UNIVERSITY OF CAPE COAST

TARGETING PRICE AND FINANCIAL STABILITY IN GHANA: THE ROLE OF MONETARY POLICY AND MACROPRUDENTIAL REGULATIONS

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BY

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DECLARATION

Candidate's Declaration

I hereby affirm that this thesis is entirely unique to me and that no portion of it has ever been submitted for credit towards another degree at this university or anywhere else.

Candidate's Signature: …… Date: ……

Candidate's Name: Justine G. Kankpeyeng

Supervisor's Declaration

I hereby certify that the supervision of the thesis' preparation and presentation adhered to the standards established by the University of Cape Coast for thesis supervision.

Supervisor's Signature: …… Date: ……

Supervisor's Name: Professor William Gabriel Brafu- Insaidoo

ABSTRACT

Examining the effect of Ghana's macroprudential regulations and monetary policy on the nation's financial and price stability is the main objective of this study. It specifically looks at how these policies interact and what effect they have on Ghana's prices and financial stability. This is done using the Autoregressive Distributed Lag (ARDL) model to evaluate quarterly data from 2013 Q1 to 2022 Q1 provided by the Bank of Ghana (BoG), Ghana Statistical Service (GSS), and World Development Indicators (WDIs). The results show that macro-level prudential regulations have no long-term association with financial stability, but they have a favourable and significant short-term effect. Furthermore, the existence of monetary policy boosts the short-term effects of macro-level prudential regulations on financial stability but has no significant long-term influence. Additionally, without macro-level prudential regulations, monetary policy has a detrimental, albeit slight, effect on price stability; nevertheless, in their presence, the study finds a notable and statistically significant positive effect in the long-run. The study proposes as a recommendation that Ghana maintain its framework for managing inflation, using measures to control liquidity, borrowing costs, inflationary pressures, and foster stability, including policy rates and macro-level prudential regulations, particularly the primary reserve requirement ratio. Immediate concerns about financial stability can be addressed using a coordinated approach that combines macroprudential regulations and monetary policy, while fine-tuned macro-level prudential regulations should be the principal tool for long-term stability preservation.

KEYWORDS

Financial stability

Ghana

Macroprudential regulations

Monetary policy

Price stability

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DEDICATION

To Prof. Kankpeyeng Warinsie Benjamin, Christina Kankpeyeng, and my late dad

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LIST OF ABBREVIATIONS

AFSI	Aggregate Financial Soundness Indicator
AIC	Akaike Information Criterion
APRRR	Actual Primary Reserve Requirement Ratio
ARDL	Autoregressive Distributed Lag
BoG	Bank of Ghana
BP	Banks Profit
CAR	Capital Adequacy Ratio
CD	Credit Deposit
CLA	Core Liquid Assets to Total Assets
CLAS	Core Liquid Assets to Short-term Liability
CPI	Consumer Price Index
ECT	Error Correction Term
EXC	Official Exchange Rate
GDP	Gross Domestic Product
GSS	Ghana Statistical Service
IPF	Integrated Policy Framework
IMF	International Monetary Fun
LR	Lending Rate
MPR	Monetary Policy Rate
MP	Monetary Policy
MR	Macroprudential Regulation
NPL	Non-Performing Loans

PS	Price Stability
PP	Phillip Perron
RESET	Regression Specification Error Test
ROE	Return on Equity
ROA	Return on Assets
TB	Treasury Bill Rate
WDI	Wold Development Indicators
ZS	Z-Score

CHAPTER ONE

INTRODUCTION

This part contains information about the study's background, problem statement, purpose, objectives, questions and hypotheses, significance, study delimitations, and limits. Additionally, the organization of the study is also outlined to give readers a comprehensive understanding of its structure and content.

Background to the Study

Both price and financial stability create incentives for favourable economic outcomes and support economic growth and development in any country. Maintaining stable prices and ensuring financial stability are critical for an economy's smooth operation. Achieving financial stability in a country ensures price stability, which necessitates close collaboration between money and financial factors. Keeping prices steady is both a desired outcome and a monetary policy tool, as it has a significant impact on fostering sustainable economic expansion and overall macroeconomic stability (Pop 2016). Also, financial stability inspires confidence in its users. And denotes a situation in the financial system that consists of marketplaces, financial institutions, and associated infrastructure that has the ability to support actual economic activity effectively and manage any financial disruptions brought on by unanticipated events (Yensu et al., 2021).

Historically, the most important goal of monetary policy has been the attainment of economic stability, which entails researching the interdependence of financial and pricing stability. Monetary measures such as the monetary policy rate have been utilised to stabilise prices and financial

stability (Claessens 2013). However, the 2008–2009 worldwide economic downturn significantly altered the world economies and left policymakers with the tough task of restoring or sustaining macroeconomic indicators, particularly price and financial stability, as they were without any direction on how to do so due to the requirement to take swift action to alleviate time-pressing challenges. This is due to the fact that the crisis made them realise the inadequacies of the application of monetary measures in addressing both financial and pricing vulnerabilities. In an effort to better understand the operation of their various financial systems, central bankers switched from formulating macroeconomic policy and specifically monetary policy to coordinating monetary policy and macroprudential regulations (Roldán-Pea & Torres-Ferro 2016).

Macroprudential regulation's major goal is to sustain the financial system's stability so that it can sustainably contribute to gross domestic product growth (Uysal, 2017). Prior to the worldwide financial crisis, monetary policy goals frequently led to the implementation of macroprudential regulations, such as imposing reserve requirements and establishing capital requirements. But after the crisis, macroprudential regulations have become relevant with the detection of non-traditional monetary policy in many countries. And the acknowledgment that these instruments can help allay concerns brought on by the cyclical nature of finance, mostly as a result of developments in analytical modelling (Claessens 2013).

The synchronisation of monetary measures and macroprudential regulations is an efficient policy for achieving stability in prices and the

financial sector. Roldán-Pea and Torres-Ferro (2016) emphasised that the interactive use of these policies is important as ensuring stability in prices does not inevitably imply stability in finances and that macroprudential regulations are needed to decrease the occurrence of the accumulation of disruptions in the financial system, which are two issues that have unquestionably garnered the most attention in the reexamination of how monetary measures is implemented. According to Nier and Kang (2016), the working together of among monetary strategies and macroprudential regulations increase each policy's efficiency in accomplishing its main goal. Thus, when the two policies interact, the effectiveness of monetary measures in achieving price stability, which is their primary goal, is enhanced. Also, the efficiency of macroprudential regulations is improved by the achievement of financial stability as its primary goal. Shedding light, Uysal (2017) argues that macroprudential regulations and monetary measures impact the financial system just as monetary and fiscal policies do, and the relationships between them may result in rigidities. Therefore, to reduce potential side effects from each policy, the best possible policy response is the interaction of the policies.

In recent times, Ghana has experienced shocks, with the most recent being the global COVID-19 pandemic that has affected economies worldwide. As a response to these changing economic circumstances, the Bank of Ghana (BoG) has modified its procedures over time. According to Fosu (2015), while the objective of maintaining price stability has remained constant, Ghana's economic landscape and means of implementing monetary measures have altered. These modifications consist of the regulated regime that predated 1992, the implementation of monetary targeting from 1992 to 2002, and the

adoption of the inflation targeting strategy since 2002, which was formally declared in 2007. In May 2007, the 2002 Bank of Ghana Act, which provided the institution with implementation-related authority, legally adopted the management of inflation targeting as its monetary policy framework. The policy's primary goal is price stability (low and stable inflation), which is supported by utilising reserve requirements as a means of macroprudential regulation to manage financial stability (BoG, 2023). Other macroprudential regulation instruments used by the BoG to manage development finance institutions and reduce systemic risks in the Ghanaian financial sector are: (i) capital adequacy ratio (CAR), (ii) leverage ratio, (iii) liquidity requirement, (iv) lending limits, (v) limits on foreign currency borrowings, (vi) limits on investment, (vii) prudential returns, and (viii) Corporate governance arrangement.

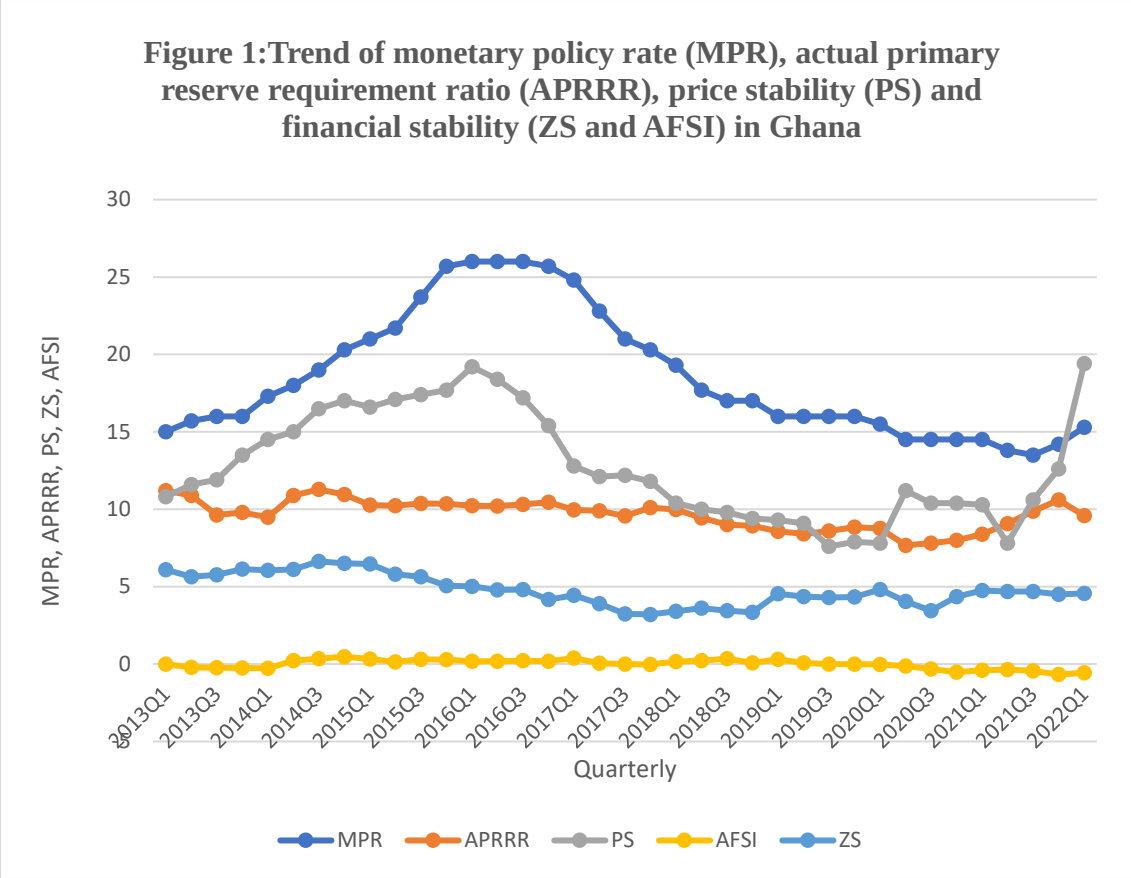

Figure 1: Trend of monetary policy rate (MPR), actual primary reserve requirement ratio (APRRR), price stability (PS) and financial stability (ZS and AFSI) in Ghana.

Source: Author (2023)

The BoG, which uses the policy rate as an anchor rate for other interest rates and to stabilise prices, has been increasing it, as shown in Figure 1. The reserve requirement, on the other hand, a macroprudential policy tool used by the BoG to regulate financial health, has increased but started falling, particularly from 2021 Q4 to 2022 Q1. Despite monetary policy's contractionary trend, inflation is rising, indicating price instability in the economy. The z-scores of banks and the aggregated financial soundness indicator (AFSI) also show a gradual loss in financial stability, a sign that the nation's financial sector is in poor condition.

The figure also demonstrates the possibility of contradictions between the goals of macroprudential regulation and monetary policy. Because there is a conflict between price stability, which is the primary goal of monetary policy, and financial stability, which is the primary goal of macroprudential regulation, Thus, their coordination in Ghana may be weak. Claessens, (2013) argued that the two policies can influence each other, and these interactions can either strengthen or weaken each policy's effectiveness in achieving its objectives. This is because of these interactions and certain requirements that are placed on institutional designs, prompting small open economies such as Ghana to reconsider their monetary policies. Thus, due to the limited possibility of international monetary measures coordination and the functional difficulties associated with aligning macroprudential measures.

Statement of the Problem

Since the implementation of inflation targeting in 2007, it has been the main strategy used by the BoG to achieve price and financial stability in Ghana. While the reserve requirement serves as a tool for prudential supervision to manage financial stability, the policy's primary objective is to ensure price stability (BoG, 2023). This shows a connection between macro-level prudential regulations and the BoG's execution of monetary measures.

Existing literature in other parts of the world, such as Roldán-Pea and Torres-Ferro (2016), Nier and Kang (2016), Smets (2014), and Uysal (2017), argues that the interaction between Monetary policy and macroprudential regulations improves financial and pricing stability as it eliminates conflicting policy directions. However, studies such as Claessens (2013) argue that the interaction has both strengths and weaknesses. However, there is limited

knowledge of the interplay among monetary policy and macroprudential regulations that combine to attain stability in prices and the overall financial system, particularly in Ghana.

The most pertinent studies to date have concentrated on various facets of Ghana's fiscal policy, monetary policy, exchange rates, monetary policy effectiveness, financial stability measurement, and banking sector sustainability. These studies include Havi and Enu (2015), Iddrisu and Alagidede (2022), Adu et al. (2015), Akosah et al. (2018), Maama (2021), and Yensu et al (2021). So far, it has been difficult to identify any study on Ghana which investigates the complementing effect of monetary policy and macroprudential policy on price and financial stability in Ghana.

This investigation aims to address this deficiency by exploring how both stability in prices and the financial system are impacted by Ghana's monetary policy and macroprudential regulations. By completing this study, we can evaluate Ghana's monetary policy's efficacy and advance our knowledge in relation to Macro-level prudential regulations interact with the monetary system to keep the country's economy stable.

Also, the outcome of the study will help know the potency of monetary and macroprudential policies which will enable the achievement of price and financial stability. Investors trust will be encouraged and increase Ghana's GDP. The Sustainable Development Goals (SDGs) aim number two, "zero hunger," will be more likely to be achieved as a result of the rising GDP, which will represent an improvement in living conditions.

Purpose of the Study

Identifying the influence of Ghana's macro-level prudential regulations and monetary policy on the nation's financial and price stability is the study's main objective.

Research Objectives

In particular, the investigation seeks to:

1. determine the influence of macroprudential regulation on the stability of the banking sector in Ghana
2. assess how macroprudential regulation influence banks financial stability conditioned upon the existence of an expansionary (restrictive) monetary policy
3. examine monetary policy's effects on preserving a steady price level in Ghana
4. investigate monetary policy's effects on price stability conditioned upon the existence of a stringent (lax) macroprudential policy

Research Hypotheses

1. H_0: Macroprudential regulations have a statistically significant effect on Ghana's banks financial stability.

   H_1: Macroprudential regulations have no statistically significant effect on banks financial soundness in Ghana.
2. H_0: The financial stability of banks in Ghana is influenced significantly by interacting actual primary reserve requirement ratio and monetary policy rate.

H_1: Coordination between the policy rate and the actual primary reserve requirement ratio does not significantly influence Ghana's banks financial stability.

3. H_0: There is statistically strong evidence that monetary policy has an effect on Ghana's price stability.

   H_1: Monetary policy does not exert a significant influence in maintaining stable prices in Ghana.

4. H_0: The coordination of the short-term interest rate policy and the actual primary reserve requirement ratio has a significant effect on Ghana's pricing stability.

   H_1: The interplay of the short-term interest rate policy and the actual primary reserve requirement ratio has an insignificant impact on price stability in Ghana's economy.

Significance of the Study

Any endeavour to lessen financial and pricing instability is a coordinated one aimed at accelerating economic growth. By identifying how the influence of Ghana's macro-level regulations and monetary policy needs to be applied to ensure stable prices as well as financial stability in the nation, the study's conclusions will help promote stable prices and banking sector stability. According to the study's findings, monetary policymakers (BoG) will be able to choose the best course of action for maintaining financial stability and price stability. As stability or mild instability is a sign of a healthy economy, this will reduce pricing instability and banks' financial instability, luring investors. This is due to the fact that increasing investor trust will encourage significant investment and increase Ghana's GDP. The Sustainable

Development Goals (SDGs) aim number two, "zero hunger," will be more likely to be achieved as a result of the rising GDP, which will represent an improvement in living conditions. The discoveries of this research would also serve as a springboard for more investigation.

Delimitation of the Study

The study looks at Ghana's financial stability and price stability in relation to monetary and macro-level prudential regulations. Key variables include non-performing loans, capital-based macroprudential regulation such as CAR, monetary policy rate, actual primary requirement ratio, banks' profit, treasury bills, lending rate, and macroeconomic indicators like GDP and exchange rate. Additionally, this is different from other research on the subject, the study computed an aggregated indicator along with utilising the z-score of banks as measures of financial sector soundness.

Limitations of the Study

The study has its own set of limitations, similar to any other research. Given that the study considered a macro perspective on the general stability of banks using time series data, the use of cross-sectional data for individuals' banks may provide more detailed relationships. Also, the study focuses on the banking sector, with no consideration given to other institutions such as insurance companies.

Additionally, the study transformed annual and monthly data to quarterly. Therefore, there is the possibility of Interpolation challenges. However, the descriptive statistics suggest that there are no outliers in the dataset after the interpolation, hence, the challenges of interpolation are ignorable.

Definition of Terms

The idea of financial stability in this study pertains to a banking system that is reliable and effective. Maintaining a stable financial environment is important for efficient financial system operation and the effectiveness of the process of transmission, which improves the effectiveness of achieving stable prices (Smets, 2014).

Price stability refers to sustaining stable prices of goods and services in an economy spanning a long period of time. When the consumer price index in the economy has a minimal fluctuation within periods.

Monetary policy is the application of the MPR by the BoG to controls price instability and achieve economic growth in the economy.

Macroprudential regulations refer to the use of the reserve requirements ratio in regulating banks in the economy.

Organization of the Study

The study includes five chapters. The opening chapter, covered background to the study, the problem statement, research objectives, and questions. hypothesis, significance of the study, delimitation, limitations, and organisation. Chapter Two contains the study's literature review. Chapter Three presents the research approach. Chapter Four deals with the data analysis, results, and discussions, while Chapter Five covers the summary, conclusion, and suggestions.

CHAPTER TWO

LITERATURE REVIEW

Introduction

This chapter focuses on the conceptual framework, theories, and empirical research that are important to the topic. In the review, monetary policy's influence and actions to protect the financial system on keeping prices steady and making sure the financial system is stable is discussed in relation to both theoretical and empirical evidence.

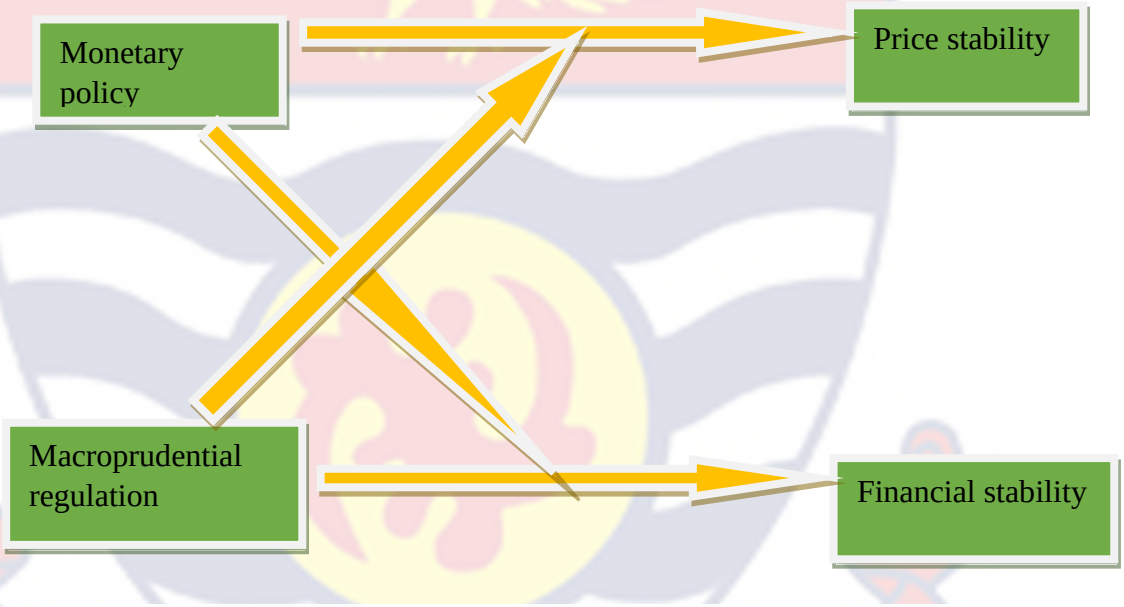

Figure 2: Conceptual Framework

Source: adapted from Nier and Kang, (2016)

Monetary policy and measures to protect the financial system's interactions with one another are necessary because the operation of one policy alone has a side effect on the other. So, the interaction of the two policies produces better results by minimising the side effects present (Nier and Kang, 2016). The interaction of the policies is possible, according to Nier and Kang (2016), in three ways.

