

High incidence of fiscal dominance is a possible cause of inflation target misses. Mishkin (2000) observes the high incidence of fiscal dominance in many countries creates a problem for meeting inflation targets. Indeed, many developing countries are prone to this situation hence the relatively high inflation target misses observed.

The credibility of the monetary authority itself is a major factor that determines whether Inflation target can be achieved or not. Fraga, Goldfajn and Minella (2003) points out that if the level of credibility of the authority is low then actual inflation would often be far from the target inflation, hence the target misses. They further mention that inflation volatility is higher and hence target misses more common when credibility is imperfect. To corroborate these assertions, Nahon and Meurer (2009) reaffirms the need for a high level of credibility by an inflation targeting practitioner as the credibility in itself helps to guide actual inflation to target levels.

2.6 Monetary policy and its effectiveness

In the most basic sense, monetary policy relates to the things a Central Bank does to manage the availability of cash on the overnight money market and hence interest rates as it pursues economic objectives. Generally, Monetary Authorities are armed with things as; open market operations,

discount rate and legal reserve requirements as tools of monetary policy. Actions taken by central banks have to go through certain processes or channels in order that goals may be achieved. Monetary Policy goals often include; High Employment, Economic Growth, Price Stability, Interest Rate Stability, Financial Market Stability, Foreign Exchange Market Stability among others. Like firms which may have several objectives, if the firm is unable to make profits than all other goals may be rendered useless. So can it be said that if the actions of the monetary policy authority do not lead to achieve economic growth then it may not be worthwhile achieving any other goal of policy. Sustained economic growth should therefore be the foundation upon which all other goals must be rested.

Nevertheless, monetary policy practice may be faced with certain challenges that could render it ineffective. From the onset it should be emphasized that factors that determine the effectiveness of monetary policy may differ between developed and developing countries on the one hand and among developed countries on the other hand. .

In the macroeconomic theory, one critical matter that determines the effectiveness of monetary policy is the Liquidity Trap. Liquidity Trap occurs when the nominal interest rate is zero and monetary policy is powerless. Its impact and existence has been a subject of great debate among economists. It is considered as a powerful constraint on monetary policy, and that the possibility of an economy being trapped in a situation of low aggregate demand, makes monetary policy powerless and inefficient.

Closely related to the issue of liquidity trap is the impact of the constraint that nominal interest rate cannot fall below the zero mark- a phenomenon known as the Zero Lower Bound(ZLB) on the nominal interest rate) has on monetary policy. To that extent it has been suggested that monetary policy becomes ineffective and so policymakers should resort to using fiscal policy in such situations. With a nominal interest rate of zero, at the margin agents do not value the liquidity services provided by money thus when the central bank expands the money stock by purchasing bonds, individuals can just hold the additional money in place of the bonds. As in modern economies, where Central Banks generally have reasonably clear explicit or implicit long-run inflation targets, agents may reasonably believe that the central bank will largely undo the increase in the money stock as soon as it starts to have an important effect on aggregate demand. As a result, expected inflation may not rise, and the open-market purchase may have little effect, hence monetary policy may become quite ineffective. With the enormous economic downturn and the binding of the zero lower- bound constraint on nominal interest rates for many Central Banks, however, there has been renewed interest in the use of fiscal tools for short run stabilization. This call to shift from monetary policy to fiscal policy clearly goes against potency of monetary policy.

The effectiveness of monetary policy also hinges on the ability of the policymaker to commit to maintaining a low inflation. Kydland and Prescott (1977) have shown that the inability of policymakers to commit themselves to a low-inflation policy can give rise to excessive inflation. Kydland and Prescott's basic observation is that if expected inflation is low, so that the marginal cost of additional inflation is low, policymakers will pursue expansionary policies to push output temporarily above its normal level. But the public's knowledge that policymakers have this

incentive means that they will not in fact expect low inflation with the consequence being that inflation targets are overshoot making monetary policy seem ineffective .

Discussing monetary policy and its effectiveness lays a lot of emphasis on independence of Central Banks. According to Alesina (1988), Central Bank independence provides a measure of the delegation of policymaking to conservative policymakers. Intuitively, the greater the independence of the central bank, the greater the government's ability to delegate policy to individuals who can be more focused on policy for its own sake and not be subject to the political business. Cukierman, Web, and Neyapti (1992) indicate that several investigations of the relation between measures of independence and inflation find that among industrialized countries, independence and inflation are strongly negatively related. So as Mishkin (2008) puts it, as institutional independence is weak in emerging-market economies, effectiveness of monetary policy would largely be constrained.

Considering effectiveness of monetary policy in general, and inflation targeting as a Monetary Policy framework in particular, one needs to consider two issues of price level targeting as against Inflation Targeting (Hatcher, 2014). Thus with Inflation Targeting when shocks which were not anticipated affects the price level they are often not corrected because of the focus on the inflation rate which is not so under price level targeting. As such forecasts of the price level at long horizons might have a large variance under inflation targeting, which presumably impedes private-sector planning. On the other hand, strict price-level targeting requires that overshoots or undershoots of the target be fully made up, which reduces the variance of long-run forecasts of prices but could impart significantly more volatility into monetary policy in the short run, making it ineffective. This all important dichotomy may be a conversation for another day.

2.7 Review of Empirical Works

The review of empirical works would mainly focus on how optimal inflation is estimated in the literature.

2.7.1 Estimating optimal inflation

In the literature there is some distinction between the approaches used to estimate optimal inflation in developing or emerging-market economy and advanced economy settings respectively. Studies on optimal inflation in advanced economies mostly analyse optimal inflation in quantitative set-ups that particularly account for the Zero Lower Bound (ZLB) on interest rates within the Dynamic Stochastic General equilibrium framework (DSGE). This modelling framework comprises a typical consumer, a selection of monopolistic producers of intermediary goods, a fiscal authority, and a monetary authority. These representative agents are 'made' to optimize their objective function, which produces among others an optimal price level within the system.

Billi and Kahn (2008) estimated an optimal inflation with data on the United States of America. Their estimate was based on the Personal Consumption Expenditure price index and found optimal inflation rate for the US economy to range from 0.7 to 1.4 percent per year, far lower than the implicit optimal target of 2% by the Fed.

Billi (2011) again undertook to estimate an optimal long-run inflation rate from the United States economy using New Keynesian modelling, where the only policy instrument is a short-term nominal interest rate that may occasionally run against a zero lower bound (ZLB). The model allowed for worst-case scenarios of misspecification. He finds that, if the government commits to an interest rate rule, the optimal inflation rate would be lower than 1 percent annually, but could

rise to about 17 percent if the monetary authority were not to commit, thereby reaffirming the importance of commitment to rules as a panacea for achieving inflation targets.

Again, Fuchi, Oda, and Ugai (2008) sought to find an optimal rate of inflation for Japan. Their study employed Dynamic Stochastic General Equilibrium model (DSGE) to evaluate the effects of inflation on social welfare. They employed annual time series data for the sample period of 1981 to 2004 with real GDP, the GDP deflator, compensation of employees per person, per-employee real GDP, overnight call rate as variables. Estimating a social loss function and with some stochastic simulations in which they take into account the zero lower bound on nominal interest rates, they found that the optimal inflation rate for Japan was between 0.5% and 2.0% .

Reviewing empirical works employing Dynamic Stochastic General Equilibrium (DSGE) one observes that those studies do not deliberately intend to find an optimal inflation rate per say, rather what they seek to find is an aggregate price level which could maximize welfare. Consequently such a price level is thus construed as an optimal inflation for the economy.

But most studies on optimal inflation for developing or emerging-market economies focus more on the associations between inflation and economic growth or per capita GDP. These studies explore nonlinearities in the relationship between inflation and economic growth or per capita GDP growth and come to the conclusion that at certain point where inflation is low it has a positive impact on growth whereas when inflation is high it affects growth negatively, giving credence to the observation that such a relation may not be linear. If the relationship between inflation and

growth is not linear, there should be a way to find it, be at a point or the range over which the switch occurs.

2.7.2 Relationship between inflation and growth

The argument about the exact relation and direction of causality between inflation and growth is very open. It is because of this that there are still questions asked about whether such a relation exists and if so what is the nature of that relationship. Opinions vary and differ on the nature of the relation and this section of the paper throws more light on the matter

For instance, structuralist economics affirm the beneficial impact of inflation on growth whereas monetarist view inflation as bad for growth (Mallik & Chowdhury 2001). With the introduction of money into the Slow-Swan growth model it was seen that inflation makes holding money more expensive, money holders would tend to substitute cash for capital, and more capital leads to more growth thereby supporting the positive impact of inflation on economic growth (Azariadis & Smith, 1996). On the contrary, endogenous growth theory indicates that economic growth is more reliant on returns to capital and since inflation leads to a reduction in the returns, investment in capital would be reduced remarkably with a reduction in growth as the consequence (Nelson 1976). Furthermore, De Gregorio (1993) affirms that inflation does have an impact on accumulation of physical capital and since cash reduces transactions costs for both consumers and firms, a higher inflation will lead to a reduction in money demand and increase transaction costs. This will consequently lead to a reduction in the accumulation of capital i.e. investment and growth.

The above assertions notwithstanding, the impact of inflation on growth is not always positive especially when inflation is high. According to Barro (1991), Fischer (1993) when inflation is too high it does not engender growth.

2.7.3 Threshold Inflation

The empirical literature has given some evidence of a relation between growth and inflation. That is to say a turning point inflation rate which establishes that any rate above is detrimental to growth while a rate below enhances or is growth neutral. Such an inflation could come as a range or a point, whatever be the case, there is a turning point at both ends. It is this inflation that is called a threshold inflation rate.

According to Fischer (1993) a threshold inflation rate exist whereby at lower rates growth could be positive while growth was not enhanced when inflation was higher. By applying break-points of 15 and 40 per cent respectively in spline regression, Fisher (1993) was able to show that when inflation was in the double-digits particularly above 40 percent, the relation between inflation and GDP growth was weaker than when inflation is lower.

Again, Barro (1995) used international cross-sectional data covering the period 1960 to 1990 and observed most of the Latin-American countries which where sampled and had very high rates of inflation also had very low growth. The data comprised real per capita GDP as dependent variable with inflation computed from consumer price index, government spending, and fertility ratio, black market premium of exchange rate, investment ration, terms of trade and human capital index . The data is further broken down into 3 decades of 1960-70, 1970-80, and 1980-90. The study employed

Ordinary Least Squares. The study found that increase in inflation by 10 percentage points leads a reduction in growth by about 0.2 – 0.3 percentage points.

Similarly, Bruno and Easterly(1998) in analyzing the relationship between economic growth and inflation used annual data of consumer price index (CPI) inflation for countries with episodes of high inflation between 1961 to 1994. Employing a non-parametric approach in their analysis, they found inflation rate of 40 per cent as threshold.

Also, Sarel (1996) analysed data for eighty-seven countries for the period 1970-90 in a panel study. On the relationship between inflation and growth, He found that there was structural break when inflation is 8 percent, which implies inflation higher was detrimental to growth.