Firstly, there are a variety of "side effects" that money management policy might have on financial stability. But when it interacts with macroprudential policy, it mitigates these unintended consequences, giving monetary policy more leeway to pursue its main goal. Second, tighter macroprudential policy instruments, when operated alone, may have "side consequences" that reduce price stability. However, when combined with successful monetary policy, it can offset these impacts by increasing margin accommodation. Finally, macroprudential policy can create safety nets that can be loosened during tough financial times. Such a policy can assist in maintaining the transmission of monetary policy, retaining its efficacy in the face of such stress.

Policymakers utilise these two crucial tools to ensure both price stability and financial stability: macroprudential regulation and monetary policy. All objectives are performed concurrently, and this, however, depends on the communication mechanism between the two instruments.

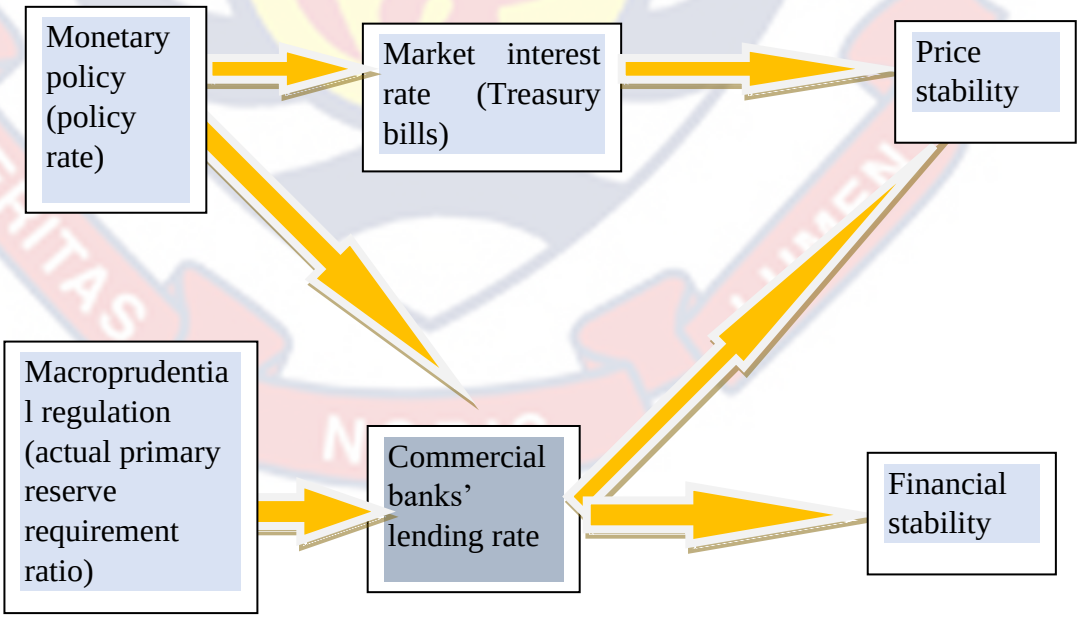

Figure 3: Interaction of Monetary Policy and Macroprudential Regulation

Source: adapted from Spencer, (2014)

From Figure 3, systemic risks in banks are lessened by macroprudential regulations in two ways: a). curbing asset prices and credit cycles b. by making balance sheets more resilient throughout the cycle's downturn (Spencer, 2014). In Spencer's view, when coordinating monetary policy and macroprudential regulations, the focus is on curbing asset prices and credit cycles.

An increase in macroprudential regulations such as reserve requirements by the central bank will reduce the money available for lending, which will raise interest rates and lessen inflationary pressures. This will result in stable prices. Higher reserve requirements will also make the financial system more stable by guaranteeing that banks have adequate cash on hand to fulfil their obligations. Also, an increase in monetary policy, like the policy rate, by the central bank increases the costs of borrowing, which results in less lending and expenditure. This will ultimately lead to a reduction in inflationary pressures. Hence, prices will remain stable. The danger of loan defaults and other financial obligations being missed, however, is another way that increased interest rates could cause financial stability.

Theoretical Review

The theoretical frameworks that define the ways that monetary policy and macro-level prudential rules mutually influence stable prices and the financial system stability are presented in this section. The integrated policy framework (IPF) by the International Monetary Fund (IMF) and the intermediate theory of money (I-theory of money) by (Sannikov & Brunnermeier 2012) provide the study's foundation theoretical framework.

The aforementioned theories serve as a reference for choosing the study variables.

The Integrated Policy Framework (IPF)

In response to the Mundell-Fleming model's shortcomings in the years since the 2008 worldwide financial crisis the IMF created the IPF, as stated in Ramlogan et al. (2021). It aims to integrate macro-level prudential regulations and monetary policy into a unified framework that addresses the objectives of financial stability and price stability. It coordinates several policy instruments to simultaneously accomplish multiple policy goals. In order to accomplish the following goals in terms of pricing stability as well as financial stability, the IPF utilised both money management and macro-level prudential regulations:

Central banks normally conduct monetary policy with the aim of maintaining price stability by controlling the money supply and interest rates. Central banks can alter borrowing and lending decisions by changing interest rates, which can possess an effect on inflation and economic expansion. Also, macro-level prudential rules strive to preserve stability in the financial sector by regulating the actions of financial institutions and markets. This may entail taking steps to regulate market players' behaviour as well as establishing capital and reserve requirements.

The IPF coordinates these two policy tools to achieve both financial stability and price stability. For instance, if inflation is high and threatens to undermine financial stability, central banks may raise interest rates to reduce inflation. However, if this causes a decline in lending and a rise in financial instability, Macroprudential regulations could be implemented to stabilise system of finance while the national bank focuses on inflation. Hence, the

study objectives will be achieved as they focus on addressing price and financial instabilities. Generally, the IPF is essential for achieving both financial and price stability and requires a coordinated approach to policy-making that takes into account the complex interactions between different parts of the economy.

Empirically, Basu et al. (2020) argues that the IPF is a system that looks for the best combination of monetary policy and Macroprudential measures (MPMs) or other policies to obtain a price and real sector stability and stable financial system in an open economy. Ramlogan et al. (2021) emphases that the IPF is important for the interaction of policies due to the following two main reasons:

Firstly, to deal with shocks, many nations have used unconventional strategies as opposed to traditional interest rate setting and flexible exchange rates. Shading a light on this, Basu et al. (2020) explained that Emerging Market Economies (EMEs) employed monetary policy rate reduction, Macroprudential regulation easing, relaxation of some CFMMs, and sales related to foreign currency reserves in the wake of COVID-19 epidemic to achieve real sector and price stability. Whereas others used monetary policy and "leaned against the wind" as their beginning of defense opposed to financial instabilities. Ramlogan et al. (2021) conclude that many nations, both developed and developing, have coordinated multiple policies, especially monetary policy and Macroprudential regulation, as seen throughout the US Federal Reserve's (Fed) effort to normalise monetary policy (between 2016 and 2018). These examples of coordinated policymaking show that nations are

moving beyond the suggestions made by traditional models of monetary and demand theory, such as the Framework for M-F.

Secondly, the empirical data does not support several of the M-F paradigm's fundamental assumptions. The "impossible trinity" or "trilemma" is the name given to the idea that nations can simultaneously pursue either two, with certain exceptions, the following policy goals: steady exchange rate, monetary independence, and openness of finance. Robert Mundell and Marcus Fleming first proposed this famous aphorism in the early 1960s. The surge in boom-bust cycles in capital flows over the past few decades has cast doubt on the M-F model's insights, despite its appeal as a de facto guide for policy-making in EMEs (Rey, 2015). Moreover, Bergant et al. (2020) presented proof that there is actual complexity in the real world that makes policy-making more complex than simply deciding on a policy rate. In greater detail, Bergant et al. (2020) demonstrated that stricter Macroprudential regulation reduces the sensitivity of GDP growth in EMEs to external and capital flow shocks and permits monetary policy to respond to global financial shocks more countercyclically.

The Intermediate Theory of Money (I-Theory of Money)

A whole different viewpoint on optimal monetary policy—one that goes well beyond inflation targeting—is offered by the theory's conceptual foundation. The I-theory of money proposed by Sannikov and Brunnermeier (2012) is a model that best represents monetary policy's interaction with financial system stability. The I-theory of money contends that due to financial frictions, pricing, financial stability, and fiscal stability are interwoven. During downturns, optimal monetary policy should spot and remove balance sheet obstructions that prevent money from flowing to the economy's productive

sectors. This indicates the potency of monetary policy in strengthening macro-level prudential policies address financial instabilities the focus of the study objective 2. When the economy is doing well, caution is needed to avoid imbalances that leave it open to liquidity and deflationary spirals. Brunnermeier and Sannikov (2013) emphasize that because the level of inside money production and the cost of risk are largely determined by the health of the financial intermediation sector of an economy, there is a stable price-Related Relationship with financial stability. Thus, lowering the short-term interest rate can boost the price of long-term bonds, stabilizing the balance sheets of banks. Similar to this, buying particular assets may enhance prices and so aid countries that are burdened by high debt.

Empirical Review

This section includes empirical studies that examine the influence of monetary measures and macro-level prudential rules on the stability of prices, as well as the financial system, and other study variables like the exchange rate, GDP, CAR, lending rate, non-performing loans, and bank profits.

An Empirical Examination of How Monetary Policy and Macro-Level Prudential Regulations Work Together

The interaction of monetary strategy and macroprudential regulations gained recognition after the financial crisis worldwide in 2008. There were concerns about how much financial stability goals should be considered in price-stability-oriented monetary policy frameworks, as financial instability was a nightmare during the crisis.

Smets (2014) reviewed both theoretical and empirical works and concluded that macroprudential regulations are good for financial stability and

should be used to stabilise the financial sector. However, it should be in coordination with a monetary policy where financial stability is monitored by monetary policymakers. This will enable the central bank to adjust its course, when necessary, even though its main focus is on continuing price stability for all periods.

According to Rubio and Carrasco-Gallego's (2014) study, "Investigating Monetary Policy and Macroprudential Regulations: Implications for Financial Stability and Social Welfare," when the two policies are implemented in concert, they unmistakably work together to promote both societal welfare and financial stability. Even so, when they are not coordinated, societal welfare is greatly increased.

Shedding a light on monetary policy's and macro-level prudential regulations coordinating effects on financial stability, Jiang et al. (2019) examined the outcomes of synchronizing macroprudential and monetary policy on the long-term viability of finance and financial stability: Evidence from China. Their study concludes that monetary and macro-level prudential regulations must be coordinated to guarantee financial stability and the long-term viability of finance.

In his study on how monetary and macro-level prudential rules interact, Claessens (2013) concludes that while macro-level prudential measures can affect price stability, including the stability of the real sector, monetary policy also has a bearing on financial stability. The study stresses that, as discovered for the interaction of the monetary and fiscal frameworks, money-related and macroprudential measures can both be changed to take

interactions into account. Even so, their contact has both favorable and unfavorable effects on each person's primary goal.

Cecchetti and Kohler (2012) examine the extent to which macroprudential policies and policy rates might be used as alternatives in achieving the goal of stabilizing the economy using a straightforward macroeconomic model. Their study discovers that both of them serve as stand-ins for fulfilling monetary policy objectives. Also, the study demonstrates that they can both be utilized to achieve financial stability goals in theory. The study concludes that coordination is required between the application of money management instruments and macroprudential tools.

Rubio (2016) uses the New Keynesian framework to create a dynamic stochastic general equilibrium (DSGE) model solution that incorporates the real estate market as well as Savings and loan users. The macroeconomy and financial markets are stabilized by monetary guidelines and macro-level prudential policies in two different contexts: when dealing with rates for both short and long terms. According to the findings, macroprudential and monetary interventions are more ineffective at reducing interest rates with longer maturity periods. But when it comes to rates with shorter maturity periods, monetary intervention can bring about stability in finance while possibly escalating macroeconomic instability. However, macroprudential policy greatly enhances financial stability when dealing with short-term rates but only somewhat when dealing with long-term rates.

In their study entitled Analysis of macroprudential and monetary intervention in light of welfare, Rubio and Carrasco-Gallego (2015) conclude that the best combination of policies when both macro-level prudential and

monetary interventions are used simultaneously is the preservation of stable prices, which is the focus of monetary policy, while the macro-level prudential regulations concentrate on maintaining stability in the financial system. But adding a macroprudential rule or broadening monetary policy both help to strengthen financial stability. Their study utilizes a DSGE model with a housing market and collateral limits and investigates the interplay of macroprudential and monetary policies.

Determinants of Financial Stability

Capital Adequacy Ratio

Many nations, including Ghana, employ capital adequacy requirements as a key tool for managing their financial sectors. Aiyar et al. (2014) claim that tighter money-lending practices and rising capital requirements for banks both have an adverse effect on their financial stability. This underscores the necessity of coordinating the use of conventional monetary tools and macroprudential controls, a need that will unavoidably have an impact on the creation of the governing structure meant to fulfill the shared objectives of stability in the macroeconomic and financial systems.

According to Sang (2021), the ratio of capital to assets favors Vietnam's financial stability. His study uses the Generalized Method of Moments (GMM) model to look at how the capital adequacy ratio might affect the 18 Vietnamese commercial banks' ability to stay in business between 2010 and 2020. The study's findings suggest that CAR might help banks become more financially stable.

In the view of Antwi (2019), CAR has a negative impact on bank performance, which could put banks in danger of bankruptcy. In his study, the

connection between Ghanaian banks' performance, capital sufficiency, and ratio of costs to income is looked at. The investigation focused on a list of some of the banks that are traded on the Ghana Stock Exchange and used data from banks' annual reports for the fiscal years ending between 2013 and 2018. According to the report, CAR can contribute to Ghanaian banks' financial instability.

The Z-Score of Nigerian deposit money institutions is positively impacted by the Capital Adequacy Ratio (CAR), according to Kparobo and Ikeora (2022), but this impact is not statistically significant. In the study, the effect of NPLs, capital adequacy, and corporate governance on bank stability in Nigeria from 2006 to 2021 was examined. With E-Views version 9.0, their study analysed secondary data from Deposit Money Bank annual reports and accounts as well as the NDIC annual report and accounts. In the study, corporate governance was divided into internal and external control (INTC and EXTC), and used the Z-score as the dependent variable to measure bank strength. The independent variables were the non-performing loan ratio and the capital adequacy ratio.

Macroprudential Regulations

Regarding macroprudential regulations on the stability of finance, Kim and Mehrotra (2017) investigate the management of price and financial stability objectives in Asia and the Pacific inflation-targeting economies. The technique used is structural vector autoregression, which includes shocks resulting from monetary and macro-level prudential policy for four of the region's economies. Using historical breakdowns, the study evaluates the role played by each policy shock in explaining departures from the goals of the

other policies. Their study's findings suggest that there have been times when disruptions to macroprudential policy have caused inflation to depart from the inflation objective set by central banks. Furthermore, there have been instances where Shocks to the monetary system have facilitated increased credit activity, implying that short-term compromises exist between maintaining price stability and ensuring financial stability goals. The paper also notes instances where changes in monetary and macroprudential policies helped strengthen financial stability and stabilize inflation.

According to Takyi and Obeng (2013), over time, Ghana's economy's finance industry has suffered negatively as a result of macroprudential policies. They revealed this in a study titled "Determinants of Financial Development in Ghana" that used the ARDL model. The results of this study, which focused on financial development rather than financial stability as in the current study, may not be the same as those of a study with a different focus.

Glocker (2021) investigated how related macroprudential regulations and financial sector stability are related and concluded that when there is a limit on the ability to alter deposit rates, the cost effect brought on by high macroprudential regulations encourages banks to select riskier assets, which worsens their financial stability. This indicates tighter macroprudential regulations affect banks' financial health negatively. Glocker and Towbin (2012) examine the conditions under which macroprudential regulations can function as a policy tool for maintaining financial or price stability. This is accomplished using an example of a small open economy that involves the banking industry and persistent prices subjected to a legal macroprudential regulations as well as financial frictions. They then calculate the best interest

rate and macroprudential regulations in situations where financial frictions are prominent. The study concludes that macroprudential regulations can only contribute to price stability if there are significant financial frictions and that they provide considerable benefits when financial stability is a concern.

In the view of Uysal (2017), higher macroprudential regulations can yield low loanable funds through the quantity channel and higher credit interest rates through the pricing channel, which slows the development of vehicle loans for financial institutions. His study focuses on financial stability and macroprudential regulations in Turkey. Also, studying whether macroprudential regulations are important for both price and financial stability, Horrigan (1988) concludes that macroprudential regulations and the payment of interest on macroprudential regulations are insignificant for economic stability as long as when macro-level prudential regulations or the interest rate change, the central bank either (1) modifies the supply of reserves or currency or (2) economic actors correctly estimate the current interest rate when developing their price level expectations.

Agur and Demertzis (2019) argue that when macro-level prudential regulations are in place, monetary policy has an inverse relationship with financial stability. They investigated when macroprudential regulations mitigated monetary policy's effects on financial system stability. And simulated the risk-taking by banks as a result of monetary policy transmission as well as its interplay with a regulator's optimisation issue.

Monetary Policy

Garca-Herrero and Del Rio Lopez (2003) studied the effects of monetary policy on financial stability and came to the conclusion that when

central banks prioritise stable prices as their main objective, financial instability is decreased. With an emphasis on monetary policy design, they add to the body of knowledge on the factors that contribute to financial stability. They also looked at how choosing central banks' goals and the related monetary tools techniques affected stable financial system in 79 countries between 1970 and 2000. Due to their dynamic economies, the study's generalizability is restricted to the chosen nations.

Cesa-Bianchi and Rebucci (2017) claim that restrictive monetary policy in a monopoly banking system increases the risk of financial instability in response to contractionary economic shocks. And when only the policy rate is the applicable weapon, monetary policy authorities must decide between macroeconomic and financial stability. They looked at how loosening monetary policy affects the stability of financial systems. Also, the model they used in their analysis took both macroeconomic and financial constraints into account. It showed how monetary guidelines and macro-level prudential policies interact and what role US monetary and regulatory policies played in the years before the subprime mortgage crisis.

Shedding additional light on how monetary policy affects a financial system's resilience. Does the resilience of banks depend on monetary policy? was the question posed by Altunbas et al. in 2010 to look into how monetary policy affects the financial health of banks. Their research comes to the conclusion that a long-term low monetary policy increases bank instability. The level of supervision, securitization activity, and bank competition are a few examples of macroeconomic and institutional controls that are applicable

to various risk metrics. The outcomes indicate that monetary policy causes financial instability.

Lending Rate

Lengnick et al. (2013) used an agent-based credit network approach in investigating money creation and financial instability and concluded that while lending rates can help stabilise the economy under normal circumstances, they exacerbate systemic instability, contagion, and bankruptcy cascades during times of crisis. According to Köhler (2015), countries with high lending rates have less financial stability. He investigated which banks were the riskiest. Focusing on the effect of corporate strategies on bank resilience.

Koskei (2020a) examined the factors affecting the financial stability of Kenya's commercial banks and came to the conclusion that the banks' lending rates are detrimental to their financial stability. In his research, data from January 2015 to December 2019 were analyzed using multiple linear regression. However, Morgan and Zhang (2017) contend that banks' high mortgage lending rates have a favourable considerable influence on the financial system's stability. They investigated the connection between sound financial conditions and mortgage lending. It performed an analysis to determine the impact of a bank's share of mortgage lending on the bank's Z-score and the percentage of non-performing loans, two financial stability indicators. The study examined 1889 banks, a sample, from 65 developed and emerging economies, between 1987 and 2014. The study by Morgan and Zhang focuses on developed and developing economies in Europe and Asia, which may be different in the context of Africa.

Non-Performing Loan

Khan (2020) asserts that non-performing loans undermine Pakistan's commercial banks' ability to maintain financial stability. His research examines the impact of defaulted loans from 2014 to 2018 on finance sector stability. It assesses the financial soundness of Pakistani commercial banks and makes predictions about how various economic scenarios, including optimistic, pessimistic, and worst-case scenarios, may affect their soundness. However, Koskei (2020b) examined what defaulting loans do on the stability of Kenya's commercial banks and came to the conclusion that defaulted loans had a favourable influence on banks' financial stability. Specifically, over the time frame of January 2015 to December 2019, the defaulting loan ratio was used as a tool to track non-performing loans, and banks' Z-scores were used as a gauge of their financial health. The multiple regression model was used in his investigation.

According to Atoi (2019), multinational banks can endure shocks from non-performing loans (NPLs) over an extended period, even though they can encounter brief swings over the short run. As opposed to that, long-term NPL shocks can threaten the stability of national banks. His study focused on determining how defaulted loans affected banks soundness in Nigerian with both national and foreign licences. The study uses a "restricted" dynamic generalised method of moments (GMM) to predict the drivers of NPLs for each licenced category, taking into account both macroeconomic and bank-specific factors. It covers the period from 2014 Q2 to 2017 Q2. The paper creates a Z-score to represent bank stability and uses a panel vector autoregressive framework to analyse how this score responds to NPL shocks.

NPLs have a favourable but with a negligible statistical effect on the stability of banks, in Kparobo and Ikeora's (2022) estimation. Their study examined the effects of NPLs, capital sufficiency, and corporate governance on the stability of Nigerian banks from 2006 and 2021. secondary information from Deposit Money Bank yearly reports and accounts as well as the NDIC annual report and accounts were analysed using multiple regression analysis in the study using E-Views version 9.0. In the study, corporate governance was divided into internal and external control (INTC and EXTC), and utilised the Z-score as the dependent variable to measure bank strength. The independent variables were the defaulted loans ratio and the capital -assets ratio.

Bank Profit

In their 2018 study, Rupeika-Apoga et al. focused on both Nordic and non-Nordic banks while examining the stability of Latvian banks. The study found that banks' profitability has a major impact on their stability. Further, the study revealed the positive effects of GDP expansion and inflation on bank stability. The study looked at both macroeconomic (exogenous) and bank-specific (endogenous) factors while examining the variables that affect the stability of banks in Latvia. The impact of numerous variables on bank stability was investigated using multivariate regression analysis methods, which were applied to the yearly financial statements of Latvian banks from 2003 to 2016.

Investigating the relationship between bank profitability and financial stability from a theoretical and empirical perspective. With an emphasis on non-interest revenue and retail-oriented operations, Xu et al. (2019) created a theoretical framework and panel regression analysis to study the relationship

between bank profitability and financial stability. The results show that the profitability and stability of a bank are not positively correlated. They examined a sample of 431 publicly traded banks from 2004 to 2017 that included GSIBs, banks from advanced European nations, and banks from the United States.

According to Pessarossi et al. (2020), it is unknown whether a bank's big profit is favourable for its stability in Europe. Their work makes use of four separate sets of metrics for assessing high profitability in logit models, analysing cases of distressed European banks from a thoroughly compiled dataset. The results demonstrate that great profitability does not lessen the possibility of bank trouble. Their findings also suggest that there is less evidence that, over a three-year period, bank distress may become more common due to high profitability. These results refute the hypothesis that increasing bank profitability will increase bank stability.

Exchange Rate

Stoica and Ihnatov conducted research on the influence of exchange rate regimes on financial stability in 2016, concentrating on 135 European nations. According to the analysis, from 1999 to 2010, there was a bad correlation between exchange rates and financial stability. The study used the de jure and de facto classifications of exchange rates; however, the results were not consistent across exchange rate periods.

Eichengreen (1998) argues that exchange rates and financial stability have a positive correlation, but there is no correlation between exchange rates and financial instability in a study that examines the stability of exchange rates and banks in Europe. The study believes that when the stability of the banking

system is jeopardised by external factors, having a flexible exchange rate is advantageous. This discourages banks from relying too heavily on external financing and empowers domestic authorities to provide emergency funding when necessary. On the other hand, if the primary threats to the banking system's stability arise internally, there is a case for fixing the exchange rate. This constrains domestic policymakers and allows shocks to be absorbed by the external sector. However, exchange rate switches by policymakers always take time, and the argument by Eichengreen (1998) may not reflect in economies.

Inflation

The level of price stability is a significant determinant of any economy's financial stability. Ha et al. (2019) argues that a drawback relationship exists between high inflation and financial stability. But there is an advantageous association among low or stable prices and financial stability. Their investigation emphases that when there are low and stable prices, economic growth and development are improved, which reduces uncertainty, promotes efficient resource allocation, and maintains financial stability. This study, however, is a cross-economy study, and its findings may not depict a specific economic condition.

Merko and Habili (2023) contend that inflation adversely impacts financial stability in the Albanian economic system. Their study intends to evaluate how Albanian commercial banks' stability is impacted by inflation, interest rates, and exchange rates. Between May 2022 and December 2015, they collected information from the Institute of Statistics of Albania (INSTAT) and the Bank of Albania. A multiple regression model was

employed to examine the link between the independent variables and the dependent variable. However, this study's findings can only be broadly applied to Albania's economy.

Determinants of Price Stability

Macroprudential Regulation

Macroprudential regulations are essential in the stability of prices in an economy. Horrigan (1988) argues that economic stability, which includes price stability, is not affected by the number of macroprudential regulations or the payment of interest on macroprudential regulations. However, in 2022, Trabelsi conducted research on the connection between macroprudential openness and price stability in developing and emerging economies. The findings of the study revealed that increased macroprudential transparency has the potential to help emerging and developing economies achieve price stability by reducing banking crises. Furthermore, macroprudential transparency is especially beneficial for countries that do not use an inflation-targeting policy. In his study, he utilised an imbalanced panel consisting of 190 developing and emerging countries, as categorised by the International Monetary Fund (IMF). The duration of the investigation covers the years from 1998 to 2015, and the countries selected were chosen based on their implementation of macroprudential tools.

Tayler and Zilberman (2016) claim that regulatory countercyclical behavior is more successful in fostering stability in prices, finance, and the overall macroeconomy as opposed to monetary policy following credit disturbances. Furthermore, it is optimal to combine macroprudential control and a more aggressive anti-inflationary strategy when dealing with supply

shocks. The outcomes underline how significant Basel III agreements are in minimizing how central banks' balance output and inflation during financial upheaval. In a model incorporating the borrowing cost channel, where endogenous financial frictions are brought on by bank losses, credit risk, and capital expenses, their research focuses on the macroprudential functions of monetary and capital controls on banks.

Glocker and Towbin (2012) examine the use of macroprudential regulations as a policy tool in many emerging economies to achieve financial or price stability. Using a small open economy model with sticky prices, financial frictions, and legal reserve requirements, the study looks at what the best interest rate and macro-level prudential regulations are in the banking industry. The results indicate that reserve requirements are only effective in promoting price stability when there are significant financial frictions, and they can have a positive impact on financial stability.

Through the use of structural vector autoregressions, Kim and Mehrotra in 2018 investigated macroprudential and monetary policy's consequences. They found that the latter, which seeks to restrain credit expansion, has a considerable detrimental effect on macroeconomic indices like real GDP and price stability. There are numerous economies using macroprudential policies in the Asia-Pacific area in conjunction with inflation targeting to promote financial stability, their study investigates the implications of monetary and macro-level prudential regulations. even more so when the economy is doing well. They suggest combining the policies. However, they emphasis that stable price levels and the growth of the banking industry could pose difficulties for the government.

Monetary Policy

Gbadebo and Mohammed (2015) look at how well monetary policy works to stabilize prices in Nigeria. Quarterly time series data from 1980 Q1 to 2012 Q4 were used for the cointegration and error-correcting techniques approach was used to examine the relationship between price stability and monetary impulses. Their research showed that monetary policy significantly and adversely affects price stability in the short and long terms. The cointegration test also reveals a long-term connection between the chosen regressor vector and price stability.

According to Okotori (2019), in addition to the exchange rate, the monetary policy rate, the rate on treasury bills, and the reserve requirement, all have a considerable and effective impact on price stability. Additionally, his study's Johansen Cointegration test shows that price stability and all of the other variables examined have a long-term link. The study used a model that was constructed using monthly data from 2009 to 2017 to explore the relationship between monetary policy and price stability in Nigeria.

Examining the differences between macroprudential controls and monetary strategy in terms of their effects on credit and price stability, Suh (2014) conducted a comparison between macroprudential policy and monetary policy using a basic New Keynesian model that incorporates credit. The study shows that macroprudential policy can effectively stabilize credit with minimal impact on price stability. On the other hand, monetary policy can stabilize prices, but it is not precise enough to effectively stabilize credit.

The efficiency of Nigeria's monetary policy in upholding price stability was investigated by Itodo et al. in 2017. To solve unit root problems in the

time series data, they employ a Vector Autoregressive (VAR) model that contains differencing. Their conclusions suggest that the monetary policy in Nigeria has no statistically meaningful impact on the level of prices.

Lending Rate

Asamoah and Adu conducted a practical Assessment of variables affecting rates of interest in Ghana in 2016 and discovered a correlation between Ghana's price instability and banks' lending rates. Additionally, their research revealed a favourable correlation between Ghana's loan interest rate and both the exchange rate and the policy rate employed by the country's central bank. They made use of annual time series data collected between 1970 and 2013. Furthermore, according to Bodhgire (2021), the lending rate and price stability are positively and marginally significantly correlated. His research sought to determine how lending rates at private and public sector banks are affected by India's price stability. Regression and ANOVA methods were used to compare the inflation rate to the weighted average loan rates for the study period of 2010 to 2019.

Nainggolan et al. (2019) draw the conclusion that the lending rate of banks, which impacts price stability, has a favourable impact on inflation. They examine how the interest rates on loans and deposits affect price stability in Australia, South Korea, and Indonesia. For the three nations having Financial Services Authorities between 2004 and 2017, the study used 42 data points from the World Bank, including loan rates, deposit interest rates, and price stability (as determined by the consumer price index). The panel data approach was used for the analysis. In 2018, Darmawan looked into how Interest rates on loans, defaulted debts, and outside parties financing, and

inflation rates affected Indonesian commercial banks' lending to MSMEs. The Indonesia Stock Exchange provided secondary data for their study, which used a multiple linear regression analysis technique, for the years 2013 to 2015. From the investigation, it was determined that there is no meaningful connection between price stability and loan lending.

Treasury Bill

In the views of Logubayom (2015), T-bills and price stability have a log-quadratic relationship that is unidirectional, running from T-bill to price stability but is cointegrated. The focus of his study was on analyzing the dynamic connections between certain macroeconomic factors in Ghana using modeling techniques. According to Nyawata (2013), the use of treasury bill rates is the most effective way to reduce the flow of currency in an economy, thereby promoting stability in the financial sector and prices of goods and services. Nonetheless, his study emphasizes that the primary factors to take into account when making a decision are the central bank's operational autonomy, the advancement of the market, and the reinforcement of the signaling of monetary policy's effectiveness.

Ida et al. (2014) modelled the dynamic interrelationships between treasury bills, price stability, and exchange rates in Ghana. The study found that the treasury bill has a unidirectional effect on price stability and the exchange rate in the country. Multivariate time series analysis was employed for the period January 2000 to October 2012. The study concludes that the VAR (1) model is suitable for analysing and understanding patterns and trends in rates over a period of time. However, Olsson and Sharafuddin (2015) studied the relationships between price stability and treasury bills in the US

and discovered that there is no statistically significant relationship between treasury bills and price stability. Their study spanned from 1990 to 2015.

Gross Domestic Product (GDP)

In their study from 2014, Semuel and Nurina examined the impact of interest rates, exchange rates, and inflation on Indonesia's GDP growth rate and found no statistically significant association between price stability and GDP. However, Saymeh and Orabi (2013) found a strong positive correlation between GDP and price stability. Their study's main objective was to determine how Jordan's real economic development was impacted by changes in interest rates, inflation, and GDP between 2000 and 2010. Economic growth, interest rates, GDP, and inflation levels are the four variables included in the study's cointegration analysis.

Umair and Ullah (2013) argue that price stability and GDP have a negative statistically insignificant relationship in a study in which they examine the Indian economy between 2011 and 2018 to see how GDP and inflation affect the unemployment rate. Chang (2015) said GDP has a significant negative effect on price stability, particularly in the 2000s. The study emphases further that the majority of countries' GDP growth affects stable prices. Nonetheless, the study concludes that the GDP may not be sufficient to give a thorough grasp of the impact of current economic structural changes as well as changes in domestic and international economic conditions. The study focused on how the impact of the GDP gap on price stability has changed over time.

Exchange Rate

In Zimbabwe from 1980 to 2007, Madesha et al. (2013) looked at the empirical connection between exchange rates and price stability. The Granger causality test is used in the study, and the results show a long-term correlation between the exchange rate and price stability. Additionally, there was evidence that within the time period under study, price stability and currency rates had a Granger-Causal link.

Jiang and Kim's (2013) investigation of influence of exchange rates regarding the stability of prices in China unveiled that there is typically only a partial impact of exchange rate changes on price stability. A structural vector autoregression (SVAR) model is employed in the study to analyse how China's domestic monetary policy influences how exchange rate changes affect pricing. According to their study's findings, preserving exchange rate stability has a considerable and distinct impact on ensuring price stability in China.

Abdurehman and Hacilar (2016) examine the connection between price stability and Turkey's exchange rate. To examine how the exchange rate and price stability are related, they used an OLS regression and a straightforward GARCH model. The findings of the OLS regression showed that Turkey does not have Purchasing Power Parity (PPP). Contrarily, the application of ARCH and GARCH within the context of the connection raises the possibility that PPP discrepancies are not random but rather have a pattern.

Chapter Summary

This chapter discusses relevant literatures both theoretical and empirical as well as a conceptual framework. The conceptual framework explained the transmission mechanism of monetary policy and macroprudential regulations to price and financial stability. The chapter discussions explained the need to integrate both monetary and macro-level prudential regulations to achieve price and financial stability, as the focus of the study.

CHAPTER THREE

RESEARCH METHODS

Introduction

The emphasis in Chapter 2 was a review of pertinent literature. In this chapter, the research approach and estimation techniques are explained. The research design, data sources, formulation of the empirical model, methods for data analysis, stationarity tests, measurements of the variables, and chapter summary are all specifically covered.

Research Design

An approach a researcher employs to guide the study is known as a research design. In particular, before data collection begins to achieve the research goal, a research design's purpose is to transform a topic for investigation into information that might be evaluated to generate precise answers to the research issues at the lowest possible expense. The choice of an appropriate research design is determined by a thorough investigation of the issue statement, research questions, theoretical or conceptual framework, and pertinent literature (Bostley, 2019). An explanatory research design was used in the study. The explanatory research design is helpful for identifying relationships, causes, and effects of a topic being studied, as well as why things are the way they are (Leavy, 2022), because the study's focus is to examine monetary policy's and macroprudential regulations' mutually reinforcing effects regarding pricing stability and financial stability in Ghana.

This work applies positivist philosophy. This is so that the researcher can use it to perform social research deductively and to explain the relationship among variables. Also, positivist researchers operationalize ideas

to measure them and use them to create hypotheses that will aid in reaching conclusions.

Research approaches can be categorised as either quantitative, qualitative, or mixed (quantitative and qualitative). Given that this study is quantitative in nature, it employs a quantitative approach. In quantitative studies, data is acquired in numerical form, metric form, etc., through the use of experiments or standardised questionnaires, claims Bhattacherjee (2012). The researcher frequently has more control over the location, study variables, and research objectives when performing quantitative research, according to Polit and Beck's (2008) explanation. Establishing links between factors and results is also made easy by this strategy. Making a hypothesis, which is a declaration of the expected result, relationship, or consequence of the research question, is a critical stage in quantitative research. Compared to the other two, the quantitative research approach has the ability to reduce researcher bias.

Data Type and Source

The study used secondary time series data produced quarterly in Ghana between 2013 Q1 and 2022 Q1. The period of the study is mainly due to the availability of data on the study variables, and quarterly because the BoG gives a quarterly update on the operation of monetary policy in the country. Data were gathered from the Bank of Ghana (BoG), the Ghana Statistical Service, and the World Development Indicators (WDI). The following variables are used in the study: capital adequacy ratio (car), actual primary reserve requirement ratio (APRRR), monetary policy rate (MPR), commercial banks' lending rate (LR), market interest rate (91-day Treasury bill (TB)), total

assets, total equity, and banks' profit (BP), which were all obtained from BoG on a monthly basis. The Ghana Statistical Service (GSS) dataset on the consumer price index (CPI) was also used. Indicators of financial soundness such as the capital adequacy ratio (CAR), return on assets (ROA), return on equity (ROE), non-performing loan (NPL), credit deposit (CD), core liquid assets to total assets (CLA), and core liquid assets to short-term liabilities (CLAS) were also obtained from the BoG's online economic database. Additionally, WDI annual information on the GDP and the official exchange rate (EXC) were used too.

Data Management and Generating of Variables

Data management and statistical analysis were conducted using Econometric Views (E-views) statistics software version 10. First, all of the monthly and annual data were transformed into quarterly data by interpolation. Thus, all the monthly and annual data were imported to E-views and each interpolated into quarterly data. Second, by adding ROA and the equity-assets ratio divided by the standard deviation of ROA, the banks' Z-score—a gauge of their financial stability—was created. To quantify financial stability as well, an aggregated indicator (AFSI) was created using the financial soundness indicators. The statistical analysis produced descriptive and inferential statistics as tables.

Unit Root Test for Stationarity

The main reason to do a unit root test is that, according to Datta and Kumar (2011), which Kasidi and Mwakanmela (2013) cite, the ARDL model's conclusions would be wrong if the data were used without first checking to see

if it was stationary. Stationarity was examined using the Phillip Perron (PP) and Augmented Dickey-Fuller (ADF) methods.

The taut statistics from both the PP and ADF are compared with the critical values at 1%, 5%, and 10% significant levels to determine significant stationarity or otherwise. When the taut statistic is less than the critical value or greater in absolute terms at any of the significance levels, then it is significant and stationary with no unit root problem. Nevertheless, whenever it exceeds all of the crucial values, or less in absolute terms, it is not significant. Thus, they are non-stationary and have a unit root problem (Hill et al., 2018). The null (H_0) and alternative (H_1) hypothesis tests include:

H_0 : There is no stationarity in the series

H_1 : There is stationarity in the series

Theoretical Model Specification

The study's theoretical model is based on the Integrated Policy Framework (IPF) by the International Monetary Fund (IMF). The framework is essential for achieving both financial stability and price stability as it requires a coordinated approach to policy-making that looks for the best combination of monetary policy, and macroprudential regulations or other policies to achieve price and financial stability in an open economy (Basu et al. 2020).

To achieve the study objectives, financial stability and price stability are modelled as dependent on macroprudential policy, monetary policy, the interaction of both policies, and other control variables as in the functional forms below.

Objective 1 and 2

$$FS = f(MR, V) \quad \text{(1)}$$

$$FS = f(MR, MP, \text{MP} * \text{MR}, V) \quad \text{(2)}$$

Objective 3 and 4

$$PS = f(MP, V) \quad \text{(3)}$$

$$PS = f(MP, MR, \text{MP} * \text{MR}, V) \quad \text{(4)}$$

Where, $FS, and\ PS$ represent banks' financial stability (z-score, AFSI) and price stability respectively. MP represents monetary policy (monetary policy rate), MR represents macroprudential regulations (reserve requirement ratio), MP*MR represents interaction term, and V represents other control variables.

Empirical Model Specification

The study's framework, which is adapted from Spencer (2014), lays the groundwork for the development of the empirical model. As a result, the following are the defined empirical models for the study objectives:

Objective 1

$$FS_t = \gamma_0 + \gamma_1 MR_t + \gamma_2 LR_t + \gamma_3 CAR_t + \gamma_4 NonPL_t + \gamma_5 BP_t + \gamma_6 INF_t + \gamma_7 Exc_t + u_t \quad \text{(5)}$$

Objective 2

$$FS_t = \gamma_0 + \gamma_1 MR_t + \gamma_2 MP_t + \gamma_3 MP * MR_t + \gamma_4 LR_t + \gamma_5 CAR_t + \gamma_6 BP_t + \gamma_7 NonPL_t + \gamma_8 INF_t + \gamma_9 Exc_t + u_t \quad \text{(6)}$$

Objective 3

$$PS_t = \Phi_0 + \Phi_1 MP_t + \Phi_2 TB_t + \Phi_3 GDP_t + \Phi_4 Exc_t + u_t \quad \text{(7)}$$

Objective 4

$$PS_t = \Phi_0 + \Phi_1 MP_t + \Phi_2 MR_t + \Phi_3 MP * MR_t + \Phi_4 LR_t + \Phi_5 GDP_t + \Phi_6 Exc_t + \Phi_7 TB_t + u_t \quad (8)$$

Where, MP = monetary policy, CAR = capital adequacy ratio, MR = macroprudential regulation, LR = lending rate, GDP = gross domestic product, TB = treasury bill, BP = banks profit, INF = inflation, exc = exchange rate, and NonPL = non-performing loans.