Khan and Senhadji (2001) selected one hundred and forty (140) countries to identify the existence of a threshold inflation. These countries were both industrial and developing respectively. In their paper, Khan and Senhadji (2001) varied the Hansen (1996; 2000) econometric method for threshold estimation and inference, and estimated a threshold inflation of 1 -3 percent for developed countries and 11-12 percent for developing countries.

Furthermore, in analyzing the relationship between inflation and economic growth for Malaysia from 1970- 2005, Munir and Mansur (2009) found an inflation rate of 3.89% as the threshold inflation for the country. They opine that if inflation was above 3.89% growth was hampered. Their evidence strongly supports the view that the relationship between inflation and economic growth could be nonlinear.

Then for Taiwan and Japan, Lee and Wong (2005) used data spanning 1965 to 2002 for Taiwan and 1970 to 2001 for Japan and estimated a point threshold inflation of 7.25 per cent for Taiwan and a range threshold of 2.52 - 9.66 percent for Japan.

Fabayo and Ajilore (2006) applies the method of Khan and Senhadji (2001) to also examine the existence of threshold effects in the inflation-growth nexus in Nigeria using data from 1970-2003. They find the existence of an inflation threshold at 6%. They opine that below this 6 percent inflation rate for Nigeria growth could be improved, while above this threshold level, inflation hurts economic growth.

Adusei (2012) investigates whether or not a threshold inflation existed in the relationship between inflation and economic growth in South Africa using annual dataset from 1965 to 2010. The study employs nonlinear regression models and finds evidence that of a 7% threshold inflation above which the effect of inflation on economic growth is negative and statistically significant.

Now focusing on Ghana, there are a number of significant studies worth mentioning. Frimpong and Oteng-Abayie (2010) analyze the threshold effect of inflation on economic growth in Ghana for the period 1960-2008 using a threshold regression model. The data set employed include growth rate of GDP, growth rate of aggregate labour force, growth rate of money supply and growth rate of terms of trade. Their result reveal an inflation threshold level of 11% at which inflation starts to significantly hurt economic growth in Ghana. Below the 11% level, inflation is likely to have a mild effect on economic performance, they assert.

Quartey (2010) also found that an inflation rate of 22.2% is optimal for Ghana as it leads to maximizing both revenue and economic growth. On the contrary, Marbuah (2010) found a lower threshold inflation range at 6 - 10 percent. He opines that inflation rate above this range is not optimal for growth.

Ayisi, Minlah, Adu, and Sam (2013) also sought to estimate inflation threshold for Ghana using data spanning the period 1965 to 2011. The methodology employed was Ordinary Least Squares (OLS). They found a threshold inflation rate of 21% indicating that growth was a good up to the threshold and negative beyond.

Clearly, two salient issues can be observed from the review of these works on Ghana. It is seen that most of them have employed a single methodology in estimation, and secondly the results from each is quite different from the other. There seem not be a consistency of results. It is in this wise this present study employs two different methods in its estimation as well as use a more recent data to do a rigorous empirical study of the matter of establishing an optimal inflation for Ghana.

2.8 Conclusion

Ultimately, monetary policy should aim at promoting welfare. In spite of the shortcomings associated with using real GDP growth as a measure of welfare, it is still relevant. It is being able to consider welfare effects of inflation that one can talk about finding an optimal inflation rate, hence the use of Per Capita Income as the dependent variable in this study. To emphasize, it is by finding an inflation rate that gives the optimum real Per Capita GDP growth that one can conclude that such an inflation rate is optimal and welfare enhancing.

CHAPTER THREE

OVERVIEW OF MONETARY POLICY PRACTICE AND INFLATION IN GHANA

3.0 Introduction

Chapter three gives an overview of the key concepts mainly within the Ghanaian context. A review of themes such as inflation and its measurement, Inflation performance, inflation Targeting, inflation target misses and monetary policy practice in Ghana was done. It further looked into the relationship between economic growth and inflation, all within the Ghanaian context.

3.1 Inflation Measurement in Ghana

The government agency responsible for measuring and publishing inflation data in Ghana is the Ghana Statistical Service (GSS). The GSS estimates inflation using the Consumer Price Index (CPI) which measures the rate of consumer goods price changes.

The Ghana Statistical Service conducts a household expenditure survey as part of a broader survey to determine the items that will go into the basket of goods and services for the CPI to be compiled. Accordingly, commodities regularly consumed are chosen to form a basket of goods and services. The basket of goods is reviewed from time to time, and the latest review occurred in the year 2012 after the review in the year 2002. Whenever a new CPI is designed goods and services which are found to be out of use are taken out of the basket, and new goods and services that emerged in the in the survey are included. The construction of the 2012 CPI led to an increase in the size of the

basket from 242 to 267 items. This change of the CPI basket with 2012 as reference became the fifth change since 1963.

These 267 items are grouped and weighted following the Classification of Individual Consumption by Purpose (COICOP) aggregation structure which is a system of classifying goods and services published by the United Nations Statistics Division (United Nations, 2018). Following COICOP the Ghana statistical service classifies these 267 items under a hierarchical structure of 12 main groups based on the consumption expenditure patterns of households. The prices of these items in 2012 becomes the reference such that any changes over a period of time say monthly, quarterly and annually is computed as the inflation rate thereof.

Table 1: CPI classification of households' consumption expenditures and the Weights

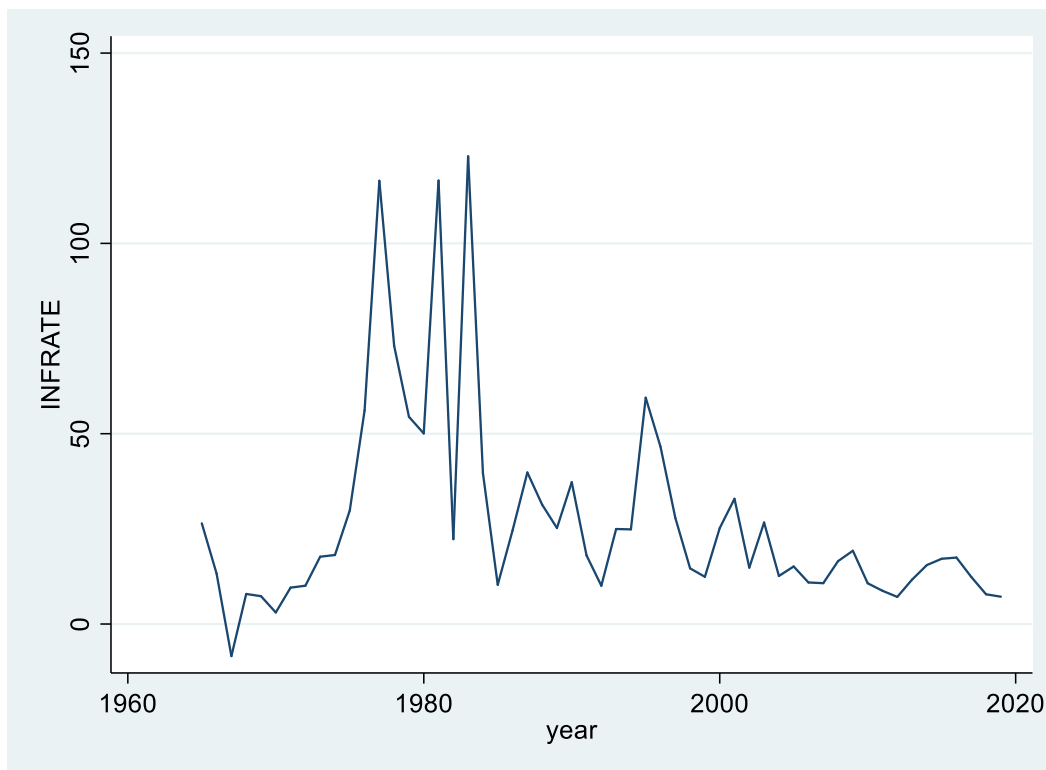
Item	Description	Weight
1	Food And Non-Alcoholic Beverages	43.9
2	Alcoholic Beverages, Tobacco And Narcotics	1.71
3	Clothing And Footwear	8.96
4	Housing, Water, Electricity, Gas And Other Fuels	8.63
5	Furnishings, Household Equipment And Routine Maintenance	4.66
6	Health	2.42
7	Transport	7.32
8	Communications	2.68
9	Recreation And Culture	2.64
10	Education	3.87
11	Hotels, Cafes And Restaurants	6.07
12	Miscellaneous Goods And Services	7.14

Source: Ghana Statistical Service 2013

3.2 Inflation Performance in Ghana

In spite of the use of varied monetary policy strategies, the desire to achieve stability in the price level has always been something that monetary authorities in Ghana have pursued. This notwithstanding, instability and high levels of volatility has been the result for several years Figure one (1) below shows the inflation performance from 1965 to 2019.

Figure 1: Graph of Inflation (Consumer Prices annual %)

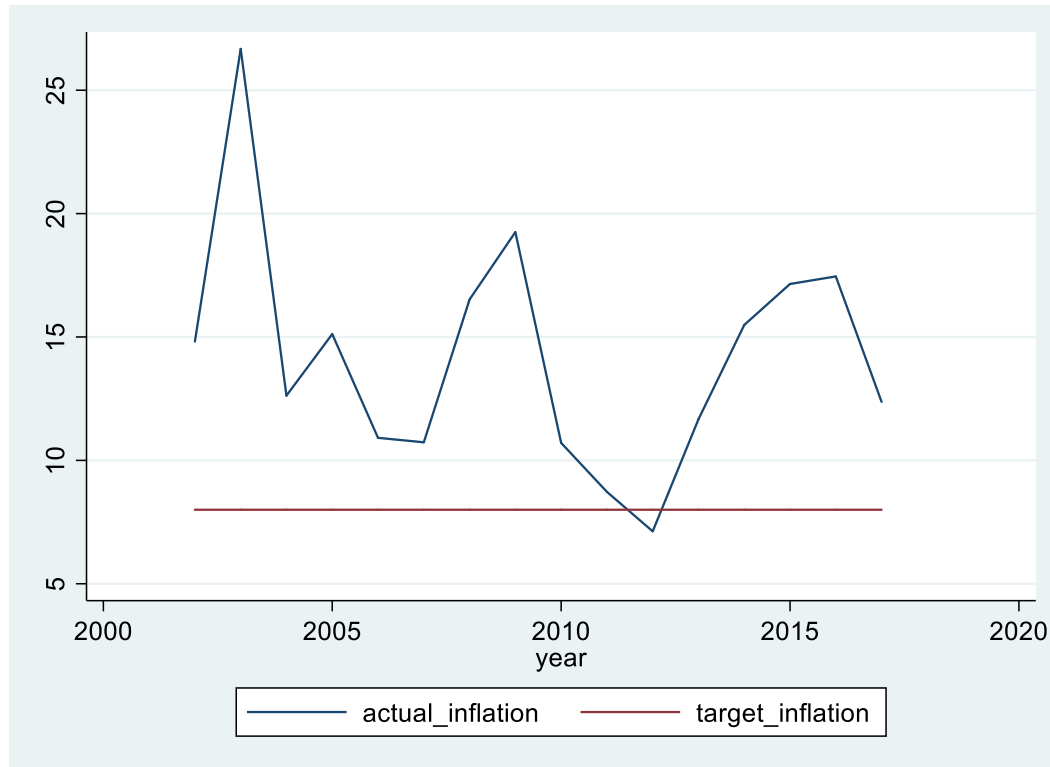


Source: Authors drawing using World Development Indicators data 2019

Figure one (1) above shows the inflation as measured by the CPI from which the rate of inflation is computed. The inflation rate is predominantly high, with the turbulence of the 1980s glaring. However there is evidence of stability from the year 2000 onwards.