$\gamma_1, \gamma_2, \gamma_3, \gamma_4, \gamma_5, \gamma_6, \gamma_7, \gamma_8$ *and* $\Phi_1, \Phi_2, \Phi_3, \Phi_4, \Phi_5, \Phi_6, \Phi_7,$ represent the elasticities of their respective variables. γ_0, Φ_0 represent constant terms in their respective equations. The subscript t, represent time and u_t is an error term in each of the equations (N $(0,\boldsymbol{\sigma}^2)$)

According to the goals of the investigation, the autoregressive distributed lag (ARDL) model is applied to each of the aforementioned equations. Since all the variables were fixed at either a level or a difference, the ARDL model was utilised to simultaneously determine the short-run and long-run connection. A bound test is also performed to determine whether a long-term partnership is present. The study used the ARDL model from Pesaran et al. (2001) as cited in Kulu et al. (2022), and modeled the functional link between the study variables in an ARDL model specifications form as below;

$$FS_t = \gamma_0 + \sum_{i=1}^{p} \gamma_1 FS_{t-i} + \sum_{i=0}^{n} \gamma_2 MR_{t-i} + \sum_{i=0}^{n} \gamma_3 MP_{t-i} + \sum_{i=0}^{n} \gamma_4 MP * MR_{t-i} + \sum_{i=0}^{n} \gamma_5 LR_{t-i} + \sum_{i=0}^{n} \gamma_6 CAR_{t-i} + \sum_{i=0}^{n} \gamma_7 BP_{t-i} + \sum_{i=0}^{n} \gamma_8 NonPL_{t-i} + \sum_{i=0}^{n} \gamma_9 INF_{t-i} + \sum_{i=0}^{n} \gamma_{10} exc_{t-i} + \gamma_1 FS_{t-i} + \gamma_2 MR_{t-i} + \gamma_3 MP_{t-i} + \gamma_4 MP * MR_{t-i} + \gamma_5 LR_{t-i} + \gamma_6 CAR_{t-i} + \gamma_7 BP_{t-i} + \gamma_8 NonPL_{t-i} + \gamma_9 INF_{t-i} + \gamma_{10} exc_{t-i} + u_t \quad (9)$$

$$PS_t = \Phi_0 + \sum_{i=1}^{p} \Phi_1 PS_{t-i} + \sum_{i=0}^{n} \Phi_2 MP_{t-i} + \sum_{i=0}^{n} \Phi_3 MR_{t-i} + \sum_{i=0}^{n} \Phi_4 MP * MR_{t-i} + \sum_{i=0}^{n} \Phi_5 LR_{t-i} + \sum_{i=0}^{n} \Phi_6 GDP_{t-i} + \sum_{i=0}^{n} \Phi_7 exc_{t-i} + \sum_{i=0}^{n} \Phi_8 TB_{t-i} + \Phi_1 PS_{t-i} + \Phi_2 MP_{t-i} + \Phi_3 MR_{t-i} + \Phi_4 MP * MR_{t-i} + \Phi_5 LR_{t-i} + \Phi_6 GDP_{t-i} + \Phi_7 exc_{t-i} + \Phi_8 TB_{t-i} + u_t \quad (10)$$

Where, p = lag length of the regressand, n = lag length of the regressors, and the rest maintain their meaning as in equations 7 and 8

The study hypotheses were tested by considering the significance of the main variables (MP, MR, and MP*MR) both in the immediate and long-term. The parameters I (0) and I (1) were taken into account using the ARDL-bound testing method, which checks for co-integration. In the long term, the alternative hypothesis of long-run relation was evaluated against the null hypothesis of no long-run relation.

The estimated F-statistics value is evaluated in light of Pesaran et al. (2001)'s essential values to determine whether a long-run link exists. I will not be able to reject the null hypothesis that there is no long-term connection between the dependent variable and the independent variables if the estimated F-statistics are less than both the lower and upper bound critical values at 5%. In light of this, the ARDL will estimate only the short-run effects. The result will also be unreliable if the predicted F-statistic is between the lower and upper bounds of the 5% crucial values. If the estimated F-statistics are higher than the 5% upper-bound critical values, the null hypothesis, which states that there is no long-run connection, will be rejected.

Equations 11 and 12 show the short-run dynamics that represent the error-correction factors used in the ARDL short-run model in equations 9 and 10.

$$\Delta FS_t = \gamma_0 + \sum_{i=1}^{n} \gamma_1 \Delta FS_{t-i} + \sum_{i=0}^{n} \gamma_2 \Delta MR_{t-i} + \sum_{i=0}^{n} \gamma_3 \Delta MP_{t-i} + \sum_{i=0}^{n} \gamma_4 \Delta MP * MR_{t-i} + \sum_{i=0}^{n} \gamma_5 \Delta CAR_{t-i} + \sum_{i=0}^{n} \gamma_6 \Delta LR_{t-i} + \sum_{i=0}^{n} \gamma_7 \Delta BP_{t-i} + \sum_{i=0}^{n} \gamma_8 \Delta NonPL_{t-i} + \sum_{i=0}^{n} \gamma_9 \Delta INF_{t-i} + \sum_{i=0}^{n} \gamma_{10} \Delta exc_{t-i} + \sum_{i=0}^{n} \gamma_{11} ECT_{t-i} + u_t \quad (11)$$

$$\Delta PS_t = \Phi_0 + \sum_{i=1}^{n} \Phi_1 \Delta PS_{t-i} + \sum_{i=0}^{n} \Phi_2 \Delta MP_{t-i} + \sum_{i=0}^{n} \Phi_3 \Delta MR_{t-i} + \sum_{i=0}^{n} \Phi_4 \Delta MP * MR_{t-i} + \sum_{i=0}^{n} \Phi_5 \Delta LR_{t-i} + \sum_{i=0}^{n} \Phi_6 \Delta GDP_{t-i} + \sum_{i=0}^{n} \Phi_7 \Delta exc_{t-i} + \sum_{i=0}^{n} \Phi_8 \Delta TB_{t-i} + \sum_{i=0}^{n} \Phi_9 ECT_{t-i} + u_t \quad (12)$$

Where, ECT_{t-i} = lagged of the error correction term and Δ = difference operator

Estimation Technique

This section describes the estimation technique used to examine the study's data and test its objectives and hypotheses. A technique called an autoregressive distributed lag model is used to analyse the study's data.

Autoregressive Distributed Lag (ARDL) Model

The study intends to investigate the joint and individual effects of monetary policy and macro-level prudential regulations on price stability and financial stability over the short and long term. The analysis of such relationships is dynamic, especially given the variables used. Hence, to capture such a dynamic relationship, study objectives one to four were achieved using the ARDL model. The ARDL is appropriate for this analysis to compare to its close alternatives, such as conventional Johansen and Juselius (1990) and Johansen (1988), in the following ways:

The ARDL models consistently generate estimates that are asymptotically normal for the long-run coefficients, as in Pesaran et al. (2001), regardless of whether the underlying variables are purely I (0), purely I (1), or

a combination of the two. This suggests that the ARDL does not pre-test variables to determine the order of integration of the underlying variables, in contrast to the conventional cointegration approach, such as the Johansen conventional cointegration technique, which estimates the long-term relationship under the strict presumption that all model variables are integrated to order 1.

Also, as argued by Pesaran and Smith (1998), the more specifications required by the traditional cointegration test are avoided by the ARDL technique. These specifications relate to the best number of lags to be described, the handling of deterministic elements, and number of endogenous and exogenous variables to be included. The way these selections and choices are made typically has a significant impact on the estimation process.

Additionally, the usual cointegration test makes it impossible for distinct variables to have differing ideal lag times, however, with the ARDL model, this is conceivable.

Also, the ARDL method gives correct t-statistics and reliable estimations of the model's long-term outlook even if an endogenous regressor is present. This is because it includes dynamics in the model. This is especially crucial in this study because some of the regressors may be endogenous (mp, mr, and mp*mr).

Lastly, The ARDL methodology outperforms other alternative methods with small sample data, which, according to Narayan (2004), should be between 30 and 80 observations, like the sample used in this study.

Measurement of Variables, Definition, and Expected Sign

This sub-section of the study presents how the variables in the study are measured and defined, as well as their expected signs.

Dependent Variables

a) Financial Stability (FS)

Financial stability in this study is measured by the z-score of banks and the aggregated financial soundness indicator (AFSI). Due to the complex relationships and interdependence between the many components of the financial system and their interactions with the actual economy, according to Gadanecz and Jayaram (2008), financial stability is challenging to describe or assess. In addition, the interactions' temporal and global scopes complicate matters further. Nevertheless, during the past 20 years, specialists from central banks and other institutions have tried to evaluate the level of financial stability by utilising a number of indicators that reveal weaknesses in the financial system. Therefore, the concept of financial stability used in this study is consistent with Smets' definition from 2014, which refers to a stable and efficient banking system. The effectiveness of the transmission mechanism and the smooth operation of the financial system are both enhanced by maintaining bank financial stability, which also increases the efficiency of achieving price stability. It is measured in the study by the Z-score of banks as in (Tan & Floros 2013; Ghosh & Maji 2014; Tan et al. 2017; Mensah & Tornam 2019) and an aggregated financial soundness indicator (AFSI) as in (Loloh 2015).

(i) Banks' Z-Score

Banks' Z-score is a statistical measure that is used to determine the financial health of a bank. It measures the distance between a bank's actual financial performance and its expected financial performance based on the risks it faces and its size. It takes into account some financial ratios such as profitability, liquidity, leverage, and asset quality and provides an overall measure of a bank's financial stability. According to Mensah and Tornam (2019), when calculating the Z-score, banks' returns, return volatility, and banks' capital base are taken into account. A higher Z-score indicates stronger financial stability, whereas a lower Z-score indicates weaker financial stability. The Z-score of banks is calculated in the study using the same formula as Mensah and Tornam (2019).

$$\text{Z-score} = \frac{ROA + {}^{E}/_{A}}{\sigma ROA} \quad (13)$$

Where ROA = return on asset, ${}^{E}/_{A}$ = equity- asset ratio and σROA = standard deviation of return on asset.

(ii) AFSI

The study follows Loloh's (2015) approach and develops a quarterly financial soundness indicator (AFSI) for Ghana. The AFSI was calculated using seven financial soundness indicators of the Bank of Ghana, which were first computed into sub-indices such is adequate capital, high-quality assets, efficiency, earnings, and liquidity. To avoid any single indicator having an undue influence on the aggregated index, all indicators were standardised to a common scale using the z-score formula. This process ensures that no single indicator dominates the overall index. The z-score is defined as having an average of zero and one standard deviation. It is expressed as:

$$y_t = \frac{(x_t - \mu_x)}{\sigma_x} \quad \text{..... (14)}$$

Where; y_t = normalized value of an indicator of interest, x_t = value of an indicator of interest at time t, μ_x = mean of the indictor of interest (x_t) and σ_x = standard deviation of the indicator of interest.

After the normalization of the indicators, five (5) sub-indices; capital adequacy, assets quality, efficiency, earnings, and liquidity were computed by taking the average of the indicators selected for a particular sub-index as follows:

$$z_{tj} = \frac{\sum_{j=1}^{n} y_{tj}}{n} \quad \text{..... (15)}$$

Where; z_{tj} = sub-index of interest, y_{tj} = normalized indicators, n = number of indicators and $\sum$ = summation operator.

Finally, the aggregated financial soundness indicator (AFSI) was then calculated by aggregating the five (5) sub-indices. Its definition is given as the sub-indices' arithmetic mean as calculated in equation (15). Thus:

$$AFSI_t = \frac{\sum_{j=1}^{5} z_{tj}}{5} \quad \text{..... (16)}$$

where each variable retains its original meaning. The AFSI shares the same features as the sub-indices, as stated by Loloh (2015). In other words, it has an average of 0 with a standard deviation of 1. Additionally, a positive AFSI indicates a high level of financial stability, whereas a negative AFSI indicates a low level of stability.

Table 1: Indicators Used in the Computation of the AFSI

Sub-index	Indicators
Capital Adequacy	Capital adequacy ratio
Asset Quality	Non-Performing Loans
Efficiency	Core Liquid Assets to Total Assets
Earnings	Return On Assets (ROA) - Before Tax
	Return On Equity (ROE) - After Tax
Liquidity	Core Liquid Assets to Short-term Liabilities
	Credit to Deposits

Note: The selection of these indicators is based on the availability of data.

Source: BoG (2023)

b) Price Stability (PS)

The majority of central banks choose price stability as their preferred monetary policy option to reduce inflation, stabilize the exchange rate, and create an environment that encourages economic growth. In the 1990s, most developed nations adopted this strategy, and most developing nations later did the same (Quartey, 2011). Also, on October 13, 1998, the executive body of the European area specified the meaning of a price stability as an increase in the harmonised Index of year-on-year consumer price growth of less than 2% (Camba-Mendez, 2003). Based on these, the study defined price stability as a decrease in the Ghanaian consumer price index below a percent. The year-on-year consumer price is therefore used as an instrument of price stability in this study.

Main Independent Variables

a) Monetary Policy

The management of the money supply by a central bank or other monetary authority is referred to as monetary policy. Macroeconomic objectives, including reducing inflation, stabilising prices, and fostering economic growth, are examples of what is meant by this. Manipulating the monetary policy rate is the most frequently employed weapon in monetary policy, and it has the power to affect consumer spending, investment activity, and the amount of money that banks lend and borrow. The rate of interest on loans made to commercial banks by the BoG is known as the "monetary policy rate," and in this study it is used as an instrument for measuring monetary policy. It also acts as an anchor rate for other economic interest rates. The monetary policy rate has historically been seen as a way to achieve price and real sector stability (Cecchetti & Kohler, 2010). It is expected to have an inverse effect on inflation and, hence, improve price stability. Also, it interacts with macroprudential regulation and is expected to enhance the performance of monetary policy, reduce inflation, and increase price stability and banks' financial stability.

b) Macroprudential Regulations

Macro-level prudential regulations aim to protect the whole financial system (Hanson et al., 2011). Also, macroprudential policies focus on strengthening resilience and serving as a supplement to regulatory control of specific companies. Additionally, they reduced financial cycle volatility and the likelihood that disruptive imbalances would accumulate inside the financial system (Barwell, 2013). In this study, the actual primary reserve

requirement ratio is used as an instrument for measuring macroprudential regulation. In recent years, a variety of other policy goals have been addressed using the actual primary reserve requirement ratio (Ma et al., 2011). Historically, banking systems in Ghana have included a reserve requirement ratio (Kovanen, 2002). In the views of Glocker & Towbin (2012). reserve requirements ratios can produce better results as they expand the degrees of freedom in a scenario where they react to price and financial movements. The study expects this variable to, therefore, have a positive impact on financial stability. It also interacts with monetary policy and is expected to enhance the performance of macroprudential regulation by increasing price stability and bank financial stability.

Control Variables

c) Capital Adequacy Ratio (CAR)

The CAR is one metric of capital adequacy employed by commercial banks. A bank's capacity for sound financial management is quantified by the capital adequacy ratio (CAR). Regarding each of its assets subject to risk weighting, it shows how much capital a bank has available to cover its risks, including those posed by loans and investments. By subtracting the risk-weighted assets from the capital of a bank, the CAR is determined (Bialas & Solek, 2010; El-Ansary & Hafez, 2015). Because it assists regulators and investors in determining whether a bank has enough capital to withstand future losses, the CAR is crucial. A higher CAR shows that a bank is more stable and secure since it has more capital available to cover its risks.

The BoG oversees the CAR in Ghana. The Basel III framework, a global benchmark for gauging bank capital adequacy, forms the foundation for

Ghana's CAR calculation. This approach allocates a risk weight to each category of assets while taking into account the credit risk, operational risk, market risk, and other risks faced by banks. The CAR as published by the BoG was employed in the study, which anticipates a favourable effect on financial stability.

d) Non-Performing Loans (NPLs)

NPLs are defaulted loans or loans that have not been paid back according to their contractual terms. When a loan defaults, the lender's ability to collect the debt from the borrower is at risk, which jeopardises their stability and financial health. The lender may also have to write off the loan as a loss, which can impact its profitability and capital adequacy ratio. A common issue in the banking sector is NPLs, especially during times of economic downturn or recession, as in Ghana's current situation. Factors that can contribute to the rise of non-performing loans include high interest rates, inflation, unemployment, and poor economic conditions.

Banks and other lenders typically have processes in place for managing non-performing loans, such as working with borrowers to develop repayment plans, restructuring the loan, or pursuing legal action to recover the debt. In some cases, lenders may also sell non-performing loans to debt collectors or other financial institutions, which can be a way to recover some of the debt and reduce the risk on the lender's balance sheet.

In Ghana, the Bank of Ghana (BoG) regulates the measurement and reporting of non-performing loans (NPLs) for banks and other financial institutions. The BoG uses international best practises and standards, including the Basel Accords, to define and measure NPLs. According to the BoG's

definition, a loan is classified as non-performing if it has been in arrears for 90 days or more. This means that if a borrower fails to make a scheduled payment for a loan for 90 days or more, the loan is considered non-performing. Banks and other financial institutions in Ghana are required to report their NPL ratios to the BoG monthly. The NPL ratio is calculated by dividing the total amount of non-performing loans by the total amount of loans in the lender's portfolio. The resulting percentage is a key indicator of the lender's asset quality and credit risk. This study used the reported NPL ratio as a measure of balance sheet risks as a control variable. Cucinelli (2015) concludes that non-performing loans affect financial stability negatively. Hence, the study expects it to impact financial stability negatively.

e) Lending Rate

Lending rates are the sum of money that borrowers pay to banks for using borrowed funds. Numerous variables, including inflation, changes in the value of the dollar, and alterations in the state of the general economy, can influence this rate. The lending rate in this study is measured using the average weighted commercial banks' lending rate (Eke et al., 2015). Studies such as Malede's (2014) conclude that commercial banks' lending rates have a statistically unfavorable effect on financial stability. Also, a high lending rate is always associated with low or stable prices. The study, therefore, expects the lending rate to be related to financial stability in the opposite direction but have a positive relationship with price stability.

f) Banks' Profit

Banks' profit describes how much money a bank makes from its operations after deducting all of its costs and taxes. Profit is primarily what

determines a bank's profitability and performance. Banks must be profitable because it shows that they can maintain operations, pay dividends to shareholders, and engage in new business ventures. The majority of studies, like those by Alshatti (2016) and Masood & Ashraf (2012), employed return on assets (ROA) and return on equity (ROE) as indicators of banks' profitability. However, the ROA is used to compute the z-score of banks in the study, and is highly correlated with it. Hence, return on equity (ROE) is utilised to gauge the profitability of banks. The ROE of a corporation serves as a gauge of its capacity to offer a commendable return on investment (Alshatti, 2016). It is anticipated to improve financial stability, as in a study by Yensu et al. (2021).

Treasury Bill

A Treasury bill, also known as a "T-bill," in this study referred to a debt instrument with a short maturity issued by the BoG on behalf of the Ghanaian government Given that the government backs it and there is no default risk, it is one of the safest investments accessible in Ghana. T-bills are produced in a range of tenors, from 91 to 364 days. They are tools used by economic management to mobilise money to pay for short falls in budgets and control liquidity in the financial sector. T-bills are available for purchase at auction, where investors can also receive interest. In Ghana, the yield on T-bills is set through a competitive auction procedure in which investors bid the yield they are willing to receive. Following that, the BoG receives bids based on the current market rates and issues T-bills to the successful bidders at the current interest rate. When a T-bill matures, investors receive the principal value of the investment plus interest earned on it. Due to the highly liquid

nature of T-bills, investors can sell them on the secondary market before they mature.

The Treasury Bills Rate in Ghana's money market is a dominant default-risk-free rate asset whose existence has an impact on the purchasing power of other assets in the security market. And BoG normally sells them to remove excess liquidity from the system and purchases them back when it wants to pump money into the economy (Logubayom et al. 2013). The 91-day T-bill rate is utilised as a measure inside the market interest rate in the study. It is intuitively projected to have a beneficial effect on prices in the country.

Gross Domestic Product

GDP is typically used to gauge economic expansion and output. it is the steady increase in a nation's real per capita income brought on by a gain in the nation's capacity for productivity over a specific time period. Comparing one time to another, it shows how well a nation can produce commodities and services. The study uses the annual growth in GDP as a metric for output. And logically, it should have a favourable effect on price stability.

Exchange Rate

In order to evaluate the exchange rate, the study employed the official exchange rate (LCU per US$, period average), which is the rate set by national authorities or the exchange rate set on the currency market that is permitted by law. Changes in exchange rates had a large but erratic effect on price stability, according to Adu et al. (2015). According to this analysis, the exchange rate is predicted to have a detrimental effect on price stability.