Additionally, it is also important that we consider the performance of inflation in relation to targets set by the monetary authorities. Figure two (2) below compares the actual inflation rate with the official inflation target of 8 percent. The period for this data starts from the year 2002 which is said to be the year that Ghana unofficially began practicing Inflation Targeting.

Figure 2: Graph of Actual and Target Inflation

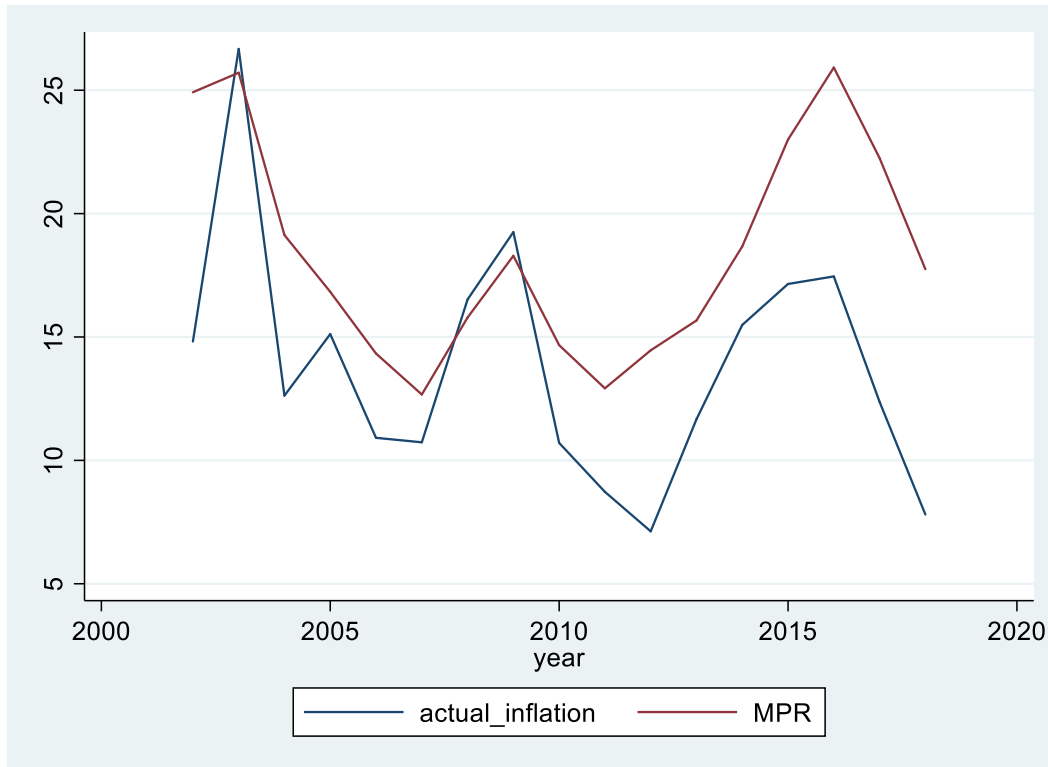


Source: Authors drawing using World Development Indicators data 2019

Figure two (2) above shows the actual inflation rate from the year 2002 as against the official inflation target rate of 8% as specified in the implementation of Inflation Targeting. It is seen that apart from the years 2011 and 2012 actual inflation has been higher than target for a very brief period though. This shows it has been difficult to achieve the target. This clearly shows how difficult it has been to achieve targets.

Furthermore, there is the need to also look into inflation performance with the Monetary Policy Rate (MPR), main monetary policy tool of Bank of Ghana. Figure three (3) below depicts the relationship between inflation and MPR from 2002 to 2019.

Figure 3: Graph of Actual inflation and the Monetary Policy Rate (MPR)



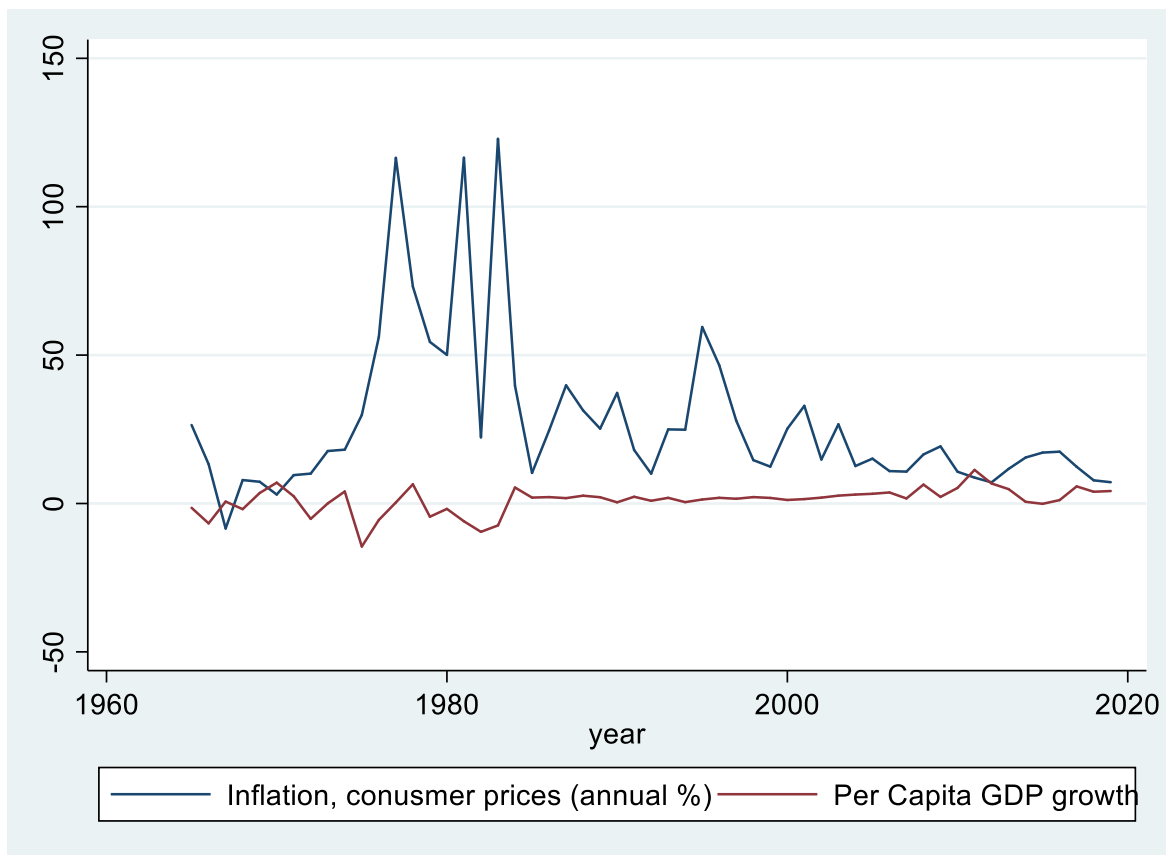
Source: Authors drawing using World Development Indicators data 2019

Figure three (3) is a time plot of inflation and monetary policy rate. There appears to be a direct relation between these two variables, giving some credence to the potency of Bank of Ghana's policymaking. The MPR seems to rise and fall with inflation. But a more salient feature is the tendency of the PR to pull down the inflation revealing the effectiveness of policy considering that the policy goals to fight inflation. But some others view the MPR in terms of the impact lending

rates, which has not been very effective hence the call that monetary policy is ineffective. The assessment of the MPR and its impact on lending rates is not focus for this study.

Finally, it is needful comparing inflation with the Per capita GDP growth rate. This is shown in figure four (4) below.

Figure 4: Graph of Actual inflation and Per Capita GDP growth



Source: Authors drawing using World Development Indicators data 2019

The figure 4 above reveals that inflation has largely been higher than Per Capita GDP growth rate. It is also observed that at a point where inflation peaked 1970-1980 Per Capita GDP growth fell sharply. If “picture speaks a thousand words” this presents a lingering challenge to policy.

To sum the discussion about the performance of inflation in Ghana with reference to the data used, it would not be an overemphasis to say that inflation has generally not performed well. This is corroborated by comparing; inflation with targets, inflation with the monetary policy tool and inflation with growth of GDP among others.

3.3 Monetary Policy Rate(MPR) and Inflation

The Policy Rate as the MPR is often called is a very important tool to Ghana's Central Bank. It is the rate at which the central bank lends to commercial banks. From time to time the central bank has to undertake an assessment of how it needs to fine-tune the MPR in order to manage inflation to the target. As has been observed, changes in MPR should have some impact on lending rates of commercial banks mainly through the interbank rate. It is this many analyst rely on to declare monetary policy as ineffective.

Kovanen (2011), observes that many of these indices respond to the policy rate in a very gradual way. Figure three (3) above depicts a direct correlation between inflation and MPR. Based on this, it can be argued that as monetary policy action is to influence inflation, the policymaker anticipates the level of inflation and adjust the policy rate accordingly, hence that correlation. So far as the trend shows some direct relationship then it presupposes that the policy rate may have an effect on inflation, and so monetary policy may be effective after all.

Kwakyee (2010)in analysing the historical performance of inflation in Ghana, observes that the establishment of the Bank of Ghana which led to Ghana conducting its monetary policy independently from the other English-speaking British colonies probably were the beginnings of inflationary pressures. Thus, the Central Bank became a cause of inflation due to persistent

financing of fiscal deficits. Ghana is said to have inflation rates much larger than other peer francophone countries because of their ability to limit fiscal deficit financing.

In assessing the performance of inflation using some time periods linked to political cycles, Ocran (2007) opines that the period immediately after independence thus from 1957 to 1964 experienced low inflation averaging 8% per annum gradually rising to 23% per year from the 1964 -1966 period. The seeming increase in inflation performance was really part of a decline in the general macroeconomic performance (Aryeetey & Fosu, 2003). These events necessitated the first IMF sponsored stabilization program, which came with a devaluation policy in order to control inflation in the 1966 to 1972 era. Even though the devaluation policy reduced price levels below the 1966 period there was an attendant economic decline. A period of political instability from 1972 – 1983, recorded a mix of low and high inflation rates peaking at 123% in 1983. Then there was a second stabilization program by the IMF (Economic Recovery Program (ERP-1983)) which coupled with high agricultural production helped reduce inflation from 123% to 40%.

Notwithstanding the apparent volatility in inflation over the years, the period from early 2000 has seen stability in macroeconomic performance, of which inflation is part - to the extent that single-digit inflation has been recorded.

In examining this stability in inflation and particularly the achievement of the single-digit inflation, Kwakye (2012) opines arguably, that a general improvement in macroeconomic management, a drop in food inflation and provision of subsidies on fuel and other utilities are the main drivers of this low inflation performance in that era. Given the fact that Food and Non-Alcoholic beverages

constitute a very high proportion of the CPI (over 40% of the 2012 CPI) food inflation is really a major contributor to the inflation rate in Ghana, hence a fall in food price largely accounts for the low inflation experienced and not necessarily of direct monetary policy. However, it is clear that the MPR has indeed impacted inflation.