Summary of Chapter

This chapter provides information on the research design, data type and source, unit root test, empirical model, and measurement of variables. It outlined the conditions that necessitated the study to follow the positivist philosophy and adopted the explanatory design. Data properties which led to the specification of an ARDL model for the study analysis in addressing its objectives were explained in the chapter as well.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

Introduction

In this chapter analyses and explains the conclusions drawn from the use of secondary time series data gathered from the Ghana Statistical Service (GSS), the Bank of Ghana (BoG), and the World Development Indicators (WDI). The study gives a brief summary of the descriptive statistics of the relevant variables, runs Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests, analyses cointegration with long-term estimates using the bounds test approach, and discusses the implications of short-term dynamics. A summary of the major findings concludes the chapter.

Descriptive Statistics of Variables

This section includes summary statistics for the study variables listed in Table 2 below. It shows the mean, median, standard deviation, skewness, kurtosis, minimum and maximum values, the Jarque Bera test, and the number of observations from 2013 Q1 to 2022 Q1.

Table 2:Descriptive Statistics

	CAR	EXC	ZS	GDP	LR	MP	NON_PL	PS	BP	MR	TB	AFSI
Mean	18.56	4.26	4.76	4.56	25.21	18.58	16.63	12.78	23.17	9.66	17.91	0.00
Median	18.36	4.26	4.68	4.56	25.56	17	17	11.9	21.23	9.87	14.71	0.06
Maximum	21.48	5.81	6.63	8.13	28.98	26	22.22	19.4	34.01	11.28	25.75	0.47
Minimum	15.06	1.98	3.21	0.51	20.18	13.5	11.19	7.6	11.39	7.67	12.48	-0.68
Std. Dev.	1.68	1.03	1.00	1.95	2.85	4.09	3.48	3.55	4.95	0.96	4.96	0.30
Skewness	0.01	-0.39	0.23	-0.02	-0.41	0.67	-0.04	0.36	0.38	-0.35	0.39	-0.56
Kurtosis	2.02	2.51	2.06	1.97	1.78	2.08	1.73	1.88	2.84	2.28	1.41	2.37
Jarque-Bera	1.48	1.29	1.72	1.64	3.34	4.09	2.48	2.73	0.93	1.57	4.83	2.53
Probability	0.48	0.53	0.42	0.44	0.19	0.13	0.29	0.26	0.63	0.46	0.09	0.28
Sum	686.88	157.58	176.68	168.72	932.7	687.3	615.44	472.7	857.3	357.58	662.83	0.01
Sum Sq. Dev.	102.11	37.84	36.28	136.58	291.6	600.8	435.69	454.09	882.8	33.08	884.99	3.16
Observations	37	37	37	37	37	37	37	37	37	37	37	37

Note: Std. Dev. = standard deviation and Sum Sq. Dev = sum of square deviation

Source: Author (2023)

The descriptive statistics for the study variables are shown in Table 2. Rows one and two of the table display the mean and median values for the series. Also, it can be observed that the capital adequacy ratio (CAR), banks' z-scores (ZS), one of the measurements of financial stability, monetary policy (MP) as measured by the monetary policy rate, banks' profit (BP), which is measured by return on equity, price stability (PS) as measured by the consumer price index, and treasury bill (TB) as measured by the 91-day treasury bill rate are skewed positively. This indicates that the vast majority of their values are below the corresponding variables' means. Whereas, the exchange rate (EXC), gross domestic product (GDP), lending rate (LR), non-performing loans (non-PL), macroprudential regulation (MR) as measured by actual primary reserve requirement, and aggregate financial soundness indicator (AFSI), a measure of financial stability, are negatively skewed. As a result, it may be inferred that the majority of their values are higher than the corresponding variables' means.

Data points appear to be more densely clustered together (no outliers), according to the variables' standard deviation. This is due to the fact that all of the variables' standard deviations are relatively low when compared to their respective means, or that the difference between the minimum and maximum values is not very wide. All of the variables are expected to have a normal distribution at the 5% level of significance, according to the probability values of the Jarque-Bera test. This is the case since all of the study's probability values are higher than 5% (0.05). This implies that the variables' distribution in their natural state is sound and that they shouldn't be logged. Additionally,

when subjected to the Jarque-Bera test for all the variables, the study fails to refute the null hypothesis of a normal distribution.

The kurtosis statistic describes the shape of a series' distribution, specifically indicating how peaked the distribution is. A kurtosis of 3 is considered mesokurtic, representing the shape of a standard normal distribution. From the table above, it is clear that the kurtosis coefficients of all the variables are less than 3. This suggests that the dataset is leptokurtic, which has lighter tails than a normal distribution.

Unit Root Test

The mean, variance, and other features of time series data frequently fluctuate throughout time since they are rarely steady. This makes it critical to test for stationarity before conducting any analysis, as non-stationary data can lead to inaccurate results. The stationary test is useful in this study because it is used to determine whether or not the data used for the study is stationary. If the data is not stationary, the ARDL model employed cannot produce consistent long-run estimates. Due to the fact that the ARDL consistently yields findings when the variables are stationary at either level [integrated of order zero, or I (0)] or first differences [integrated of order 1, or I (1)]. In order for the ARDL technique to cointegration to work, the series included in the model must have integration of order d, where d can range from 0 to 1 ($0 \leq d \leq 1$).

Different methods are used to test for variable stationarity. With the help of Augmented Dickey-Fuller (ADF) tests and Phillips-Perron (PP) unit root tests, the exact order of integration for all of the variables in levels and first difference was found. To ensure the sequence of integration of the

variables, the unit root tests were run with intercepts, trends, and intercepts as well as without trends and intercepts. The ideal number of lags or lag lengths included in the test were also chosen automatically using Schwartz, Bayesian Information Criteria, and Akaike Information Criteria (AIC). The unit root decision, which resulted in the rejection or failure to reject the null hypothesis (unit root or non-stationary), was made in the study using the P-values and the critical values.

Hill et al.'s (2018) ideology was employed in the study's rejection or unable to rule out the null hypothesis. Therefore, upon rejection of the null hypothesis, stationary behaviour is implied (unit root is not an issue). It means that a series is non-stationary or has a fault if it fails to reject, though. The results of the ADF and PP unit root tests are shown separately in table 3 and 4

Table 3: Results of Augmented Dickey-Fuller (ADF) Unit Root Test

	Levels			First difference			Order of Integration
VARIABLE	Intercept	Trend	No trend	Intercept	Trend	No trend	
PS	-3.118**	-0.477	0.581	-2.718*	-2.642	-2.711***	I (0) and I (1)
ZS	-1.619	-1.460	-0.912	-6.011***	-4.852***	-6.072***	I (1)
CAR	-1.570	-2.639	0.182	-5.959***	-5.934***	-6.013***	I (1)
MP	-2.839*	-3.035	-0.317	-2.235	-2.071	-2.270**	I (0) and I (1)
LR	0.207	-1.866	-1.321	-5.365***	-5.423***	-5.086***	I (1)
TB	-1.360	-2.307	-1.132	-3.822***	-3.757**	-3.406***	I (1)
GDP	-4.898***	-4.699***	-0.257	-1.539	-1.504	-1.588	I (0)
MR	-2.119	-3.065	-0.706	-4.775***	-4.699***	-4.825***	I (1)
BP	-1.252	-1.039	-0.851	-6.360***	-6.333***	-6.393***	I (1)
EXC	-2.500	-0.592	0.737	-5.134***	-5.929***	-5.033***	I (1)
Non-PL	-1.887	-2.658	0.176	-4.859***	-4.837***	-6.397***	I (1)
AFSI	-0.993	-1.838	-1.175	-6.375***	-6.714***	-6.446***	I (1)

Note: ***, **, and * represent 1%, 5% and 10% signification level respectively, Trend = trend and intercept, No trend = No trend and No intercept.

Source: Author's construct (2023)

The null hypothesis, which states that a unit root exists in the majority of the variables at their original levels, cannot be disproved based on the ADF results in Table 3. This is due to the probability values (p-values) for the ADF are not significant according to the standard statistical thresholds, statistics (1%, 5%, and 10%), except for price stability (PS), monetary policy (MP), and gross domestic product (GDP), which are stationary at 5%, 10%, and respectively, 1% significance thresholds with intercept. On the other hand, at first differences, all the variables were stationary as their test statistic values were less than 1%, 5%, and 10% significance levels, and their p-values were statistically significant. Except GDP, which suffers from unit root at the first differences as its test statistic value was greater than all the significance levels and an insignificance p-value.

Table 4: Results of Phillips Perron (PP) Unit Root Test

	Levels			First difference			Order of integration
VARIABLE	**Intercept**	**Trend**	**No trend**	**Intercept**	**Trend**	**No trend**	
PS	-1.295	-1.131	0.334	-2.509	-2.381	-2.497**	I (1)
ZS	-1.619	-1.491	-0.949	-6.010***	-5.980***	-6.071***	I (1)
CAR	-1.398	-2.541	0.462	-6.745***	-7.255***	-6.465***	I (1)
MP	-1.272	-1.925	-0.241	-2.933	-2.071	-2.270**	I (1)
LR	0.302	-2.254	-1.359	-5.357***	-5.427***	-5.083***	I (1)
TB	-0.960	-1.764	-1.261	-3.405**	-3.348*	-3.347***	I (1)
GDP	-2.266	-2.244	-1.210	-2.857*	-2.782	-2.913***	I (1)
MR	-2.149	-2.280	-0.876	-5.390***	-5.350***	-4.916***	I (1)
BP	-1.474	-1.953	-0.548	-5.706***	-6.556***	-5.669***	I (1)
EXC	-2.449	-0.585	0.566	-5.142***	-5.940***	-5.038***	I (1)
Non-PL	-1.791	-2.701	0.176	-6.354***	-6.221***	-6.396***	I (1)
AFSI	-1.112	-1.525	-1.227	-6.479***	-15.840***	-6.533***	I (1)

Note: ***, **, and * represent 1%, 5% and 10% signification level respectively, Trend = trend and intercept, No trend = No trend and No intercept

Source: Author's construct (2023)

The outcomes of the Phillip Perron unit root test are displayed in Table 4, along with the intercepts, trend, and absence of both. As can be seen, none of the variables in the table are free of unit root at levels. Hence, the study fails to disprove the unit root null hypothesis at all levels, as the various variables respective p-values are insignificant and their absolute critical values are greater than all the significance levels. But all the variables eventually become stationary, whether they have an intercept, a trend plus an intercept, or neither. This is as a result of the fact that all p-values for the variables are statistically significant at the different levels of significance (1%, 5%, and 10%). Additionally, at the traditional significance thresholds, their respective t-statistics are higher than the absolute critical values. According to Tables 4 and 3, respectively, the results of the unit root test carried out utilising the PP and ADF test methodologies The majority of the variables display first-order integration, designated as I (1), when the model takes into account the intercept, trend, and lack of trend.

Some of the variables are integrated at the order zero level, according to the unit root test's findings on certain of the variables, hence I (0), indicating that they are stationary at levels. In particular, in the ADF with intercept. Furthermore, the results of the test prove that the majority of the variables are I (1), indicating stationary at first differences. These findings support the applicability of the ARDL estimation method used in the methodology.

Co-Integration Test

In accordance with the goals of the investigation, the bound test for co-integration is used to determine if a long-term link exists in the six (6) models of the study. According to Pesaran et al. (2001), an ideal lag length is needed

for the bound test in the ARDL model, which was the approach adopted in this work. Due to the relatively limited sample size and to prevent degrees of freedom from being lost, the study consequently utilizes an ideal latency of 2 and 3. Hence, a maximum lag length selection structure for objectives 1 and 2 was chosen at 2, 1 for the dependent variable of objectives 3 and 4, and 3 for the regressors.

Lag selection structure

After selecting the optimal lag at 2 and 3, the study allows the software (EViews 10.0) to automatically generate a specific optimal lag length for each of the variables based on the Akaike Information Criterion (AIC). The Akaike Information Criterion (AIC) is useful because it compares the information entropy of different models using a measure known as Kullback-Leibler divergence. The AIC also assesses the amount of information sacrificed by a model, indicating that models with lower information loss are considered higher quality than others.

Table 5: ARDL Bound test results

F-Bounds Test (Z-score)		Null Hypothesis: No levels of relationship		
Test Statistic	Value	Significance	I (0)	I (1)
F-statistic	3.475	10%	2.12	3.23
K	6	5%	2.45	3.61
		1%	3.15	4.43
F-Bounds Test (AFSI)		Null Hypothesis: No levels of relationship		
Test Statistic	Value	Significance	I (0)	I (1)
F-statistic	1.719	10%	2.12	3.23
K	6	5%	2.45	3.61
		1%	3.15	4.43

Note: k = number of regressors in the model, Z-score = banks' Z-score, AFSI = aggregated financial soundness indicator, I (0) = integrated at levels, and I (1) = co-integrated at first differences

Source: Author (2023)

Table 5's findings reveal that the regressors and the dependent variables are not co-integrated. This is because the F-statistics of 3.475 and 1.719 for both the Z-score and the AFSI, respectively, which measure financial stability, are less than the I (1) critical values of 5% (3.61), for the Z-score and the AFSI. Also, the F-statistic of 1.719 for the AFSI is less than the I (0) critical value of 5% (2.45). Therefore, given that the study variables are not co-integrated at I (0) and I (1), the null hypothesis of no long-run relationship between financial stability and macroprudential regulation in Ghana is not rejected. As a result, the study estimated only the short-run outcome of the

ARDL for both the Z-score and AFSI measures of financial stability. The short-run results are presented in Tables 6 and 7.

Effect of Macroprudential Regulation on Financial Stability

In estimating the relationship between the dependent variables (Z-score and AFSI), which measure financial stability, an optimal lag is selected at 2, and the software (E-views 10.0) automatically generates appropriate lags for the regressors. Table 6 below shows the short-run relations between financial stability and the regressors with diagnostic tests.

Table 6: Estimated Short-Run Coefficients

Dependent variables:	**D (Z-SCORE)**		**D (AFSI)**	
Regressors	Coefficient	Standard error	Coefficient	Standard error
D (FS (-1))	0.257	0.195	-0.237	0.148
D (FS (-2))	-0.326	0.204		
D (MR)	0.431**	0.184	0.134**	0.055
D (LR)	-0.02	0.13	0.085**	0.034
D (LR (-1))			0.068*	0.036
D (CAR)	0.238**	0.098	0.129***	0.030
D (CAR (-1))	-0.054	0.083		
D (CAR (-2))	0.163*	0.087		
D (NON_PL)	0.07	0.042	0.038***	0.013
D (NON_PL (-1))	-0.113**	0.041	0.023	0.014
D (INF)	-0.008	0.049	-0.016	0.015
D (INF (-1))	-0.059	0.056		
D (INF (-2))	0.131**	0.062		
D (EXC)	0.579*	0.3		
D(BP)			0.022*	0.011
D (BP (-1))			0.031**	0.011
D (BP (-2))			0.028**	0.011
C	-0.099	0.071	0.019	0.024

R-squared	0.561	0.645
Adjusted R-squared	0.276	0.468
S.E. of regression	0.37	0.122
Sum squared residual	2.735	0.328
Log-likelihood	-5.4	30.638
F-statistic	1.967	3.640
Prob(F-statistic)	0.084	0.005
Akaike info criterion	1.141	-1.096
Schwarz criterion	1.77	-0.558
Hannan-Quinn criterion	1.356	-0.913
Durbin-Watson stat	1.869	1.928

Note: ***, **, and * represent 1%, 5% and 10% signification level respectively

Diagnostic Tests		
Test	F-statistics	F-statistics
Heteroscedasticity	0.377	1.653
	[0.962]	[0.152]
Serial correlation	0.221	0.340
	[0.804]	[0.716]
Normality (Jarque-Bera)	4.648	1.00
	[0.083]	[0.606]
Misspecification	1.425	1.923
	[0.247]	[0.180]

Note: […] are probability values

Source: Author (2023)

The short-run outcomes displayed in Table 6 suggest that macroprudential regulation has a favorable impact on financial stability. According to the estimated coefficients, tightening macroprudential regulation by a cedi will improve financial stability by 0.431 and 0.134, respectively, according to the Z-score of banks and the AFSI. When evaluating financial stability with the Z-score, banks, and the AFSI, the effect is statistically significant at 5% since the probability values are smaller than 0.05. The findings confirmed Glocker and Towbin (2012) conclusion that macroprudential regulation has a favorable influence on financial stability and contradicted the findings of (Glocker 2021; Takyi & Obeng 2013). The study, therefore, fails to reject the null hypothesis of the statistically significant effect of macroprudential regulation on financial stability in Ghana.

The positive effect of macroprudential regulation on financial stability implies that higher macroprudential regulation makes financial institutions (banks) hold a lot of money in primary reserves pertaining to their deposit liabilities and have an adequate buffer of asset liquidity, implying a greater ability to meet withdrawal requests promptly. This provides a cushion to absorb unexpected shocks or liquidity pressures in the banking system. Also, tight macroprudential regulation can be used to deter banks from lending too much, as it increases the cost for banks to expand their loan portfolios because they must set aside a larger portion of their deposits as reserves. This helps prevent the buildup of an unsustainable expansion of credit, which reduces the chance of future financial turmoil.

To consider the effect of the control variables on financial stability in the short run, the capital adequacy ratio (CAR) proves to have a statistically

significant favorable impact on financial stability. Thus, an increase in capital asset ratio of 1% will increase financial stability by 0.238 and 0.129, as measured by the z-score and AFSI, respectively. This is related to Sang's (2021) finding in the Vietnam economy, where he found a positive effect of the CAR on financial stability.

This means that Banks with a higher CAR have a larger buffer to absorb potential losses. Therefore, banks with larger capital ratios are better positioned to withstand losses without jeopardising their solvency in the event of adverse economic conditions or unexpected shocks. This lowers the likelihood of bank failures and systemic disruptions, thereby promoting overall financial stability.

Also, a favourable effect on financial stability is suggested by banks' lending rates. The effect is not significant when the z-score is used to gauge financial stability. When the AFSI measures financial stability, it is statistically significant. This implies that financial stability improves by 0.085 when the lending rates of Ghanaian banks increase by one cedi. The outcome aligns with that of Morgan and Zhang (2017), who found a positive effect of banks mortgage lending rates on financial stability, but goes contrary to Koskei's 2020 and Köhler's 2015 findings. The lending rate reflects market dynamics and bank competition. So, banks are incentivized to offer competitive lending rates to attract borrowers when there is healthy competition. This promotes banking sector efficiency, encourages innovation, and promotes better pricing and terms for borrowers. This increases market efficiency, and the competition helps to maintain financial stability by improving credit availability, reducing information gaps, and preventing the

emergence of monopolistic practises that harm borrowers and the economy as a whole.

The coefficient of bank profit also indicates that a cedi increase in the profit of banks will increase their financial stability by 0.022. Profitable banks have easier access to capital and are more likely to receive funding from investors and creditors because they are perceived as less risky. This enables banks to maintain liquidity, support lending activities, and contribute to the financial system's smooth operation. It lowers the likelihood of liquidity crises, which can destabilise individual banks or the financial system as a whole. In the Latvian banking sector, Rupeika-Apoga et al. (2018) found the profit of banks to possess positive impact on their financial resilience, as the present study for Ghana.

Furthermore, defaulted loans exert a positive effect on the economy of Ghana's financial stability. The estimates indicate that with an increase in non-performing loans of 1 cedi, Ghana’s financial stability will improve by 0.038 for the AFSI. This confirmed the findings of Koskei (2020b) but contradicted those of Khan (2020). Non-performing loans expose the true quality of a bank's loan portfolio. Hence, banks provide greater transparency to stakeholders such as investors, regulators, and the general public by recognising and classifying non-performing loans. This transparency allows the stakeholders to get a fuller understanding of the bank's financial health and risk profile. It can therefore result in increased market discipline and better resource allocation, ultimately promoting financial stability.

Financial stability is affected positively by the exchange rate, as the estimates indicate that financial stability improves by 0.579 when the

exchange rate increases by a cedi. Eichengreen (1998) argues that the exchange rate influences financial stability positively, which this study's findings associate with. The reason for the positive influence can be that exchange rate stability discourages excessive speculation and short-term currency trading. Sharp and unpredictable exchange rate movements can attract speculative activity, causing volatility and disrupting financial markets. Policymakers can improve financial stability by maintaining a stable exchange rate.

Table 6 also shows the diagnostic tests for the two models (Z-score and AFSI). Both the stability test and the diagnostic test are performed to check the robustness of the models. Hence, stability, normality, heteroscedasticity, misspecification, and autocorrelation in the ARDL models are tested. When financial stability is assessed using the Z-score and the AFSI, the study is unable to reject the null hypothesis of homoscedasticity from the Breusch-Pagan-Godfrey test for heteroscedasticity. Due to the fact that the p-values (0.962 and 0.12) are higher than the 1%, 5%, and 10% significance limits. Also, the null hypotheses for no functional form misspecification for the RESET test, no serial correlation as in the Breusch-Pagan-Godfrey Serial Correlation Lagrange Multiplier (LM), and normal distribution for the Jarque Bera test for normality are all not rejected at 5%. Therefore, study model 1 is free from misspecification and serial correlation, and the residuals are normally distributed. The stability tests show that the models are stable, as shown in the CUSUM and CUSUMSQ plots and in line with Pesaran et al.'s (2001) stability test in an ARDL specification. According to Appendix B, both specifications' CUSUM and CUSUMSQ residuals fall within the critical value

limitations of 5%. This demonstrates the stability of the models. The ARDL equations were so constant during the whole-time span of the research.