3.4 Assessment of Economic growth and inflation

Aryeetey and Fosu (2003) have said that Ghana's economic growth record is not smooth. The early 1960s saw some reasonable growth while a decline began around 1964. The lowest growth of negative 14% occurred in 1975, which was associated with worldwide oil price shocks.

The growth record of Ghana cannot be analysed without reference to the Economic reforms of the 1980s. The impact of the reforms on the economy is a well debated issue. However some economist argue that there were positive effects of these reforms on the economy. With a negative 5% growth in 1983, when reforms were introduced growth shot up to 8% in the following year 1984. Indeed, the trend of favourable growth has persisted from that time.

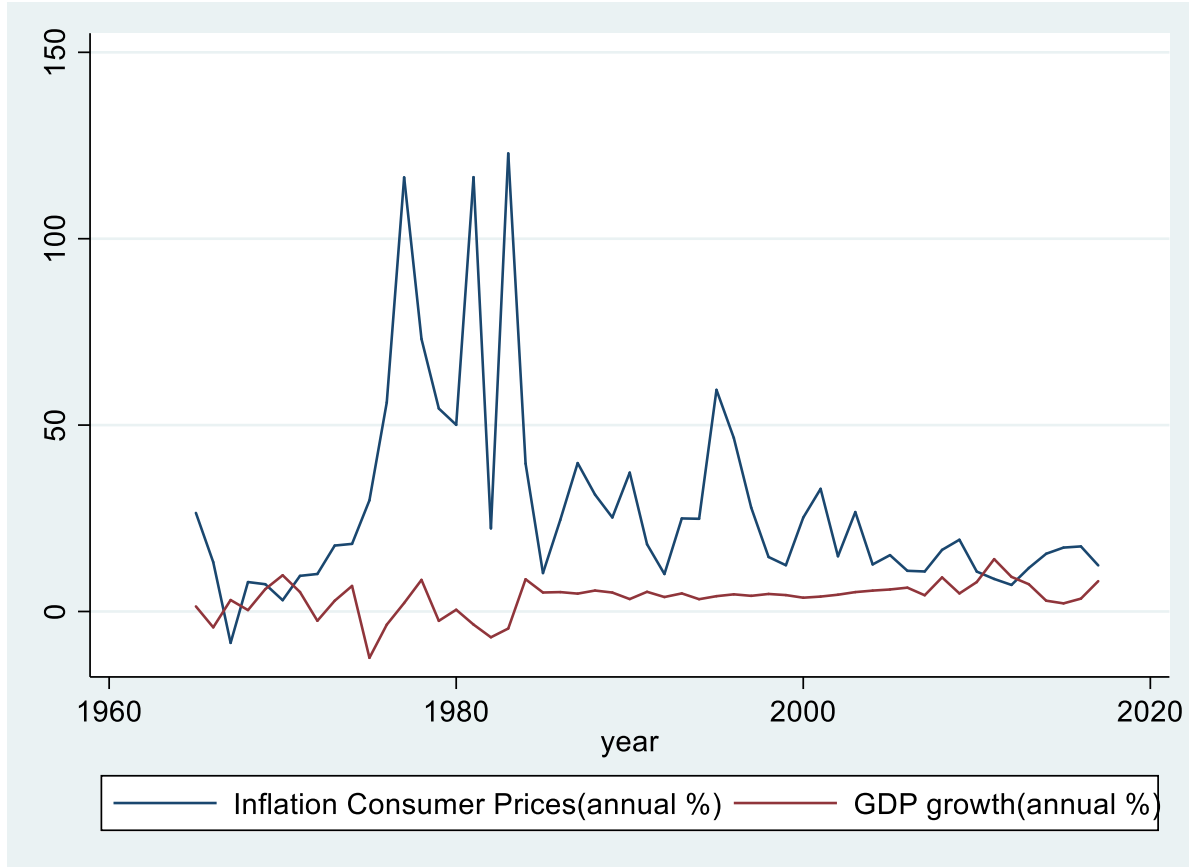
Figure 5: Graph of Inflation and GDP growth

Figure four (4) above shows the rate of inflation and GDP growth rate, respectively. A casual look is quite revealing. A close relation among inflation and GDP growth in Ghana may be found because the economy is primary or commodity dependent. As pointed out previously, inflation in Ghana is largely driven by food prices, even with agriculture declining in terms of contribution to GDP it is still a significant employer of the labour force. Thus, if the supply of food improves, the associated improvement in food prices would affect inflation. As the increased food supply propels the growth of GDP, consequently inflation will also decline. Thus showing that closer relationship between inflation and growth in Ghana.

3.5 History of Monetary Policy in Ghana

Amoah and Mumuni (2008) in analysing the recent economic history of Ghana, emphasizes that a stable price level has been the goal of monetary policy. Notwithstanding, different weights have been attached to this object over the years. The Monetary Policy Authority in Ghana is the Central Bank of Ghana which was established on 4th March 1957, barely two days before the country's independence was proclaimed. This was after a law³ was passed in the Parliament of Britain to that effect. Accordingly, its mandate was given as:

- i. "to issue and redeem bank notes and coins:
- ii. to keep and use reserves:
- iii. influence the credit situation in order to maintain monetary stability in Ghana"

Over the years, these objectives have been expanded to include others like stable exchange rates, financial sector stability and economic growth. To achieve these objectives, the Bank has employed various strategies ranging from targeting the exchange rate, monetary aggregates to the more recent inflation targeting.

Presently however, the law that the Bank is working with is the Bank of Ghana Act, 2002 (Act 612), which clearly states its principal object as maintenance of price stability. Some have argued that it is this Act which made the Central bank of Ghana an Inflation targeter.

Aryeetey and Kanbur (2017) have said that monetary management history in Ghana can be grouped into two distinct phases. One relates to the use of direct control measures of monetary policy which happened during the years before the implementation of the financial sector recovery

³ the Bank of Ghana Ordinance Number 34, 1957

programme. From the economic literature the typical direct measures are statutory liquidity ratio cash reserve, directed credit and administered interest rates. Quartey and Afful-Mensah (2014) have said that to a very large extent this regime was quite favourable to the government as it enables it to channel credit into sectors that are deemed critical to the national economy. Again, in an attempt at rapid industrialisation, the government intervened in every sphere of the economy.

The second regime as Aryeetey and Kanbur (2017) mentions is associated with the period when the use of 'indirect' measures of monetary policy were implemented. The indirect instruments generally operate through outright transaction in government securities (open market operations). According to Ncube (2007), countries which do not have well developed financial markets such as secondary bill markets are unable to employ these indirect monetary control instruments. The use of these indirect monetary policy measures also described as market-based measures are expected to regulate money supply instead of directly intervening so as to realise objectives.

Given this background, and with a commitment to anti-inflation and price stability, the new law refocused policy bringing about a shift from extreme and volatile macroeconomic performance to a stable one. With this, inflation targeting monetary policy was birthed.

Inflation targeting policy was now focused on gaining a low inflation. Inflation targeting as a framework may not be a complete remedy for all the difficulties policymakers face, but when other appropriate policy actions such as fiscal, financial, and other structural policies are combined with sound monetary policy then economic success could be assured.

3.6 Inflation Targeting Practice in Ghana

Svensson (2000) has described Inflation Targeting practice as “technically difficult in practice”. Practical Inflation Targeting involves the central bank deciding on an expected inflation target, which is usually conditional on the prevailing macroeconomic environment. The bank holds this inflation rate as the target over a certain time horizon. This is so because, according to Woodford (1999) monetary policy has a lagging effect on inflation, hence a good Inflation Targeting framework needs an inflation forecast target. Since the inflation target itself is an overarching goal, the forecast target is what the bank works to achieve using whatever tools and plans are available to it. Thus it uses its aim on the forecast to approach its official target and not cause too much variability in the real economy. Thus Woodford (2007) opines that from this perspective, inflation-forecast targeting is just a way to deal with an inter-temporal problem of optimization.

Clinton et al. (2010) states that the Bank of Ghana establishing itself as an inflation targeter has also been able to design a tool variously known as the Monetary Policy Rate (MPR), Bank of Ghana Policy rate used in policymaking. The Monetary Policy Committee (MPC) of Ghana similar to that of the Bank of England, initiates proposals for the formulation of monetary policies (Sowa & Abradu-Otoo, 2009). It sets interest rates (Bank of Ghana Prime Rate or policy rate) and publicises it, albeit independently. In fixing the policy rate, the MPC meets to examine substantial information on the economy. By considering a myriad of issues in setting the policy rate, the Bank of Ghana could thus absolve itself from the view that it might be too ‘fixated’ on controlling inflation to the detriment of other macroeconomic indicators. This rate is reviewed periodically by the Monetary Policy Committee in response to the various macroeconomic

indicators so as to be able to give a more accurate forecast of their trends in order to achieve the set inflation target rate.

Thus, Inflation Targeting in Ghana is conducted through the policy rate. Bank of Ghana lends to commercial banks at the policy rate and so it is expected that it could influence general interest rates in the interbank market as well as rates banks charge on loans to the general public. Again, the rate is kept at a particular level by the use of open market operations for as long as is deemed capable of achieving the price stability required in the medium term.

One key ingredient needed for Inflation Targeting to be a success is transparency. Therefore to fulfill this requirement, the committee would hold a meeting of the press and speak to the general public as well as give relevant economic statistics. It is generally agreed this new way of doing things is very different from what used to happen previously at the Central Bank. Such a move is expected to bring the general public particularly relevant agents to partake in achieving the policy objectives.

The success or otherwise of the Inflation Targeting policy framework in Ghana is well debated. Notwithstanding, it is agreed that Inflation Targeting stabilized inflation. In light of this, Opoku-Afari (2005) argues that since the Bank of Ghana started the implementation there has been a fall in the inflation expectations. In corroboration, Kyereboah-Coleman (2012) asserts that fluctuations in inflation have decreased after Inflation Targeting indicating effectiveness of monetary policy in Ghana, supporting the effectiveness of monetary policy in Ghana.

In spite of these, it is quite clear that inflation targets have often been missed. Abango, Yusif, and Issifu (2019) have indicated that in comparing pre-inflation targeting and post inflation targeting regimes, it is observed inflation has been low in the post targeting era, even though it has more often than not been higher than the 8 percent target.

So in examining the impact of Inflation Targeting on inflation and GDP growth, Puni, Osei, and Barnor (2014) have asserted that although Inflation Targeting has significantly lowered inflation and its variability it has not really translated into enhanced growth – bringing to mind the Ghanaian saying of “people not feeling it in their pocket”. They further argue that persistent depreciation of the Ghana Cedi, high domestic interest rates have been the cause of the uncertainty and the lack of trickling down of the stability created by the Inflation Targeting policy framework.