Effect of Macroprudential Regulation on Banks' Stability in Ghana, Conditioned upon the Existence of an Expansionary (Restrictive) Monetary Policy

To achieve this objective, two models are estimated. Model 2a, which contains both monetary policy and macroprudential regulation as well as control variables, and Model 2b, which contains both monetary policy and macroprudential regulation plus the interaction of the two policies and other control variables.

Bound Test Results

Table 7: ARDL Bound test Results for model 2a

F-Bounds Test (z-score)		Null Hypothesis: No levels relationship		
Test Statistic	Value	Significance	I (0)	I (1)
F-statistic	7.122	10%	2.03	3.13
K	7	5%	2.32	3.50
		1%	2.96	4.26
F-Bounds Test (AFSI)		Null Hypothesis: No levels relationship		
Test Statistic	Value	Significance	I (0)	I (1)
F-statistic	3.114	10%	2.03	3.13
K	7	5%	2.32	3.50
		1%	2.96	4.26

Note: k = number of regressors in the model, Z-score = banks' Z-score, AFSI = aggregated financial soundness indicator, I (0) = integrated at levels, and I (1) = co-integrated at first differences

Source: Author (2023)

The study's regressors and the Z-score, which measures financial stability, are co-integrated, according to Table 7. As a result, the F-statistic for the Z-score, which is 7.122, is higher than the upper bound [I (1)] critical values at 5% (3.50). Additionally, the F-statistic of 7.122 for the Z-score exceeds the lower bound [I (0)] critical values at 5% (2.32). However, there is no co-integration between the AFSI measure of financial stability and the regressors. This is because its F-statistic of 3.144 is less than the 5% [I (1)] crucial upper bound values (3.50). Because of this, the null hypothesis that there is no long-run relationship between financial stability and macroprudential regulation in Ghana is rejected because the Z-score assessed for financial stability is co-integrated at I (0) and I (1). As a result, the analysis supports the alternative hypothesis that in Ghana, there is a long-term connection between financial stability and macroprudential regulation. In order to estimate the long-run coefficients and short-run dynamic effects for solely the Z-score measure, the study uses the ARDL cointegration approach. However, it estimates the AFSI measure in the first difference for the short-run effect. For research goal two, model 2a with diagnostic test, the long-run and short-run outcomes are shown in Tables 8 and 9.

Effect of Monetary Policy and Macroprudential Regulation on Financial Stability

In this model, the optimal lag was once again set at 2, while the software automatically generated appropriate lags for each of the variables. The lags for the regressors are (2, 2, 1, 2, 1, 2, 1).

Table 8: Long-Run Coefficients, ARDL (2, 2, 1, 2, 1, 2, 1)

Dependent variable: D (Z-SCORE)				
Regressors	Coefficient	Standard Error	T-Statistic	Probability
MR	-0.197	0.365	-0.541	0.597
MP	-0.436	0.127	-3.442	0.004
LR	0.220	0.190	1.158	0.266
CAR	0.123	0.242	0.507	0.620
NON_PL	-0.054	0.090	-0.603	0.556
INF	0.381	0.111	3.429	0.004
EXC	-0.206	0.233	-0.887	0.390

Source: Author (2023)

Table 8 shows the long-term relationship between financial stability and the regressors. The findings show that macro-level prudential regulations have a statistically negligible negative effect on financial stability when monetary policy and those regulations are included in the same model. Long-term analysis rules out the null hypothesis that macroprudential regulation has a significant effect on financial stability when monetary policy is held constant. Therefore, there is no statistically significant impact of macroprudential regulation on financial stability.

Monetary policy has an unfavourable statistically significant effect on financial stability as measured by the Z-score of banks, indicating an inverse effect on financial stability. Thus, a cedi increase in the policy rate will reduce financial stability by 0.436. This is related to the claim made by Agur and Demertzis (2019) that monetary policy has a detrimental effect on financial stability when there are macro-level prudential regulations in place. The

inverse effect can be due to high borrowing costs from high interest rates as a result of contractionary monetary policy, which makes borrowing more expensive for businesses and individuals. This leads to reduced investment and consumption, which negatively affect economic growth and financial stability. Thus, if businesses and households face difficulties servicing their existing debts due to high interest payments, it can increase the risk of defaults and financial distress.

Only inflation among the control factors is statistically significant over the long run and shows a favourable impact on financial stability. It suggests that a 1% increase in inflation will result in a 0.381 increase in financial stability. Although it seems contradictory, Ha et al.'s (2019) research supports their claim that financial stability is enhanced by low or constant inflation. Because when there are low and stable prices, economic growth and development are improved, which reduces uncertainty, promotes efficient resource allocation, and maintains financial stability.

Table 9: Short-run coefficients

Dependent Variable:	**D (Z-score)**		**D (AFSI)**	
Regressors	Coefficient	Std. Error	Coefficient	Std. Error
C	2.211***	0.249	-0.002	0.028
D (FS (-1))	0.265**	0.107	-0.362*	0.189
D (FS (-2))			0.299	0.210
D (MR)	0.133	0.088	0.080	0.067
D (MR (-1))	0.336***	0.084		
D (MP)	-0.351***	0.072	0.141**	0.062
D (MP (-1))	0.329***	0.067	-0.042	0.060
D (MP (-2))			0.083	0.048
D (LR)	-0.092	0.069	0.011	0.067
D (LR (-1))			0.014	0.053
D (LR (-2))			-0.159**	0.072
D (CAR)	0.071**	0.052	0.095**	0.044
D (CAR (-1))	-0.108***	0.048	-0.050	0.040
D (CAR (-2))			-0.106**	0.049
D (NON_PL)	0.077***	0.022	0.060***	0.016
D (NON_PL (-1))			0.036*	0.017
D (INF)	-0.095***	0.028	-0.043*	0.021
D (INF (-1))	-0.147***	0.040	-0.055*	0.028
D (INF (-2))			-0.055*	0.028
D (EXC)	0.717***	0.154		
D (BP)			0.047***	0.015
D (BP (-1))			0.058***	0.015
D (BP (-2))			0.046***	0.015
ECT (-1) *	-0.573***	0.062		

R-squared	0.856	0.798
Adjusted R-squared	0.767	0.488
S.E. of regression	0.207	0.120
Sum squared residuals	0.901	0.187
Log likelihood	14.380	40.227
F-statistic	9.601	2.572
Prob(F-statistic)	0.000	0.042
Akaike info criterion	-0.022	-1.131
Schwarz criterion	0.600	-0.188
Hannan-Quinn criterion.	0.193	-0.810
Durbin-Watson stat	2.561	1.704

Note: ***, **, and * represent 1%, 5% and 10% signification level respectively, Std.Error = Standard error

Diagnostic Tests

Test	F-statistics	F-statistics
Heteroscedasticity	0.999	0.923
	[0.512]	[0.576]
Serial correlation	1.032	0.251
	[0.386]	[0.782]
Normality (Jarque-Bera)	0.339	0.665
	[0.844]	[0.717]
Misspecification	0.033	2.578
	[0.859]	[0.112]

Note: [ ] are probability values

Source: Author (2023)

The short-run effects of macroprudential regulation, subject to the existence of monetary policy, are depicted in Table 9 above. Based on the data, macroprudential regulations in place now have a favourable but

statistically negligible effect on financial stability. However, when financial stability is assessed using the Z-score, past macroprudential legislation has a statistically significant favourable impact on it. The effects of monetary policy at levels where financial stability is measured by z-score of banks confirmed that monetary policy has a detrimental long-term impact on financial stability. Again, in the near term, when measures by the AFSI and lag one of the Z-score measure are taken, the monetary policy has a strong beneficial impact on financial stability. This is consistent with (Rubio 2016; Garca-Herrero & Del Rio Lopez 2003) findings.

To account for the control variables in the short run, the CAR, exchange rate, defaulted loans, and bank profit have a positive influence on financial stability with statistical significance, which proves their effects in the first objective. However, inflation has a statistically significant negative effect on financial stability, which aligns with the findings of Merko and Habili (2023). And the lending rate has been insignificant in the short run.

The error correction term (ECT), which gauges how quickly an equilibrium transitions from a short-term disequilibrium to a long-term equilibrium, is statistically significant at the 1% level and also indicates a negative trend for both the z-score equations. It indicates that following a short-term shock, the short-term outcomes will adjust towards a long-term equilibrium. In particular, disequilibrium in the short run is expected to return to equilibrium in the long run by 57.3% in the Z-score model.

Table 9 also shows the diagnostic tests of the two models (Z-score and AFSI) for objective 2 model 2a. The tests are carried out to check the robustness of the models. Hence, stability, normality, heteroscedasticity,

misspecification, and autocorrelation in the ARDL models are tested. All the null hypotheses for the robustness check tests are not rejected. It therefore concludes that the study objective 2 model 2a is free from heteroscedasticity, misspecification problems, autocorrelation, and the residuals are normally distributed.

The models are stable, as evidenced by the CUSUMSQ and CUSUM charts which is consistent with Pesaran et al.'s (2001) stability test in an ARDL specification. As shown in Appendix B, both specifications' 5% critical value boundaries are not exceeded by the residuals of CUSUM and CUSUMSQ. This indicates that the models are in good shape. As a result, the ARDL equations remain stable over the entire period investigated.

Interaction of Macroprudential and Monetary Policies on Financial Stability

The interaction term is added to test the potency of the policies on financial stability. Macroprudential regulation and monetary policy play complementary roles in Ghana under the framework of inflation targeting to achieve stability in terms of both prices and finances. According to Nier and Kang (2016), each policy's efficiency is improved when they interact. But based on the outcomes of model 2a, where money management and macroprudential supervision are included in one equation, The z-score of banks, which is a gauge of both short- and long-term financial stability, is negatively impacted by monetary policy in a statistically meaningful way. While macroprudential regulation has an immediate positive insignificant effect on the z-score and the AFSI measures of stable finance and a long-term negative insignificant influence on the z-score.

Bound Test Results

Table 10: ARDL Bound Test Results for Model 2b

F-Bounds Test (z-score)		Null Hypothesis: No levels relationship		
Test Statistic	Value	Significance	I (0)	I (1)
F-statistic	7.218	10%	1.95	3.06
K	8	5%	2.22	3.39
		1%	2.79	4.10
F-Bounds Test (AFSI)		Null Hypothesis: No levels relationship		
Test Statistic	Value	Significance	I (0)	I (1)
F-statistic	3.561	10%	1.95	3.06
K	8	5%	2.22	3.39
		1%	2.79	4.10

Source: Author (2023)

The outcomes of the bound test in Table 10 demonstrate that the regressors and financial stability have a long-term connection. This is so because the F-statistics of 7.218 and 3.561 surpass the 5% [I (1)] critical value (3.39). Additionally, the F-statistics for the Z-score and the AFSI, respectively, are greater than their [I (0)] critical value at 5% (2.22), which is 7.218 and 3.561, respectively. Therefore, the null hypothesis that there is no long-run relationship between financial stability and the regressors is rejected since the research variables are co-integrated at I (0) and I (1). As a result, the study found a long-term association between financial stability and the factors examined. This implies that adjustments to these variables over time refer to modifications in financial stability. The study's estimation of the level coefficients and short-term dynamic effects using the ARDL cointegration

approach Tables 11 and 12 display the short- and long-term findings, respectively.

Table 11: Estimated Long-Run Interactive Effect Coefficients

Dependent variables	**D (Z-SCORE)**		**D (AFSI)**	
Regressors	Coefficient	Standard Error	Coefficient	Standard Error
MR	-1.564	2.055	5.026	2.894
MP	-1.824	1.112	3.874*	2.113
MP*MR	0.117	0.124	-0.316	0.182
CAR	0.997**	0.432	-0.560	0.413
LR	1.253**	0.442	-0.965	0.603
NON_PL	0.299	0.168	0.183	0.141
INF	0.320	0.179	-0.389*	0.212
EXC	-0.084	0.228		
BP			0.496	0.250

Note: ***, **, and * represent 1%, 5% and 10% signification level respectively.

The results of the interaction among monetary policy and macroprudential regulation regarding stability of the financial sector are shown in Tables 11 the long-run. Exchange rate, lending rate, non-performing loans, inflation, and the capital adequacy ratio were controlled for in the z-score equation. For the AFSI equation, the capital adequacy ratio, lending rate, non-performing loans, inflation, and banks' profits were controlled for. However, since the aim is knowing the effect of the interaction, it could not be determined from just the coefficients above, hence, the study proceeded to calculate the interaction effect in table 13.

Table 12: Estimated Short-Run Interactive Effect Coefficients

Dependent Variable	**D (Z-SCORE)**		**D (AFSI)**	
Variable	Coefficient	Standard Error	Coefficient	Standard Error
C	-20.749***	1.865	-11.690***	1.540
D (FS (-1))	0.626***	0.103	-0.621***	0.134
D (MR)	2.914***	0.536	0.001	0.200
D (MR (-1))	2.977***	0.531	-1.152***	0.210
D (MP)	1.145***	0.314	0.106	0.118
D (MP (-1))	1.766***	0.310	-0.749***	0.132
D (MP*MR)	-0.131***	0.030	0.001	0.011
D (MP*MR (-1))	-0.157***	0.031	0.071***	0.013
D (CAR)	0.524***	0.063	0.018	0.025
D (CAR (-1))	-0.309***	0.049	0.123***	0.031
D (LR)	0.436***	0.074	-0.081**	0.034
D (LR (-1))	-0.254***	0.055	0.155***	0.028
D (NON_PL)	0.179***	0.024	0.035***	0.007
D (NON_PL (-1))	-0.099***	0.020		
D (INF)	0.149***	0.026	-0.067***	0.015
D (INF (-1))	-0.104***	0.032		
D (EXC)	0.230	0.138		
D (BP)			0.064***	0.010
D (BP (-1))			-0.044***	0.011
ECT (-1) *	-0.788***	0.071	-0.307***	0.040
R-squared	0.929		0.898	
Adjusted R-squared	0.857		0.807	
S.E. of regression	0.162		0.073	
Sum squared residual	0.447		0.095	

Log likelihood	26.640	53.788
F-statistic	12.991	9.873
Prob(F-statistic)	0.000	0.000
Akaike info criterion	-0.494	-2.102
Schwarz criterion	0.306	-1.347
Hannan-Quinn criterion.	-0.218	-1.841
Durbin-Watson stat	2.547	2.491

Note: ***, **, and * represent 1%, 5% and 10% signification level respectively

Diagnostic Tests

Test	F-statistics	F-statistics
Heteroscedasticity	1.172	1.090
	[0.424]	[0.466]
Serial correlation	1.755	2.362
	[0.241]	[0.157]
Normality (Jarque-Bera)	0.853	0.999
	[0.653]	[0.607]
Misspecification	0.833	0.393
	[0.388]	[0.546]

Note: [ ] are probability values

In table 12 above the short-run results of the model 2b with the interaction of monetary policy and macroprudential regulation regarding stability of the financial sector are presented. Exchange rate, lending rate, non-performing loans, inflation, and the capital adequacy ratio were controlled for in the z-score equation. For the AFSI equation, the capital adequacy ratio, lending rate, non-performing loans, inflation, and banks' profits were controlled for. However, since the aim is to know the effect of the interaction,

it could be determined from just the coefficients above, hence, the study proceeded to calculate the interaction effect in table 13.

coefficients above, hence, the study proceeded to calculate the interaction effect in table 13.

Table 13: Marginal Effect Results

	Short-Run	
Dependent variable	D (Z-SCORE)	D (AFSI)
$\frac{dps}{dmp}$	0.140***	0.114
$\frac{dps}{dmr}$	1.145***	0.015

Source: Author (2023)

The interactive effect of the policies was found by taking the derivative of the equations in Appendix C with respect to each policy, and the outcomes are shown in Table 13 above.

Based on table 11's long-term findings the interaction term for both the z-score equation and the AFSI equation is statistically insignificant. Also, it is insignificant in the AFSI equation in the short-run as in table 12. This means that there is no statistically significant effect of the interaction of the two policies in the long-run as well as in the AFSI equation in the short-run. However, the interaction term is statistically significant for the z-score equations in the short-run. Hence the interpretation is based on the z-score equation in the short-run.

It was found that, conditioned upon the presence of monetary policy, financial stability is statistically significantly improved by macroprudential regulation. According to the findings, at the minimum value of 13.5 of

monetary policy, macroprudential regulation enhances financial stability by 1.145 in the short run, though the AFSI value is not significant. Rubio and Carrasco-Gallego (2014) support these findings in their study, which concludes that when the two policies are operated in a coordinated manner, they unmistakably cooperate to advance financial stability. According to Rubio and Carrasco-Gallego (2015), macro-level prudential regulations have the capability to increase financial stability when monetary policy and other regulations are used concurrently, which is in accordance with the results of the current investigation. The findings were further supported by Rubio's (2016) study, which makes the case that macroprudential regulation considerably enhances financial stability when dealing with short-term rates. The null hypothesis of a significant effect of macro-level prudential regulation on the stability of finance conditioned upon the existence of monetary policy is not rejected. There is therefore a noteworthy effect of macroprudential regulation on financial stability conditioned upon the existence of monetary policy.

The motive for the improvement in the degree to which macroprudential regulation influences financial stability positively upon the existence of monetary policy can be bubbles in asset prices and rapid credit expansion. When asset prices are inflated and loan growth is rapid, high policy rates, which measure monetary policy, result in high interest rates, making debt more expensive for borrowers. It also dampens asset price bubbles, thus complementing macroprudential regulations aimed at maintaining financial stability. Also, the two policies operate under the inflation targeting framework; hence, their objectives could overlap.

Additionally, when employed together, money management strategies and macroprudential supervision might lessen the possibility of financial instability. Monetary policy, for instance, can be used to slow the economy down if it is growing too quickly and causing asset bubbles. When the economy is growing too quickly and causing asset bubbles, contractionary monetary policy may be implemented to increase interest amounts in the economy, which makes it expensive for businesses and consumers to borrow. Thus, slowing the quick growth and asset price bubbles. To limit the amount of risk that financial institutions take on, macroprudential regulation can be used. Thus, tightening macroprudential regulations such as the reserve requirement helps ensure that banks' will be able to meet their obligations to depositors and creditors.

The findings also suggest that monetary policy has a short-term statistically significant positive effect on financial stability (z-score). Thus, at the minimum value of 7.67 of macroprudential regulation, monetary policy improves financial stability by 0.140. This therefore confirms its complementary function in enhancing the effect of macroprudential regulation on financial stability and the findings of Rubio (2016), as he argues that short-term rates can achieve financial stability while potentially increasing macroeconomic volatility. Garca-Herrero and Del Rio Lopez (2003) also support the findings when they conclude that monetary policy helps reduce the risk of financial instability. This is possible because lower interest rates in the country, resulting from a low monetary policy rate by the BoG, make it cheaper for businesses and consumers to borrow money. This can help stimulate economic activity and prevent financial instability.

The ECT, which gauges the rate of transition from a short-term disequilibrium to a long-term equilibrium, is negative, statistically significant, and holds for both the z-score equation and the AFSI. These significant and negative adjustment coefficients support the long-term conclusions. They imply that after a short-term shock, the results will adjust towards a long-term equilibrium. In the Z-score and AFSI models, short-term imbalance is expected to return to balance over the long term by 78.8% and 30.7%, respectively.

A diagnostic test of the two models (Z-score and AFSI) for objective 2 model 2b is also shown in Table 12. The tests for stability and diagnosis are performed to ensure the models' robustness. As a result, the ARDL models' stability, normality, heteroscedasticity, misspecification, and autocorrelation are examined. For the robustness check tests, the study fails to reject all null hypotheses. As a result, it is concluded that the study objective 2 model 2b equation is free of heteroscedasticity, misspecification, and autocorrelation and that the residuals are normally distributed. This is because their p-values (0.424, 0.388, 0.241, and 0.653) and (0.466, 0.546, 0.157, and 0.607) of the tests are greater than the 5% significance level. According to the CUSUM and CUSUMSQ graphs in Appendix B, the models are also stable.

Effect of monetary policy on price stability in Ghana

Bound test results

Table 14: ARDL Bound Test Results

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Significance	I (0)	I (1)
F-statistic	5.709	10%	2.45	3.52
K	4	5%	2.86	4.01
		1%	3.74	5.06

Note: k = number of regressors in the model, I (0) = integrated at levels, and I (1) = co-integrated at first differences

Source: Author (2023)

The findings from Table 14 indicate a lasting association between price stability and the regressors in Ghana, as revealed by the cointegration test. The F-statistic (5.709) surpasses the critical values for both I (1) at 5% (4.01) and I (0) at 5% (2.86), leading to the application of ARDL cointegration analysis for determining the long-term coefficients and short-term dynamic effects. Long-run outcomes are presented in Table 15, while short-run outcomes are shown in Table 16

Table 15: Estimated Long-Run Coefficients, ARDL (1, 3, 2, 3, 3)

Dependent Variable: D (PS)

Variable	Coefficient	Standard. Error	t-Statistic	Probability
MP	1.447	1.353	1.070	0.300
TB	-3.952	5.469	-0.723	0.480
GDP	-3.748	4.825	-0.777	0.448
EXC	-11.364	13.688	-0.830	0.418

Source: Author (2023)

Table 15's long-run outcomes demonstrate that monetary policy has a negative effect on price stability in Ghana. It indicates that when monetary policy is tightened by a cedi, price stability will reduce by 1.447%; this is, however, not statistically significant at 5%. This finding supports Itodo et al.'s (2017) results in Nigeria, where they found no statistically significant effect of price stability and monetary policy. Hence, the null hypothesis of an important long-term monetary policy's influence on price stability is disproved. Also, all the control variables (treasury bill, GDP, and exchange rate) have a positive and statistically insignificant effect on price stability in the long run.

Table 16: Estimated Short-Run Coefficients

Dependent Variable: D (PS)				
Regressors	Coefficient	Standard Error	T-Statistic	Probability
C	32.314	5.389	5.996	0.000
D (MP)	1.327	0.360	3.685	0.002
D (MP (-1))	-0.054	0.394	-0.138	0.892
D (MP (-2))	1.217	0.362	3.364	0.004
D (TB)	-0.620	0.220	-2.813	0.012
D (TB (-1))	0.557	0.203	2.736	0.014
D (GDP)	0.089	0.318	0.281	0.782
D (GDP (-1))	-0.085	0.428	-0.199	0.844
D (GDP (-2))	0.908	0.396	2.292	0.035
D (EXC)	0.585	0.757	0.773	0.450
D (EXC (-1))	1.780	0.982	1.812	0.088
D (EXC (-2))	1.079	0.772	1.399	0.180
ECT (-1) *	-0.264	0.044	-5.938	0.000

R-squared	0.770	Akaike info criterion	3.227
Adjusted R-squared	0.639	Schwarz criterion	3.810
S.E. of regression	1.054	Hannan-Quinn criterion	3.426
Sum squared residuals	23.346	Durbin-Watson stat	1.894
Log likelihood	-41.853		
F-statistic	5.858		
Prob(F-statistic)	0.000		

Diagnostic Tests

Test	F-statistics	Probability
Heteroscedasticity	0.853	F (16,17) = 0.620
Serial correlation	0.013	F (2,15) = 0.987
Normality (Jarque-Bera)	1.944	0.378
Misspecification	0.0003	F (1, 16) = 0.984

Source: Author (2023)

The short-run results in Table 16 show that monetary policy has a detrimental effect on price stability. Thus, an expansionary monetary policy will worsen price stability by increasing inflation by 1.327, which is statistically significant at the 1% level of significance. As a result, the short-run null hypothesis that monetary strategy alone has a considerable effect on the stability of prices is not rejected. Similar findings were made by Gbadebo and Mohammed in 2015, and they contend that monetary policy exhibits a significant and unfavorable influence on price stability over the short and long term.

This is possible because expansionary monetary policy aimed at stimulating economic growth can result in increased lending and credit creation. If credit is not channeled efficiently to productive sectors and instead fuels speculative activities or asset bubbles, it can cause distortions and inflationary pressures in specific sectors or asset classes while real economic activity remains sluggish. Also, in an interconnected global economy, monetary policy actions in one country can have spillover effects on other economies. If a country implements expansionary monetary policy while its trading partners pursue tighter policies, it can lead to currency depreciation and higher import prices, as in the case of Ghana. This, in turn, can contribute to higher inflation in the domestic economy, offsetting the desired monetary policy's impact on the stability of prices.

The current GDP and exchange rate demonstrate a statistically insignificant influence on price stability when the effect of the control variables is accounted for. This is consistent with Hatane and Nurina's (2015) findings that there is no statistically significant correlation between price stability and GDP. And Abdurehman and Hacilar (2016), who found no Purchasing Power Parity (PPP) in Turkey. Price stability is positively impacted by Treasury bills, according to statistical analysis. Therefore, a cedi increase in the treasury bill rate will result in an increase of 0.620 in price stability. This supports Nyawata's (2013) findings, which also reveal that the use of treasury bill rates is the most effective way to reduce the flow of currency in an economy, thereby promoting stability in prices.

. The term error correction term (ECT) is a measure of how quickly a system adjusts to a disequilibrium in the short run. The ECT in this instance is

unfavorable and statistically significant at the level of 1%. This implies that the system will eventually reach equilibrium. The ECT coefficient's magnitude indicates the rate of adjustment. The coefficient in this instance is 0.264. This suggests that the amount of time needed to return to equilibrium will be roughly 26.4% of the time it took to create the disequilibrium. The negative and significant ECT coefficient provides evidence in favor of the study's long-run conclusions. It suggests that following a brief shock, the equation will eventually reach equilibrium.

The diagnostic tests for the model in Table 16 show that it is free of heteroscedasticity, misspecification, and autocorrelation, and there is a normal distribution of the residuals at 5% because the test p-values are more than 5% significance level. However, the model is not stable, as evidenced by the CUSUMSQ plots in Appendix B. Additionally, the regressors account for 77% of all variation in price stability, and each regressor has a predictive power of approximately 63.9%.

Effect of monetary policy on price stability conditioned upon the existence of a stringent (lax) macroprudential policy

Two models are estimated for the achievement of study objective 4. Model 4a, which contains both monetary intervention and macro-level prudential regulation as well as control variables, and Model 4b, which includes both monetary policy and macroprudential regulation as well as how the two policies interact with one another and with the other control variables.

Bound test results

Table 17: ARDL Bound Test Results for Model 4a

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Significance	I (0)	I (1)
F-statistic	14.460	10%	2.12	3.23
K	6	5%	2.45	3.61
		1%	3.15	4.43

Source: Author (2023)

Table 17's bound test findings demonstrate that there is a long-term connection between price stability and the variables being taken into account. This is demonstrated by the F-statistics of 14.460, which are higher than the upper bound's critical values at the 5% significance level (3.61). Additionally, the lower bound [I (0)] F-statistics (14.460) are higher than the critical values at the 5% significance level (2.45) for price stability. The null hypothesis that there is no long-term relationship between price stability and the regressors is thus rejected because the research variables are co-integrated at both I (0) and I (1). As a result, the study discovered a strong and persistent correlation between price stability and the variables under study. This suggests a relationship between changes in price stability and fluctuations in these factors over time. The long-term coefficients and short-term dynamic effects were estimated in the study using ARDL cointegration analysis, and the outcomes are shown in tables 18 and 19, respectively.

Effect of Monetary Policy and Macroprudential Regulation on Price Stability

The optimal lag was set at 1 for the dependent variable and 3 for the regressors in light of the relatively small sample of observations and not to loss of information. The software then automatically generates appropriate lags for each variable in the price stability model. The regressors' lags are (1, 1, 3, 2, 3, 3, 1).

Table 18: Long-Run Coefficients, ARDL (1,1,3,2,3,3,1)

Dependent Variable: D (PS)				
Regressors	Coefficient	Standard Error	T-Statistic	Probability
MP	1.356	0.457	2.967	0.011
MR	-2.558	2.064	-1.239	0.237
LR	-0.822	0.686	-1.199	0.252
TB	-1.395	0.757	-1.843	0.088
GDP	-2.165	0.945	-2.290	0.039
EXC	-8.451	3.369	-2.508	0.026

Source: Author (2023)

Table 18 shows that in the long run, tightening monetary policy by a percentage will cause price stability in Ghana to decrease by 1.468. This is significant at 1% and supports the findings of Gbadebo and Mohammed (2015) and the results in Table 16. The study therefore fails to reject the null hypothesis of a significant effect of monetary policy on price stability conditioned upon the existence of macroprudential regulation. Monetary policy actions can have an impact on asset prices, such as those in the real estate or equity markets. The goal of macroprudential regulation is to reduce the risks associated with bubbles in the price of assets and excessive credit growth. However, the interaction of monetary policy and macroprudential regulation can pose difficulties. For example, if monetary policy stimulates

aggregate demand and liquidity, it may unintentionally contribute to asset price inflation, even if macroprudential measures are in place. Such inflated asset prices can have a ripple effect on the broader economy and threaten price stability. Also, macroeconomic policies and regulations, such as monetary policy and macroprudential regulation, are designed to achieve various goals. While monetary policy is primarily concerned with economic stability and inflation management, macroprudential regulation is concerned with promoting financial stability and mitigating systemic risks. Monetary policy actions to address inflationary pressures may inadvertently create incentives for regulatory arbitrage in some cases. Financial institutions may exploit loopholes or engage in risk-taking behavior to avoid regulatory measures, potentially leading to financial system imbalances and instability, which can then affect price stability.

The results also indicate that macroprudential regulation and lending rates have no statistically significant effect on price stability in the long run. The macroprudential regulation is insignificance because it is often seen as a complementary tool to fine-tune the banking system's liquidity and lending behavior rather than a direct instrument for price stability in Ghana. The rest of the control variables—treasury bill (TB), gross domestic product (GDP), and exchange rate (exc)—have a statistically significant effect on price stability in the long run.

Price stability will increase by 1.395 for every cedi that the rate on Treasury bills goes up. At a 10% level of significance, this is statistically significant. This backs up the findings in Table 16 and the findings of Nyawata's (2013) study, which also reveal that the use of treasury bill rates is

the most effective way to reduce the flow of currency in an economy, thereby promoting stability in prices.

Also, GDP improves price stability by reducing inflation by 2.165 when the GDP increases by one cedi. This confirmed the findings of Saymeh and Orabi (2013) but contradicts Umair and Ullah (2013), who found a negative, insignificant effect of GDP on price stability. The reason for the positive effect is that GDP measures a country's overall level of economic activity and production. Its growth indicates that the economy is expanding, which leads to increased production and supply of goods and services. A strong supply-side response to rising demand can help keep supply and demand in balance. When supply and demand are in balance, the likelihood of significant price fluctuations or inflationary pressures is reduced.

Moreover, the exchange rate increases price stability by 8.451 by reducing inflation by 8.451. This is statistically significant at 5% and aligns with Jiang and Kim (2013), who also found a positive effect of the exchange rate on price stability. A stronger currency can incentivize domestic producers to increase productivity and competitiveness. When the domestic currency appreciates, domestically manufactured items are more expensive on overseas markets. Local producers may need to improve efficiency, cut costs, and improve product quality to remain competitive. Increased productivity and competitiveness can lead to stable or declining domestic prices, contributing to price stability.

Table 19: Estimated Short-Run Coefficients

Dependent Variable: D (PS)				
Regressors	Coefficient	Standard Error	T-Statistic	Probability
C	48.419	3.976	12.177	0.000
D (MP)	1.468	0.131	11.207	0.000
D (MR)	-2.937	0.261	-11.272	0.000
D (MR (-1))	-0.476	0.218	-2.187	0.048
D (MR (-2))	0.885	0.198	4.470	0.001
D (LR)	-0.442	0.178	-2.478	0.028
D (LR (-1))	1.552	0.189	8.199	0.000
D (TB)	0.056	0.114	0.486	0.635
D (TB (-1))	0.361	0.112	3.209	0.007
D (TB (-2))	-0.386	0.108	-3.581	0.003
D (GDP)	-0.463	0.158	-2.925	0.012
D (GDP (-1))	0.624	0.214	2.910	0.012
D (GDP (-2))	0.838	0.171	4.905	0.000
D (EXC)	-0.362	0.375	-0.966	0.352
ECT (-1) *	-0.460	0.038	-12.163	0.000
R-squared	0.951	Akaike info criterion	1.794	
Adjusted R-squared	0.915	Schwarz criterion	2.468	
S.E. of regression	0.511	Hannan-Quinn criterion.	2.024	
Sum squared residual	4.955	Durbin-Watson stat	3.369	
Log likelihood	-15.501			
F-statistic	26.445			
Prob(F-statistic)	0.000			

Diagnostic Tests		
Test	F-statistics	Probability
Heteroscedasticity	1.720	F (20,13) = 0.159
Serial correlation	16.659	F (3,11) = 0.000
Normality (Jarque-Bera)	0.444	0.801
Misspecification	0.304	F (1,12) 0.591

Source: Author (2023)

Table 19 displays the short-term outcomes for Study Objective 4's Model 4a. In light of the results, monetary policy possesses a significant detrimental effect on stable price. Thus, an increase in monetary policy by 1 cedi will increase inflation as measured by CPI by 1. 468, which can worsen price stability. This finding is in line with the evidence found by Gbadebo and Mohammed (2015) but contrary to Okotori (2019), who found a positive effect of monetary policy on price stability. Since the effect is statistically significant, the analysis is unable to disprove the null hypothesis that Ghana's monetary policy has a major effect on price stability.

Policy credibility and expectations in the Ghanaian economy could be the cause of these negative relationships, as evidenced during and after the COVID-19 pandemic restrictions. Price stability is affected not only by monetary policymakers' actual actions but also by market participants' expectations and perceptions of future policy. If there is skepticism about the intention of the central bank in maintaining stable prices, inflation expectations may become unanchored. Higher wage demands, price-setting behavior, and inflationary spirals can all result, undermining overall price stability.

From the table, macroprudential regulation has a statistically significant positive effect on price stability. The results indicate that when macroprudential regulation is increased by a cedi, inflation will fall by 2.937. The study by Trabelsi (2022) on the connection between price stability in emerging and developing economies and macroprudential transparency lends weight to these conclusions. However, it contradicts Kim and Mehrotra (2018), who contend that macroprudential measures employed to limit credit expansion have a considerable negative impact on macroeconomic variables like real GDP and price stability. The reason is that macroprudential regulation helps boost market confidence and trust in the financial system. When regulatory authorities actively monitor and address systemic risks, it reassures market participants and investors. This assurance reduces the likelihood of panic, market disruptions, or sudden shifts in investor sentiment, which can lead to price volatility. Stable market conditions promote price stability, long-term investment, and economic growth.

Lending rate (LR) and GDP experience a statistically favorable impact on price stability when the effects of the control variables are taken into consideration. The results indicate that a rise in lending rate by 1 cedi will reduce inflation by 0.442 and improve stability of price. This goes in like with Bodhgire's (2021) claim that there is a positive, somewhat significant link between the lending rate and price stability. However, it goes against the findings of (Nainggolan et al. 2019; Asamoah and Adu 2016) who discovered a positive correlation between Ghana's price instability and banks' lending rates. This is because the monetary policy decisions of central bank's frequently influence lending rates. When the central bank raises interest rates,

it can have an impact on lending rates across the economy, making borrowing more expensive. Higher lending rates can reduce borrowing and spending, thereby reducing aggregate demand. This can help to maintain price stability by reducing excess demand and controlling inflationary pressures.

Moreover, GDP also improve price stability by reducing inflation by 0.463 when the GDP increase by one cedi. This confirmed the findings of Saymeh and Orabi (2013), but contradicts Umair and Ullah (2013) who found a negative insignificant effect of GDP on price stability. The reason for the positive effect is that GDP measures a country's overall level of economic activity and production. Its growth indicates that the economy is expanding, which leads to increased production and supply of goods and services. A strong supply-side response to rising demand can help keep supply and demand in balance. When supply and demand are in balance, the likelihood of significant price fluctuations or inflationary pressures is reduced.

Treasury bill have a negative effect on price stability which contradict its long-run results, however, it is statistically insignificant. Also, exchange rate influences price stability in a favorable way. which confirms its long-run findings but it is not statistically significant.

The ECT gauges how quickly an imbalance that is just transient shifts into a long-term equilibrium. At a 1% level of significance, it is found that the ECT is both negative and statistically significant. The negative and significant coefficients of adjustment lend support to the long-term dynamic's findings. They imply that, following a short-term disturbance, the short-run outcomes will gradually shift towards a long-term equilibrium. Thus, any temporary

deviations from equilibrium in the short run are expected to converge to equilibrium by 46%.

Table 19 also includes diagnostic tests for Objective 4 Model 4a. The model is put through stability and diagnostic tests to make sure it is reliable. As a result, the ARDL model's stability, normality, heteroscedasticity, misspecification, and autocorrelation are examined. From the robustness check tests, the study fails to reject all null hypotheses except autocorrelation. As a result, the study objective 4 model 4a is free of heteroscedasticity and misspecification, and the residuals are normally distributed.

The CUSUM and CUSUMSQ plots demonstrate the model's stability, which is consistent with Pesaran et al.'s (2001) stability test in an ARDL framework. The specifications' CUSUM and CUSUMSQ residuals are found to be within the bounds of the 5% critical values in Appendix B. This indicates that the model is stable and well-established. As a result, the ARDL equation remains stable throughout the investigation period. The R square of 0.951 also indicates that 95.1% of the total variation in price stability is explained by the regressors. And each of the regressors predicted approximately 91.5% of the variation in the R square, as shown by the adjusted R square.

Interaction of Monetary Policy and Macroprudential Regulation on Price Stability

The interaction term is included to assess how well the policies contribute to price stability. In Ghana, the framework of inflation targeting used the two policies to promote both price and financial stability. Nier and Kang (2016) contend that as the policies interact, each one's effectiveness rises. The outcomes of model 4a, where the equations account for both

monetary policy and macroprudential regulation, however, suggest something different. Macroprudential regulation affects price stability favorably in the short- and long-term, though the latter is not statistically significant. Monetary policy negatively affects price stability in the long and short runs.

Bound Test Results

Table 20: ARDL bound test results for model 4b

F-Bounds Test D (PS)	Null Hypothesis: No levels relationship			
Test Statistic	Value	Significance	I (0)	I (1)
F-statistic	11.550	10%	2.03	3.13
K	7	5%	2.32	3.50
		1%	2.96	4.26

Source: Author (2023)

The bound tests findings, shown in Table 20, show that price stability and the variables under investigation have a long-term relationship. This is evident from the F-statistics of 11.550, which surpass the critical values at a 5% significance threshold; the upper bound is 3.50. Additionally, the bottom limit [I (0)] F-statistics (11.550) is higher than the critical values at the 5% significance level (2.32) for price stability. Consequently, given the co-integration of the study variables at both I (0) and I (1), I reject the null hypothesis that there is no long-term relationship between price stability and the regressors. As a result, the study reveals a significant and enduring connection between price stability and the variables under investigation. This suggests that fluctuations in these variables over time are associated with changes in price stability. The study employed ARDL cointegration analysis to estimate the long-term coefficients and short-term dynamic effects, with the

outcomes for the long-term and short-term analyses provided in tables 21 and 22, respectively.

Table 21: Estimated Long-Run Interactive Effect Coefficients

Dependent Variable: D (PS)

Regressors	Coefficient	Standard Error	T-Statistic	Probability
MP	-19.804	5.518	-3.589	0.023
MR	-40.840	11.032	-3.702	0.021
MP*MR	2.113	0.563	3.753	0.020
LR	1.652	0.788	2.097	0.104
TB	-2.852	0.816	-3.496	0.025
GDP	-1.360	0.633	-2.149	0.098
EXC	-11.277	3.595	-3.137	0.035

Source: Author (2023)

Table 21 show the long-run outcomes of monetary policy's and macroprudential regulation's interactive effects on price stability. LR, GDP, TB, and EXC were controlled for. However, since the aim is to know the effect of the interaction, it could not be determined from just the coefficients above, hence, the study proceeded to calculate the interaction effect in table 23 below.