So to answer the question about the optimality of the single-digit inflation targeting in view of Inflation Targeting bringing some stability in inflation and its variability, one needs to ascertain whether a low and stable inflation even imply effectiveness of monetary policy given the fact that the larger population might have not generally benefited thereof. The answer to this question can be a debatable issue. However, this study has found a way to answer the questions by considering the influence of inflation on per capita GDP growth. Notwithstanding the challenges associated with using GDP as a measure of welfare as in Graham (2011), others argue that it is still a good way. Oulton (2012) maintains that persistent GDP growth helps the population by lowering unemployment. Therefore, a higher Per Capita Income would be in harmony with people’s aspirations and must be respected.

3.7 Conclusion

Monetary Policy practice has been described as a technically difficult venture. To the extent that, success would depend on the competence of “men” at the Central Bank, and more importantly on other circumstances beyond their control. In spite of this, the achievement of price stability could go a long way to ensure that other goals of monetary policy are promoted, hence Ghana’s monetary practice largely focusses. Low Inflation which has been difficult over the years can be said to have become more effective as many economist agree under the Inflation Targeting monetary policy framework. Although the general efficacy of monetary policy and optimality of the inflation targets is still a debate, one can say that its impact on welfare would be a good judge.

So far, the workings of the policy tool shows to a very large extent that policy has been effective.

CHAPTER FOUR METHODOLOGY, ANALYSIS AND RESULTS

4.0 Introduction

This chapter covers the methodology for the study. It also considers the analytical framework and presents the theoretical and empirical models used in assessing the optimality of Ghana's single-digit inflation targeting and monetary policy effectiveness. This chapter further goes on to carry out estimation and analyze the results thereof.

4.1 Methodology

The key question that requires estimation in this study is the optimal inflation for Ghana. The estimation would be based on regression techniques. It is worth mentioning at this point that Ordinary Least Squares (OLS) being the basic technique of regression analysis may not be useable because of a requirement of stationarity of variables. Generally, most macroeconomic variables are not stationary, hence the difficulty in using the Ordinary Least Squares. The estimation of an optimal inflation rate may involve a path analysis, such that various rates of inflation should be plugged into a model to identify the one or range of levels that generate better results. To that extent, there will be the need for a simple technique that could make room for these concerns.

This study employs two different econometric methodologies i.e. Autoregressive Distributed Lag(ARDL) model as proposed by Pesaran, Shin, and Smith (2001) and the Threshold Regression Model as proposed by Hansen (2000), respectively.

4.1.1 Autoregressive Distributed Lag (ARDL) Model

The ARDL modelling technique, an Ordinary Least Square (OLS) based model applies to stationary and non-stationary time series. Being a least squares based model implies it can be estimated as least squares regressions using lags of both dependent and independent variables.

The use of the ARDL Modelling technique in this study can be justified on several grounds. Firstly, it helps to avoid problems of non-stationarity which are often inherent in time series data. Second, its use would enable the establishment of long run relationships between variables, through the bounds test and error correction re-modelling that can be constructed. Again, since there is often a delay between an economic action and a consequence relating to time lags, the ARDL method allows adequate lags to fit the data generating process. Finally, it is appropriate for small or finite sample size (Pesaran et al., 2001) .

In using ARDL for this study, two models will be estimated. First is to include a dummy of inflation aimed at capturing the effect of a single-digit inflation on Per capita GDP growth, where inflation takes the value 1 for years where single-digit inflation is obtained and 0 in years with double-digit inflation. Secondly a dummy threshold model will be estimated for selected levels of inflation.

4.1.1.1 Model Diagnosis

It is often a key requirement in regression analysis that models must be diagnosed using appropriate econometric tools. Model diagnosis involves looking for errors and problems in the specification of the model as well as problems that come with variable selected in terms of their appropriateness for instance. In diagnosing, one can look at coefficient residual, a stability. The

coefficient diagnosis for instance assess whether there are any restrictions on the estimated coefficient to the extent that they can be used to make policy conclusions or further analysis. It also looks at whether redundant variables have been included or even very relevant ones omitted.

In terms of residual diagnose, one look out for errors in the residuals as whether they are correlated for instance. Then the stability diagnosis assess whether parameter estimates for instance are stable throughout subsamples of the data. All these are aimed producing a good result that can be confident to defend.

4.1.2 Threshold Regression

In order to take care of the non-linearity perceived in growth and inflation as in (Barro, 1991), this study employs a second technique of threshold regression in addition to the ARDL model. According to Zivot and Wang (2006), threshold regression involves a simple nonlinear regression containing piecewise linear specifications and regime switching that occurs when an observed variable crosses unknown thresholds. Although linear time series models are useful for research, it is possible that linear time series models leave some features of economic and financial data unexplained. It is therefore important to consider using a method which takes care of these matters.

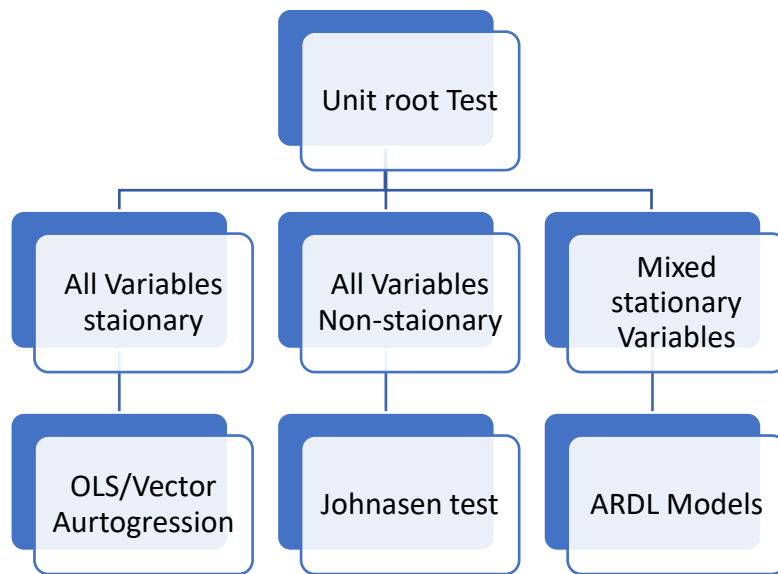
4.2 Model Specification

Model specification is a very important exercise in an econometric analysis in that it describes the process by which the dependent variable is affected by the independent variables. Usually, a researcher chooses the dependent variable in a particular analysis based on the economic question of interest and prior knowledge of economic theory. Since economic relationships are rarely linear,

a researcher may have to allow some flexibility in modelling (Roberto, 2013). Since there may be an issue of choosing a wrong specification that is why it is important to conduct an assessment of models.

The figure five (5) below is a generally suggested modeling technique for time series analysis. The framework suggest that a researcher employing time series data should first and foremost test to establish stationarity of the variables.

Figure 6: Framework for model selection in Time series



Source :Shrestha and Bhatta (2018)

Therefore following this generally accepted framework, a stationarity test was undertaken for all variables in the study.

4.2.1 General Model Specification

The general model is specified as a growth regression augmented by inflation i.e.

$$PCI=f (INFRATE, GCF, GOVT_EXP, M2)..... (1)$$

Where:

- PCI = growth rate of GDP per capita,
- INFRATE=inflation rate,
- GCF = the growth rate of Gross Capital Formation as a percentage of GDP,
- GOVT_EXP= growth rate of general government expenditure as a percentage of GDP and
- M2= the growth rate of broad money as a percentage of GDP

Equation (1) specifies the functional form of the model indicating that the growth rate of GDP per capita is influenced by the other variables. This functional form is also captured econometrically with equation 2 below.

$$PCI_t = \beta_0 + \beta_1 INFRATE_t + \beta_3 GCF_t + \beta_4 GOVTEXP_t + \beta_4 M2 + \mu_t (2)$$

Equation 2 is generally referred to as the population regression function which is a hypothetical representation of the inter-relationships that exist among the variables. The variables on the right-hand-side (independent variables) of the equation determines a value for the left hand side variable and together with the betas determine the extent and level. In equation 2 above $\beta_0 - \beta_4$ are parameters to be estimated to give an idea of how much each the independent variable could influence the dependent variable, when the others are held constant.

4.2.2 Specification of ARDL Model

$$\begin{aligned} \Delta PCI_{GR_t} = & \alpha_0 + \sum_{i=1}^4 \beta_i \Delta PCI_{GR_{t-1}} + \sum_{i=1}^4 \gamma_i \Delta INFRATE_{t-1} + \sum_{i=1}^4 \phi_i \Delta GCF_{t-1} + \\ & \sum_{i=1}^4 \delta_i \Delta GOVT_EXP_{t-1} + \sum_{i=1}^4 \theta_i \Delta M2_{t-1} + \Delta INFRATE + \varphi_1 PCI_{t-1} + \varphi_2 INF_{t-1} + \\ & \varphi_3 GCF_{t-1} + \varphi_4 GOVT_EXP_{t-1} + \varphi_5 M2_{t-1} + \mu_t (3) \end{aligned}$$

Equation (3) gives the ARDL specification of the model with a dummy as DINFRATE.

An ARDL model is specified as a single equation with lagged terms of both dependent and independent variables, with pre-determined lag structures. It also involves a single equation system of long run and short run models. The variables with the difference operator from the short run while the others are long run counterparts.

4.2.3 Specification of Threshold Regression Model

A threshold regression with two regions can be identified by a threshold value ‘ γ ’. This can be written in an equation form as equations (4) and (5) respectively

$$y_t = x_t\beta + z_t\delta_1 + \epsilon_t \quad \text{if} \quad -\infty < w_t \leq \gamma \quad \dots\dots\dots (4)$$

$$y_t = x_t\beta + z_t\delta_2 + \epsilon_t \quad \text{if} \quad -\gamma < w_t < \infty \quad \dots\dots\dots (5)$$

Where y_t is the dependent variable, x_t is a $1 \times k$ vector of covariates possibly containing lagged values of y_t , β is a $k \times 1$ vector of region-invariant parameters, ‘ z_t ’ is a vector of exogenous variables with regime-specific coefficient vectors δ_1 and δ_2 . ‘ w_t ’ is a threshold variable that may also be one of the variables in x_t or z_t , and ϵ_t is the error term. Generally, the estimated threshold ($\hat{\gamma}$) is one of the values in the threshold variable w_t .

The estimation of the threshold value involves minimizing the least squares of a single regression equation such as equation (6) below:

$$y_t = x_t\beta + z_t\delta_1 I(-\infty < w_t \leq \gamma) + z_t\delta_2 I(\gamma < w_t < \infty) + \epsilon_t \quad \dots\dots\dots (6)$$

The estimation is done based on a sequence of T_1 values in w_t , where $T_1 < T$. There is a trimming percentage of 20%, implying that T_1 corresponds to the number of observations between the 20th and 80th percentile of w_t .

The threshold for the estimator is given as

$$(\hat{\gamma}) = \arg \min_{\gamma \in \Gamma} S_{T_1}(\gamma) \text{ Where } \Gamma = (-\infty, \infty)$$

$$S_{T_1}(\gamma) = \sum_{t=1}^{T_1} \{y_t - x_t\beta - z_t\delta_1 I(-\infty < w_t \leq \gamma) - z_t\delta_2 I(\gamma < w_t < \infty)\}^2 \dots\dots\dots (7)$$

Equation (7) is a $T_1 \times 1$ vector of sum of squared residuals (SSRS), and γ is $T_1 \times 1$ vector of tentative thresholds

In a nutshell, specifying a Threshold Model also involves a single equation system with a number of regimes delineated by a threshold variable being inflation for this study. The threshold value is obtained from the observations of the threshold variable. To find this value, a number of regressions are run with the different observations in the threshold variable. In so doing one of these observations would generate the lowest residual sum of squares thus becoming the threshold value, based upon which the optimal value is identified.

Equation 8 below is a simplified specification of the Threshold Model employed in this study

$$PCI_t = (\beta_{10} + \beta_{11}INFRATE_t + \beta_{12}GCF_t + \beta_{13}GOVT_t + \beta_{14}M2_t + d[q_t \leq \gamma] + (\beta_{20} + \beta_{21}INFRATE_t + \beta_{22}GCF_t + \beta_{23}GOVT_t + \beta_{24}M2_t + d[q_t > \gamma]) + e_t \dots\dots (8)$$

4.3 Variable selection

The process of selecting variables for an empirical work is often an arduous task. Selecting the variables for this study will start with a consideration of the inflation-growth nexus with a special focus on Per Capita GDP growth.

However, there is a general problem with the determination of the sources of growth as to which variables to include in a growth equation. Neoclassical growth theory considers the capital stock, labour force and technological progress as the main determinants of growth (Solow, 1956; Swan, 1956), whereas endogenous growth theory considers human capital, knowledge and new technologies (Romer, 1990). Hahn (2010) has said that neoclassical growth theory enables an understanding of the important elements of growth by providing an organized way of thinking about growth and so be the basis upon which growth equations are formulated.

There could be the existence of a large body of explanatory variables for growth but a few may be significant in a regression. This assertion is corroborated by Sala-i-Martin (1997) who in examining the strength of explanatory variables in cross-country economic growth regression observed that investment, population growth, inflation rate, government expenditure, openness are good for growth modelling. In a similar vein, King and Levine (1993) have also underscored the importance of Financial development in the growth. These arguments have guided the selection of variables for this study.

Not only that, these same variables have also been used in some important previous works investigating the inflation and economic growth in developed and developing countries including

Ghana⁴, with significant results. In light of this, the present study utilizes the neoclassical growth theory as foundation upon which most of the independent variables are selected and justified. Furthermore, due to data constraints, this analysis will substitute investment and population for capital stock to be represented by Gross Capital Formation.

4.4 Data Sources and Description

This study employs annual time series data from the year 1965 to 2019, as the sample period. Indeed, the choice of the time period is determined by data availability from the earliest period. A time series data, according to Granger and Newbold (1986) are observations arranged according to the time they occurred . Such a sequence of data points has to be measured at regular time-intervals over a period of time and arranged according to the time of their outcome. Lütkepohl, Krätzig, and Phillips (2004) have asserted that time series econometrics has been a rapidly evolving field with many revolutionary ideas appearing very often. Analyzing time series helps to bring out important components in a data series like the trends, seasonality, cyclicity and other features.

Generally speaking, it is expected that time series should contain enough observations for proper parameter estimation even though there seems to be no hard and fast rule about the minimum size. While some authors say at least 30 observations are needed, others say 50 or at least 60 observations. More often, the 30-observations criterion is a preferred minimum. So if the observations are 30 or more for each variable the researcher is good to go. In this study, each variable has fifty five (55) observations.

⁴ Some of these works include (Ayisi et al., 2013; Bittencourt, 2012; Fabayo & Ajilore, 2006; Frimpong & Oteng-Abayie, 2010; Munir, Mansur, & Furuoka, 2009; Seleteng, 2006)

The data used for this work which were sourced from the World Development Indicators of the World Bank are presented in table two below:

Table 2: Variable Description

Variable	Abbreviation
GDP per capita growth (annual %)	PCI
Inflation, consumer prices (annual %)	INFRATE
Broad money (% of GDP)	M2
General government final consumption expenditure (% of GDP)	GOVT_EXP
Gross capital Formation as a percentage of GDP	GCF

Source: Authors compilation with WDI data

The table one (1) above gives a brief description of the variables, their abbreviations as used in the study. However, what they stand for within the econometric models used in the work is given as follows:

1. Growth rate of GDP Per Capita (PCI). This is the dependent variable employed in the estimation. It is computed as the percentage change in real GDP divided by population.
2. Inflation Rate (INFRATE). Inflation is represented by the annual percentage change in consumer price index (CPI) with 2010 as the base year. This is the main variable of interest.
3. Broad Money as Percentage of GDP (M2): this is used as one of the explanatory variables to represent an index of financial depth in a country at a particular point in time, as indicated by King and Levine (1993). Its computation is based on the annual percentage change in money and quasi money as percentage of real GDP.
4. Gross Capital Formation (GCF). Gross Capital formation was formerly called gross domestic investment. It is computed as the annual percentage change in gross capital formation as a percentage of GDP. In view of the relevance of capital formation in growth modelling, this variable is included as a proxy for capital.

5. General government final consumption expenditure (GOVT_EXP): General government final consumption expenditure was previously known as general government consumption. It includes all government current expenditures for purchases of goods and services (including compensation of employees). It also includes most expenditures on national defense and security, but excludes government military expenditures that are part of government capital formation. This variable is included because of the enormous role of government in the economy of Ghana.

4.5 Descriptive Statistics

One of the first things to do when building an econometric model is to do a detailed analysis of the characteristics of the individual time series used. Such an analysis is important because the properties of the individual series have to be taken into account in modeling the data generation process (DGP) of the system.

The conclusion of a research work cannot be based solely on results of descriptive statistics. To that extent this work goes further to substantiate the results obtained from the descriptive statistics. This was done by employing several quantitative approaches as determined by the properties of the series and other considerations.

4.5.1 Correlation Analysis

In basic statistics, correlation analysis looks at the strength of association between variables and the direction of the relationship. In terms of the strength of relationship, the value of the correlation coefficient varies between +1 and -1. A value of ± 1 indicates a perfect degree of association

between the variables. As the correlation coefficient value goes towards 0, the relationship between the two variables will be weaker. Establishing the correlation among the variables is important because if two or more independent variables have a nearer to an exact linear relationship between them then we have problems of multicollinearity, which does not give rise to reliable parameter estimates.

4.5.2 Impulse response function (IRF)

Another descriptive tool used are impulse response functions. According to Lütkepohl et al. (2004) impulse responses and forecast error variance decompositions are useful tools for analyzing the relations between variables in a dynamic econometric modelling framework, as is being employed in this study. The Impulse Response Functions (IRF) identifies the responsiveness of the dependent variable being endogenous at a particular time when a shock is introduced into the system. IRFs are presented as part of the results of the estimations.

4.6 Stationary and Unit Root Test

In time series analysis, it is important to know the behavior of the series being used. Indeed, if the major characteristics of time series data are understood and addressed properly, a regression analysis using such data can also tell us about the pattern of relationships among variables of interest and help to avoid spurious regression (Greene, 1997).

Time series data can be stationary or non-stationary. Stationary series are characterized by a kind of statistical equilibrium around a constant mean level or dispersion around that mean level (White & Granger, 2011). Again, a series is stationary when observations move towards a long-run

average so as to remain unaffected by time. This is corroborated by Makridakis (1976) who asserts that the key advantage in dealing with stationary series is that their statistical properties are independent of time.

Many macroeconomic series are non-stationary or integrated and lacks mean stationarity. In other words, the levels of such a series is not stationary but its difference is. Difference stationary processes are also known as integrated processes where they are said to be integrated process of order d , or $I(d)$, with d being the number of times the process has to be differenced to become stationary.

In testing for the stationarity or otherwise of a series, one can employ several methods being graphical or formalised test with the former being a more objective approach. Some of the formalised tests check the null hypothesis that there is a unit root against the alternative of stationarity of series that may have a non-zero mean term, a deterministic linear trend, and perhaps seasonal dummy variables. The stochastic part is modeled by an AR process or, alternatively, it is accounted for by nonparametric techniques as in the second group of tests. The third kind of tests such as the KPSS take a quite different view at the unit root testing problem by checking a stationarity null hypothesis against an alternative of a unit root.

Indeed, to a large extent unit root test in research work is done with the Augmented Dickey–Fuller (ADF) and Phillips-Perron (PP) tests and to some extent the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) is used. This study will use the ADF test and corroborate the results with the PP test. The PP test is used to corroborate ADF because according to Phillips and Perron (1988), the PP test is

nonparametric when it comes to nuisance parameters and so it permits the analysis of a wide array of time series models in which there are unit roots . It offers an added advantage to the Augmented Dickey-Fuller test in situations where there are moving average components in the time series.

Upon carrying out the unit root/stationarity test on the variables employed for this study, the results showed that there is a mixture of stationary and non-stationary variables justifying the use of the ARDL modelling technique in this study.

4.6.1 Stationary and threshold regression

According to Tjøstheim and Yin (2011) the existing literature on non-stationary threshold modelling posits that non-stationary in variables can be removed by differencing or by maintaining the model at their levels if the variable that will be considered as the threshold is stationary. What was done in this study is that the non-stationary variable were all differenced and the threshold model applied on them.

4.7 Serial Correlation

Serial correlation is a major problem for time series data. Serial correlation occurs when error terms in separate periods are related. Accordingly, Serial correlation may lead to problems with the efficiency of estimates and an understatement of the variance as well as the overstatement of the R^2 which will invalidate the 't' and 'F' tests. This may lead to some hypotheses being rejected when they should not.

This study employs the Breusch-Godfrey LM test using the STATA software. This test involves a hypothesis testing mechanism where the null hypothesis of the LM test is that there is no serial correlation up to lag order p , where p is the lag order specified by the researcher. The interpretation of the test is based on $\text{Obs} \times R^2$ value and its probability. The Breusch-Godfrey Lagrange Multiplier (LM) test for serial correlation is best suited for models where the dependent variable is represented in the model. This test belongs to a class of asymptotic test known as Lagrange Multiplier (LM) test as and is suited for both the ARDL and Threshold Models.

4.8 Estimation Results

In this section the results obtained from the using the econometric software to carry out the various estimations are presented and discussed.

4.8.1 Results from Descriptive Statistics

Results obtained from the descriptive statistics which looks at the mean of the variables, standard deviations, correlations and the impulse response functions are shown in tables and discussed below

4.8.1.1 Results of summary Statistics

The descriptive statistics which involves the mean, standard deviations, maximum and minimum values are called summary statistics, which results are presented in table three (3) below:

Table 3: Summary Statistics

Variable	Mean	Standard Deviation	Minimum	Maximum
PCI	1.130535	4.40386	-14.50853	11.31545
INFRATE	27.16475	27.10922	-8.422486	122.8745
GOVT_EXP	10.98494	2.313663	5.86129	16.76471
GCF	16.28002	7.555804	3.37764	30.04927
M2	22.78945	5.689418	11.30499	34.10823

Source: Computed by Author with data from World Development Indicators, 2019

Table 3 above gives the summary statistics of the variables under discussion. The result of the summary statistics reveals that between 1965 and 2019 the average(mean) inflation rate is approximately 27.16 per cent, with the highest(maximum) being 122.87 per cent and lowest – 8.42 per cent. Within the same sample period Ghana’s average Per capita GDP growth is about 1.02 per cent, with a maximum of 11.28 per cent and a minimum of -14.45 per cent. Clearly, average Per capita GDP growth is far lower than the average inflation rate. Even if the two variables measure completely different concepts, their growth rates can be investigated.

4.8.1.2 Results of Correlation Analysis

The result obtained from estimating the correlations between the variables is presented in table four below

Table 4: Correlation Matrix

	PCI	INFRATE	GCF	M2	GOVT_EXP
PCI	1.0000				
INFRATE	-0.3643	1.0000			
GCF	0.3483	-0.4000	1.0000		
M2	0.2229	-0.2522	0.5424	1.0000	
GOVT_EXP	0.0119	-0.2173	0.0991	0.1551	1.0000

Source: Computed by Author with data from World Development Indicators, 2019

The results of the correlations shows that the lowest correlation among the variables is 0.001 which is between per capita GDP growth (PCI) and final government expenditure (GOVT_EXP). The highest correlation among any of the variables is 0.54 between gross capital; formation (GCF)

and broad money as a percentage of GDP. The general impression from this result is that the variables are less correlated and are in acceptable range for regression.

4.8.2 Results from Stationarity Test

The result obtained from running the unit root test on the variables is presented in table five (5) below. In performing an Augmented Dickey Fuller Test an equation of the form

$$y_t = \rho y_{t-1} + x_t \delta + \epsilon_t \dots\dots\dots$$

With x_t being optional exogenous variables which may comprise a case without an intercept, with an intercept only and an intercept and a trend. In effect three models are estimated with the levels and first-differences of the variables.

Table 5: Stationarity Test Results

Variable	Model	LEVEL		FIRST DIFFERENCE		CONCLUSION
		t- statistic	p-Value	test statistic	p-Value	
PCI	None	-4.502252***	0.0000	-5.730549***	0.0000	Stationary at level- I(0)
	Intercept	-5.399***	0.0004	-12.62013***	0.0000	
	Intercept and trend	-5.548266***	0.0002	-5.728079***	0.0001	
INFRATE	None	-1.593721	0.1037	-12.74817***	0.0000	Not conclusive
	Intercept	-2.536288	0.1131	-12.74817***	0.0000	
	Intercept and trend	-4.516948***	0.0036	-12.51140***	0.0000	
GCF	None	-0.570123	0.4655	-6.378851***	0.0000	Stationary at first difference- I(1)
	Intercept	-1.703443	0.4236	-6.328836***	0.0000	
	Intercept and trend	-2.958621	0.1536	-6.224476***	0.0000	
M2	None	-0.153069	0.6261	-7.064946***	0.0000	Stationary at first difference - I(1)
	Intercept	-1.741525	0.4049	-7.003379***	0.0000	

	Intercept and trend	-2.071525	0.5490	-6.933596***	0.0000	
	None	-1.025046	0.2710	-7.783881***	0.0000	Stationary at first difference
GOVT_EXP	Intercept	-3.210004**	0.0250	-7.722896***	0.0000	
	Intercept and trend	-3.410158	0.0610	-7.642048	0.0000	

The stationarity test has a null hypothesis of the existence of a unit root in the series. The asterisks ***, **, and * depicts significance at 1 per cent, 5 per cent, and 10 per cent levels respectively, based on the MacKinnon approximate p-value. The p-value attached to the model determines the stationarity of the variable at level or at the first differences. The results show that the null hypothesis of unit root cannot be rejected at the 1 per cent level of significance except for Per capita GDP growth with that Inflation being inconclusive. Again Government expenditure is significant at the 5% significance level. The result reveals a mixture of I (0) and I (1) variables.

4.8.3 Regression Results

This section deals with the actual regression by estimating the dependent variable being the growth rate of real GDP per capita to the explanatory variables which are inflation rate, Broad Money as Percentage of GDP , Gross Capital Formation as a percentage of GDP, and General government final consumption expenditure as a percentage of GDP..

As already indicated we employ two econometric methodologies i.e. ARDL and Threshold modelling to identify the optimal inflation rate.

4.8.3.1 Results from the Auto Regressive Distributed Lag Model

An ARDL fits a linear regression model with lags of the dependent variable and the independent variables as additional regressors. Information criteria are used to find the optimal lag lengths if those are not pre-specified as an option

Table 6: Lag Length Selection

LAG LENGTH	AIC	HQIC	SBIC
PCI	1	1	1
INFRATE	2	2	2
GCF	3	1	1
M2	1	1	1
GOVT_EXP	1	1	1

Source: Computed by Author with data from World Development Indicators, 2019

Table 6 above gives information about the appropriate number of lags to use. This table is generated by the varsoc command in STATA. The lag length is generated based on an information criteria.

The ARDL Model stated in equation (3) is estimated by the inclusion of a dummy variable INF-k. INFRATE is the observed inflation rate while k is an arbitrarily selected inflation rate. The dummy variable is generated as D_t (INF -k). When the dummy (D_t) is one (1) then inflation is greater than k percent and D_t is zero when the inflation value is less than or equal to k. The estimation involved running equation (3) twenty six (26) times with the dummy being inserted at each time. The dummy variables will be used separately in the equation such that it will be the only item that would change in the estimation and the optimal value of inflation is obtained from the equation with the lowest residual sum of squares or maximum R^2 .

The significance of the dummy will determine the overall optimality of those inflation rates. if D_t is not significant then it means inflation rates lower than k are not optimal, while a range of significant inflation rates may also be determined.

Table 7: Auto Regressive Distributed Lag model estimation results

k	Coefficient	Std. Error	t-statistics	Prob	R²	Adj R²	F-value
5	-8.260088	3.793424	-2.18	0.037***	0.6328	0.4437	0.0014
6	-8.260088	3.793424	-2.18	0.037***	0.6328	0.4437	0.0014
7	-8.260088	3.793424	-2.18	0.037***	0.6328	0.4437	0.0014
8	-2.321623	1.865426	-1.24	0.221	0.5097	0.3714	
9	-2.771939	1.710435	-1.62	0.113	0.5224	0.3877	0.0008
10	-2.400193	1.688225	-1.42	0.163	0.5154	0.3787	0.0010
11	-2.780088	1.493367	-1.86	0.071	0.5724	0.4061	0.0014
12	-1.912189	1.499464	-1.28	0.211	0.6244	0.4131	0.0036
13	-2.091718	1.466253	-1.43	0.162	0.5236	0.3732	0.0016
14	-2.091718	1.466253	-1.43	0.0016	0.5236	0.3732	0.0016
15	-1.739223	1.375886	-1.26	0.214	0.5103	0.3722	0.0012
16	-2.755907	1.477814	-1.86	0.070	0.5725	0.4063	0.0014
17	-2.938242	1.432738	-2.05	0.048	0.5803	0.4170	0.0011
18	-2.728998	1.466194	-1.86	0.072	0.6200	0.4242	0.0022
19	3.284562	1.473254	-2.23	0.033***	0.6350	0.4470	0.0013
20	3.835134	1.565703	-2.45	0.020***	0.6447	0.4616	0.0010
21	-3.835134	1.565703	-2.45	0.020***	0.6447	0.4616	0.0010
22	-3.835134	1.565703	-2.45	0.020***	0.6447	0.4616	0.0010
23	.3084246	1.629002	0.19	0.851	0.4907	0.3471	0.0022
24	.3084246	1.629002	0.19	0.851	0.4907	0.3471	0.0022
25	.252078	1.592926	0.16	0.875	0.4906	0.3469	0.0022
26	-.6388085	1.696462	-0.38	0.709	0.4921	0.3488	0.0021
27	-.0162326	1.854859	-0.01	0.993	0.4902	0.3465	0.0022
28	-.9832936	1.881384	-0.52	0.604	0.4938	0.3510	0.0020
29	-.9832936	1.881384	-0.52	0.604	0.4938	0.3510	0.0020
30	3.447786	1.934309	1.78	0.082	0.5286	0.3957	0.0007

Taking the values of k which is the arbitrarily selected inflation rate which will be run in the equations from 5 to 9 as single-digit inflation rate and 10 to 30 as double digit respectively, then the significance of the coefficient of $D_t(INF -k)$ where k represents inflation from 5-30 percent

would establish the optimality or otherwise of the single-digit or double digit inflation rate respectively.

Table 7b: extracted results for analysis

k	Coefficient	Prob	R²
5	-8.260088	0.037***	0.6328
6	-8.260088	0.037***	0.6328
7	-8.260088	0.037***	0.6328
8	-2.321623	0.221	0.5097
9	-2.771939	0.113	0.5224
19	3.284562	0.033***	0.6350
20	3.835134	0.020***	0.6447
21	-3.835134	0.020***	0.6447
22	-3.835134	0.020***	0.6447

For the purposes of analysing the results, an extract is made from table 7 and labelled 7b. The result show that the values of k (representing inflation rates) which are significant are; 5%, 6%, 7%, 19%, 20%, 22% also with the highest R². Among the values listed, they fall within the single digit inflation class i.e. 5%, 6%, and 7% while 19%, 20%, 21% and 22% also fall within the double digit inflation regime. Now, considering that the coefficient of the single-digits i.e. 5, 6 and 7 percent are larger and negative, it presupposes that the single-digit rates have a larger inverse impact on the growth of Per Capita Income. What this means that if inflation is larger than these rates its impact on Per Capita Income is larger.

4.8.4 Threshold Regression Results

The result obtained from estimating the threshold regression model is presented in table 8 below. To overcome the problem of non-stationarity in the data, the first differences are used in the estimation.

Table 8: result of threshold regression result

Variables	Regime 1 INF \leq 7.71%	Regime 2 INF $>$ 7.71%
Dependent variable: PCI		
INFRATE	0.4532	- 0.1493
GCF	0.1144	0.47056
M2	-0.4356	-1.1682
GOVT_EXP	0.72412	-1.,1721
CONSTANT	2.8495	1.9744

Table ten 8 shows the results of the threshold regression. The dependent variable is growth rate of real GDP Per Capita. There is trimming of the data by 20 per cent. The estimated threshold of 7.71% splits the sample into two regimes. Regime 1 corresponds to the portion of the sample in which the inflation rate is less than or equal to 7.71% i.e. a relatively low inflation regime while regime 2 corresponds to the portion of the sample in which the inflation is greater than 7.71% a relatively high inflation regime.

Inflation below 7.71 % relates to a low inflation regime and thus inflation has a positive impact on GDP per capita, with a coefficient of 0.0453. The second column which is the relatively high inflation regime also shows that inflation has a negative impact on per capita GDP growth such that when inflation increases by about 1% it leads to decrease in growth of GDP per capita by about 0.15 per cent, all other things being equal. In very simple language if inflation is lower than 7.71 percent growth of Per Capita Income is positive and when inflation is above 7.71 percent growth of Per Capita Income is negative. This shows clearly that a low inflation target, being a single-digit for instance is indeed optimal after all.

The conclusion therefore is that the Single-Digit inflation rate can promote welfare as measured by the growth of per capita income. Hence, inflation rate between 5 – 7 percent are optimal per the data employed for this study revealing the optimal inflation for Ghana is over range and not necessarily at a point. Thus the single-digit inflation targeting by the bank of Ghana is prudent.

These results emphasise the optimality of Single-Digit inflation agrees with some earlier works on Ghana. First is the work by Marbuah (2010) who used annual time series data spanning 1955-2009 and found a threshold inflation of between 6 -10% .Although Frimpong and Oteng-Abayie (2010) found evidence of a threshold effect of inflation on economic growth at 11% inflation rate, they conclude that if the level of inflation is above 11% then economic growth is significantly impeded whereas when inflation was in the single-digits its impact on economic growth was likely to be mild. Frimpong and Oteng-Abayie (2010) is very relevant to this present study because it sought to compute the threshold value – which this present study also employs, instead of imposing it. Except that this present study employs two different methods of the Threshold regression method and the Autoregressive Distributed Lag model, with the results from both models reinforcing each other.

However, this finding differs from the conclusions of the works by Quartey (2010) who found that the growth maximizing inflation rate was in the double digits of 22.2% and Ayisi et al. (2013) who found a threshold inflation of 21%, to some extent not supporting the single-digit argument.

4.8.4.1 Result of Model Diagnosis

The ARDL model is diagnosed by testing for serial correlation in the residuals, checking the stability as well as performing a bounds test. The tables and figures below shows these results.

4.8.4.1.1 Result for serial correlation test

Table eight (8) below shows the result of the Breusch-Godfrey Serial Correlation test

Table 8: Breusch-Godfrey Serial Correlation LM Test Result

lags(p)	chi ²	df	Prob > chi2
4	2.503	4	0.6441
H₀: no serial correlation			

The result of the test done at 4 lags shows that the null hypothesis of no serial correlation cannot be rejected, hence there is no serial correlation. The result as displayed in table eight (8) above shows chi squared value of 2.503 and a probability of 0.6441 which is greater than the 5%(0.05) significance level, hence we fail to reject the null hypothesis implying that there is no serial correlation in the model.

4.8.4.1.2 Test for stability

Stability can be done by using the Cumulative Sum of Squares (CUSUM). This is shown in Figure five (5).

Figure 7: Cumulative Sum of Squares graph

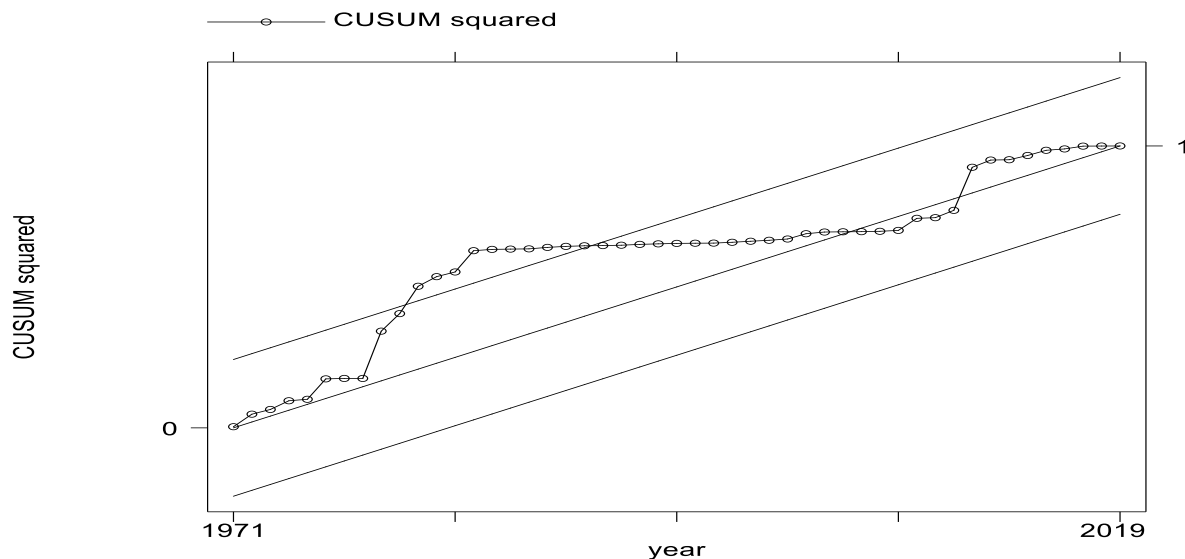


Figure 7 above gives the result of the stability test carried out on the estimated model. The CUSUM plotted against the critical bound of the 5% significant level show that the model is largely stable overtime. It therefore be concluded the model is stable and good for analysis.

4.8.4.1.3 Result of Coefficient Diagnosis(Bounds Test)

Table nine (9) shows the result of the coefficient diagnosis which is done by applying the bounds test procedure.

Table 9: Result of Coefficient Diagnosis (Bounds Test)H₀: no level relationship

F = 5.136

t = -4.917

	10%		5%		1%		p-value	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
F	2.564	3.786	3.080	4.445	4.276	5.954	0.003	0.024
t	-2.523	-3.628	-2.864	-4.020	-3.547	-4.794	0.000	0.008

From the table 9 above, the F statistic as calculated is 5.139 as pointed out earlier this value has to be compared with the critical values proposed by Pesaran, Shin and Smith (2001). The interpretation is that if the computed F-statistic lies above the upper level of the band I (1), the null is rejected, indicating cointegration. If the computed F-statistics lies below the lower level band, the null cannot be rejected, supporting the absence of cointegration. If the statistics fall within the band, inference would be inconclusive.

The computed F statistic of 5.136 is above the lower and upper bound level at the 10% and 5% significant level respectively. To that extent we cannot reject the null hypothesis of no cointegration and conclude that there is cointegration at the 5% and 10% significance level. The confirmation of a long run relationship among the variable reinforces the optimality of the threshold band from to 5 – 7 percent.

4.9 Conclusion

Using the ARDL model it was found that inflation rates between 5-7% were the ideal given the data available. This led to conclusion that the single-digit inflation targeting was optimal. This

conclusion was corroborated by the second technique being the Threshold regression method which also concluded there existed a threshold of 7.71 per cent inflation above which inflation was not conducive for the growth of per capita income.

At this point, it is worth mentioning that the first objective of the study to estimate an optimal inflation for Ghana is achieved and concludes that the optimal inflation is a band within the single-digit regime. It is observed that when inflation is higher than 7.71% the impact on growth of Per capita GDP is stronger than when inflation is below the 7.71% rate. This goes to confirm the observation in other similar studies of the negative relation between inflation and growth at higher levels of inflation. In addition, the estimated coefficients on Gross Capital Formation show a positive and relationship with Per Capita GDP. Again, financial depth (M2) also has a positive and significant effect on economic growth, all of which are confirmed in literature.

CHAPTER FIVE

CONCLUSION AND POLICY RECOMMENDATIONS

5.1 Summary and Conclusion

This study was mainly concerned with establishing whether Ghana's single-digit inflation targeting monetary policy stance was a good thing to pursue. To that extent, the study went further to consider the interrelationships between inflation on one hand , GDP growth and Per Capita income growth on the other hand and other variables of interest to economic growth.

It was observed that high and rising inflation is not a pleasant phenomenon and so if there is a way to bring down and stabilise inflation then such should be sought by monetary authorities. Nonetheless, there is often a trade-off between bringing down inflation and enhancing the levels of other critical macroeconomic indicators such as employment, interest rates among others. There is therefore the need to find a balance between inflation and these variables, that is to say a level of inflation that can “grease the wheels of the economy’ adequately or even mitigate the trade-offs inherent in the inter-relationships. This implies that the monetary authority would have to look for the ideal rate of inflation.

It is in this direction that many monetary authorities the world over have taken to perform monetary policy within the Inflation Targeting framework and consequently pursue an explicit inflation rate or level over a certain time horizon for their economies. Such a level of inflation is expected to anchor expectations of the relevant economic agents about price changes in the economy so that they can “put up their best behavior” to promote economic growth and the welfare of all. In this wise also, Ghana has being practicing inflation targeting monetary policy officially since May

2007. The country has chosen a single-digit inflation target of 8% with a 2% band above or below in the medium term.

So, it is in this regard that this present study sought to establish whether the single-digit inflation targeting policy by the Central Bank was indeed ideal or optimal. The outcome of this quest should enable one to express informed views about effectiveness of monetary policy as practiced by the Ghana's Central Bank.

The study uses two different econometric methodologies i.e. the Autoregressive Distributed Lag model as proposed by Pesaran et al. (2001) and the Threshold Regression Model as proposed by Hansen (2000), respectively. The variables employed are the growth of Per Capita GDP, inflation, growth of Gross Capital formation as percentage of GDP, growth of Broad Money as a percentage of GDP and the growth government expenditure as a percentage of GDP spanning the years from 1965 to 2019.

The study found that inflation between 5 – 7% was the ideal rate of inflation that could impact the growth of Per Capita GDP. The two econometric methodologies corroborated each other. This led to conclusion that per the data used, the single-digit inflation targeting was optimal after all.

Again it was found that there was a structural change in the relationship between inflation and the growth of per capita income as from the year 2007. This gives some credence to the validity of the practice of inflation targeting by the Bank of Ghana as that was the year that the inflation targeting was implemented.

The results compared favourably with a number of similar studies previously undertaken for Ghana. However, it could be mentioned that this present study differs from the previous studies on certain levels, first being the fact it employed more than a single econometric methodology whereas most of the previous works used just a single methodology. Again, this present study employed more recent data to the year 2019.

5.2 Policy recommendations

The entire study and its findings are very significant for a number of reasons.

- The analysis has shown that it would be desirable for the Central Bank to keep targeting a single-digit inflation as it would aid in achieving robust economic growth and consequently improve the per capita GDP growth. This recommendation is further emphasised by the fact that there has been calls on the Bank of Ghana to reconsider its single-digit inflation target policy stance in view of the recurrent misses of the single-digit inflation target.
- Since one of the key requirements for the success of policy is credibility, all policymakers must strive to commit themselves to achieving targets and engender credibility. This is particularly relevant because monetary and fiscal policy in Ghana are undertaken by different entities. If one entity chooses to commit and the other does not, overall policy credibility is impaired. It is therefore recommended policy makers must commit to policy rules.
- Closely related to the above assertion, it is further recommended that government which is in charge of fiscal policy must also work to achieve policy targets and not be dissuaded by political business cycles.

- A substantial portion of the population would have to be convinced of the Central Bank's ability to ensure price stability, it is therefore recommended that the central bank commits itself to more transparency by enhancing communication to the general public. Indeed, if the central bank would be able to pursue its single-digit inflation target policy then it behooves on it to build consensus and carry "everyone" along on this quest. More so because it is when agents expectations are properly anchored policy effectiveness would be ensured.
- Furthermore, it is recommended that inflation has to be brought under control within growth enhancing ranges. This stems from the regular occurrences of target misses resulting from overshooting the target. Bringing down inflation could be achieved as the authorities employ tighter policy measures by a combination of fiscal and monetary policy. This stems from the fact that inflation targets has been missed very often
- Lastly, it is recommended that policymakers find other measures of mitigating the effects of bringing down inflation. Expectedly, bringing down inflation may create some harsh effect and so policymakers should find other measures of mitigating these hardships on the population. There could be several areas of public expenditure that may have to be adjusted as well as controlling the overall expenditure.

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