Table 22: Estimated Short-Run Interactive Effect Coefficients

Dependent Variable: D (PS)				
Regressors	Coefficient	Standard Error	T-Statistic	Probability
C	421.854	26.471	15.937	0.000
D (MP)	-5.350	0.675	-7.922	0.001
D (MP (-1))	11.899	0.891	13.347	0.000
D (MP (-2))	6.675	0.783	8.515	0.001
D(MR)	-19.212	1.290	-14.893	0.000
D (MR (-1))	16.383	1.376	11.902	0.000
D (MR (-2))	10.863	1.247	8.713	0.001
D (MP*MR)	0.783	0.067	11.707	0.000
D (MP*MR (-1))	-1.064	0.083	-12.758	0.000
D (MP*MR (-2))	-0.618	0.077	-8.067	0.001
D (LR)	1.988	0.231	8.610	0.001
D (LR (-1))	1.949	0.184	10.568	0.000
D (LR (-2))	1.349	0.193	6.985	0.002
D (TB)	-0.163	0.083	-1.956	0.122
D (TB (-1))	1.536	0.130	11.829	0.000
D (TB (-2))	0.680	0.121	5.597	0.005
D(GDP)	-0.548	0.099	-5.528	0.005
D (GDP (-1))	1.127	0.140	8.069	0.001
D (GDP (-2))	0.850	0.139	6.123	0.003
D(EXC)	-2.565	0.296	-8.662	0.001
D (EXC (-1))	0.183	0.323	0.566	0.601
D (EXC (-2))	-3.622	0.393	-9.224	0.000
ECT (-1) *	-0.921	0.058	-15.940	0.000

R-squared	0.992	Akaike info criterion	0.446
Adjusted R-squared	0.976	Schwarz criterion	1.479
S.E. of regression	0.270	Hannan-Quinn criterion.	0.798
Sum squared residual	0.804	Durbin-Watson stat	3.159
Log likelihood	15.416		
F-statistic	62.629		
Prob(F-statistic)	0.000		

Diagnostic Tests

Test	F-statistics	Probability
Heteroscedasticity	1.100	F (29,4) = 0.528
Serial correlation	3.267	F (2,2) = 0.234
Normality (Jarque-Bera)	0.102	0.950
Misspecification	0.634	F (1,3) = 0.484

Source: Author (2023)

Table 22 shows the short-run results of monetary policy's and macroprudential regulation's interactive effects on price stability. LR, GDP, TB, and EXC were controlled for. However, since the aim is to know the effect of the interaction, it could not be determined from just the coefficients above, hence, the study proceeded to calculate the interaction effect in table 23 below.

Table 23: Marginal Effect Results

	Long-Run	**Short-Run**
Dependent variable	D(PS)	D(PS)
$\frac{dps}{dmp}$	-3.597***	0.656***
$\frac{dps}{dmr}$	-12.314***	-8.614***

Tables 21 and 22 show monetary policy's and macroprudential regulation's interactive effects on price stability. LR, GDP, TB, and EXC were controlled for. The interactive effect of the policies was found by taking the derivative of the equations in Appendix C with respect to each policy, and the results are presented in Table 23 above.

It was found that conditioned upon the presence of macroprudential regulation, monetary policy has a positive statistically significant effect on price stability. The results indicate that by keeping macroprudential regulation at its minimum value of 7.67, monetary policy enhances price stability by 3.597 in the long run. Though the short-run results indicate an unfavourable effect. The results further indicate that conditioned upon the presence of monetary policy, macroprudential regulation has a positive statistically significant effect on price stability. The results indicate that keeping monetary policy at its minimum value of 13.5, macroprudential regulation enhances price stability by 12.314 in the long run. This is supported by the short-run results, where macroprudential regulation improves price stability by 8.614, keeping monetary policy at 13.5 minimum value. These findings support the works of Claessens (2013) and Nier and Kang (2016), who conclude that each of the policies efficiency is increased when interacted with. Therefore, the null

hypothesis of a significant effect of monetary policy on price stability conditioned upon the existence of macroprudential regulation is not rejected.

The reason for this is that how monetary policy is transmitted can be influenced by macroeconomic and financial conditions. The interaction term captures the joint impact of monetary policy and measures aimed at addressing specific vulnerabilities in the financial system by incorporating macroprudential regulation into the model. This combination helps to mitigate potential price stability threats such as overexpansion of credit and asset price bubbles. Also, when there are underlying financial imbalances, monetary policy may be limited in its ability to influence price stability. However, when combined with macroprudential regulation, the combined policy approach can more effectively address the sources of financial system instability. This may have a more robust and long-term impact on price stability.

Table 22 displays the findings of a diagnostic test conducted on objective 4 model 4b. To make sure the model is reliable and robust, these diagnostic and stability tests are performed. The ARDL model's stability, normalcy, heteroscedasticity, lack of misspecification, and lack of serial correlation are all examined in the tests. The robustness check tests' findings demonstrate that none of the null hypotheses of normality, homoscedasticity, no misspecification, or no serial correlation can be ruled out. This means that the equation for objective 4 model 4b is free of problems like heteroscedasticity, misspecification, and serial correlation. Furthermore, the model's validity is confirmed by the discovery that the residuals follow a normal distribution. The fact that the test p-values are over the 5% level of significance is clear from looking at them.

Examining the CUSUM and CUSUMSQ plots, as shown in Appendix B, further supports the model's stability. The plot shows that the model remained stable throughout the study period. Overall, the diagnostic tests on objective 4 model 4b confirm the model's robustness and reliability, indicating its suitability for the study's objectives.

Chapter Summary

This chapter's main goal was to investigate the empirical effects of macro-level prudential regulations and monetary policy on Ghanaian prices and financial stability. Before presenting and discussing the results, the initial phase contains descriptive statistics and the time series characteristics of the data utilized for estimation. Unit root tests were run using both the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) approaches to ascertain the variables' stationarity characteristics. According to the results, every series is either integrated into order zero (I (0)) or integrated into order one (I (1)). The analyses of the series using ARDL were then based on the ADF technique, with intercept terms included in the analyses.

According to the findings, there is no sustained association between macroprudential regulation alone and financial stability, but rather only a significant positive short-term effect. The results also showed that macroprudential regulation, subject to the existence of monetary strategy, has a substantial positive short-term effect on financial stability, which is significant, but its Long-term significance is negligible. In the case of macroprudential regulation, monetary policy also positively and significantly affects financial stability in the short term, but less so in the long term. Furthermore, while monetary policy alone has no statistically significant effect

on price stability over a long period, it has a statistically substantial detrimental influence over the short term. However, monetary policy has a statistically significant positive influence on price stability in Ghana, provided that there is macroprudential control in place in the long-run. Additionally, in the presence of monetary policy, macroprudential restrictions have a favorable and considerable effect on price stability over the short and long term.

CHAPTER FIVE

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

Introduction

The investigation's findings on how Ghana's pricing and financial stability are affected by monetary policy and macroprudential regulation are summarised in this chapter. In accordance with the findings, it also offers a pertinent conclusion and important policy recommendations that can help Ghana's price and financial stability. The chapter also offers suggestions for new lines of investigation.

Summary

The inflation targeting system in Ghana uses macro-level prudential regulations and monetary policy. However, little is known about their interactive effect on price and financial stability in the country, as shown in Chapter 1 of this study. The objectives that led to the specification of the study models were based on the conceptual framework adapted from Nier and Kang (2016) in Chapter 2. The first goal of the investigation was to look at the influence of macroprudential regulation alone on financial stability in Ghana. The short and long-term impacts of the policies on financial stability were estimated utilising an ARDL model. The findings unveiled that macroprudential regulation has no long-run relationship with financial stability, but it has a very beneficial immediate effect on financial stability. This suggests that using macroprudential regulations is good for financial stability over the short term.

With a stimulative (restrictive) monetary strategy in place, the second objective was to investigate the influence of macroprudential regulation on the

stability of the financial system. A number of financial controls were utilized, including capital adequacy ratios, non-performing loans, lending rates, bank profits, exchange rates, and price levels. The findings indicated that macroprudential regulation has a statistically negligible impact on short and long-term financial stability, assuming that monetary policy remains constant. However, when prudential regulation at the macro-level is held constant and financial stability is determined by banks' z-scores, monetary policy has a statistically significant negative impact on financial stability both immediately and later on. With the exception of inflation, which has a short-term negative influence on financial stability, and the loan rate, which lacks statistical significance, all the control factors have been discovered to have favorable, significantly influential effects on financial stability.

However, since the two policies are used in the country, the study interacted them to determine the effect of each of them upon the existence of the other on financial stability. The results indicate that, in the presence of monetary policy, macroprudential regulation has a significant positive effect in relation to short-term financial stability but is insignificant over time. Also, with the existence of macroprudential regulation, financial stability is significantly improved in the short run by monetary policy.

Additionally, the third objective analyses the influence of money management alone on maintaining stable prices. The results demonstrate that monetary policy significantly undermines price stability. It suggests that the use of monetary policy alone should be avoided when targeting price stability in Ghana without complementing it with other policies, such as macroprudential.

Finally, the fourth objectives investigate how monetary policy affects price stability when there is either a strict or lax macroprudential policy in place. The ARDL method was once again used to control GDP, the exchange rate, the lending rate, and the treasury bill. The results show that macroprudential regulation benefits price stability, even though this effect over an extended period of time is not statistically significant. For both long and short periods, monetary policy has a statistically significant detrimental impact on price stability. However, since the two policies are used in the country, the study tested their potency by interacting them to determine the effect of each of them upon the existence of the other on price stability. From the findings, it appears that, upon the existence of macroprudential regulation, monetary policy positively and statistically impacts price stability in the long-run. Furthermore, macroprudential regulation has a favorable and significant impact on Ghana's present monetary policy's ability to maintain price stability.

Conclusions

The potency of monetary policy in the long-run, and macroprudential regulation in both short and long runs is improved in reducing inflation when they are interacted which increases price stability. Also, in targeting financial stability in Ghana, it is only in the short term that monetary policy and macroprudential regulations interaction is beneficial. Additionally, capital-based macroprudential regulations, such as capital adequacy ratios, is a good instrument for stabilising the financial sector over the long term, because they have a positive long-term effect on financial stability.

Recommendations

Macroprudential regulation and monetary policy must be coordinated in order to effectively target price stability and lower inflation in Ghana. These two instruments of government can work together to increase economic price stability and increase its efficiency of each tool individually. To effectively target the nation's financial stability, a sequential approach to policy implementation is advised. Although monetary policy and macro-level prudential regulations can work together in the short term to address current risks, ultimately, it is best to only rely on capital-based macro-level prudential regulations. Here are some suggested policies:

In order to control liquidity and affect borrowing costs, the BoG should keep using the inflation targeting framework and monetary policy instruments like policy rates. By adjusting it in tandem with reserve requirements as a macroprudential regulation tool, the BoG can help to contain inflationary pressures and promote price stability in the long-run.

Once more, a coordinated strategy combining monetary policy and macro-level prudential regulations can be adopted when there are imminent concerns about financial stability. This entails using monetary policy tools like the policy rate and liquidity management in conjunction with targeted macroprudential measures to address specific vulnerabilities or imbalances in the financial system.

Lastly, over time, the primary tool for maintaining financial stability should be improved and fine-tuned macroprudential regulations. The BoG should prioritise the development and implementation of measures that

address systemic risks such as excessive leverage, asset bubbles, and financial institution interconnectedness.

Suggestions for Future Research

Having come this far with the study taking into account its focus, the study suggests that future studies should consider interacting the two policies and fiscal policy for comparison.

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APPENDICES

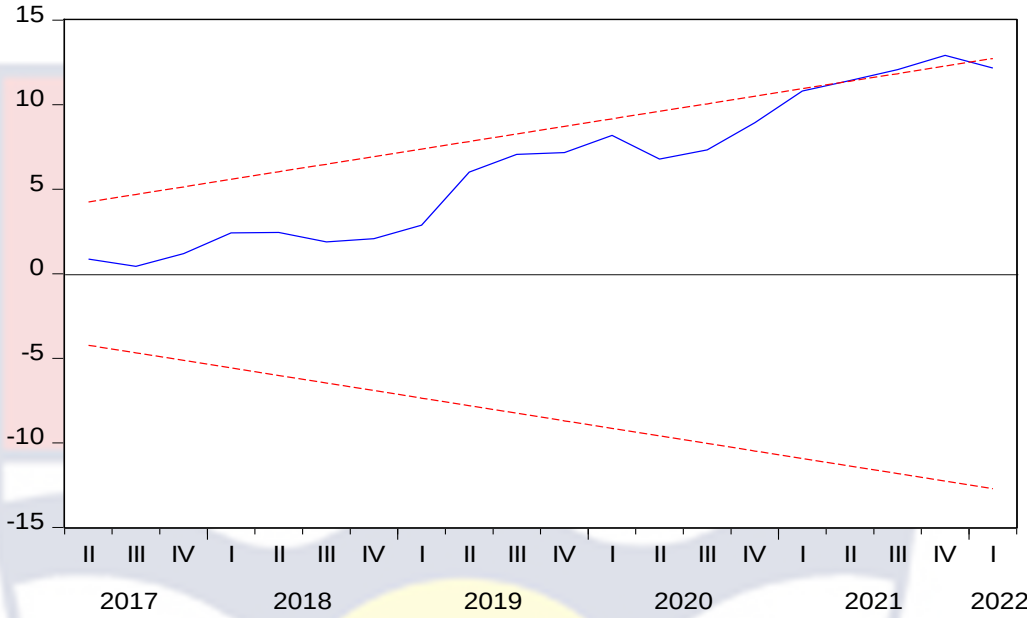
A: Correlation Matrix

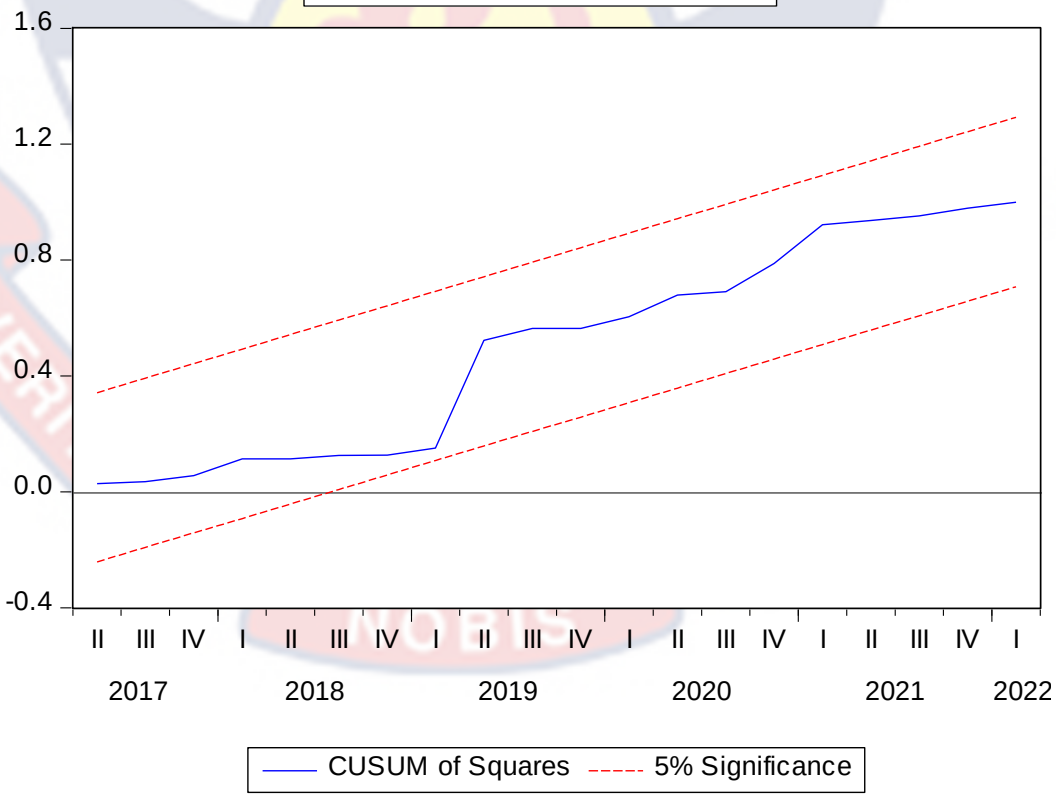
	MR	MP	LR	ZS	FSI	PS	NON_PL	TB	BP	CAR	EXC	GDP
MR	1.000											
MP	0.489	1.000										
	0.002											
LR	0.663	0.802	1.000									
	0.000	0.000										
ZS	0.549	0.061	0.406	1.000								
	0.000	0.721	0.013									
FSI	0.349	0.660	0.726	0.137	1.000							
	0.034	0.000	0.000	0.419								
PS	0.614	0.676	0.586	0.485	0.283	1.000						
	0.000	0.000	0.000	0.002	0.090							
NON_PL	-0.528	-0.002	-0.385	-0.809	-0.185	-0.304	1.000					
	0.001	0.990	0.019	0.000	0.273	0.068						
TB	0.670	0.517	0.781	0.812	0.485	0.700	-0.707	1.000				
	0.000	0.001	0.000	0.000	0.002	0.000	0.000					
BP	0.468	-0.033	0.355	0.899	0.174	0.416	-0.835	0.735	1.000			
	0.004	0.847	0.031	0.000	0.303	0.011	0.000	0.000				
CAR	-0.707	-0.725	-0.853	-0.254	-0.471	-0.597	0.193	-0.570	-0.179	1.000		
	0.000	0.000	0.000	0.129	0.003	0.000	0.253	0.000	0.289			
EXC	-0.795	-0.196	-0.571	-0.710	-0.106	-0.479	0.663	-0.701	-0.665	0.533	1.000	
	0.000	0.245	0.000	0.000	0.533	0.003	0.000	0.000	0.000	0.001		
GDP	0.112	0.139	0.057	-0.467	0.037	-0.209	0.365	-0.335	-0.473	-0.166	-0.065	1.000
	0.509	0.411	0.739	0.004	0.828	0.215	0.026	0.043	0.003	0.325	0.704	

B: Stability Test Results

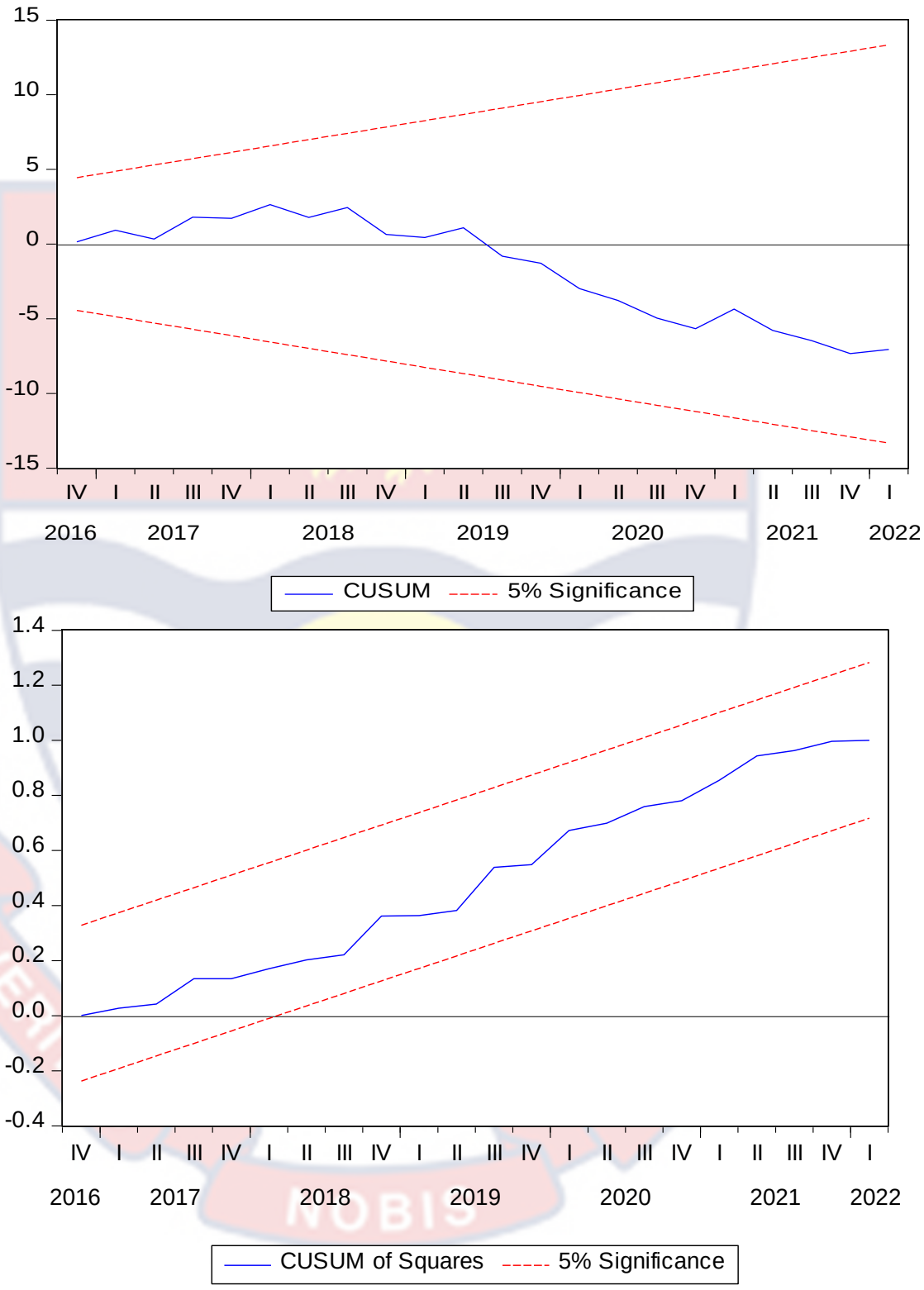
Objective 1

D (Z-SCORE)



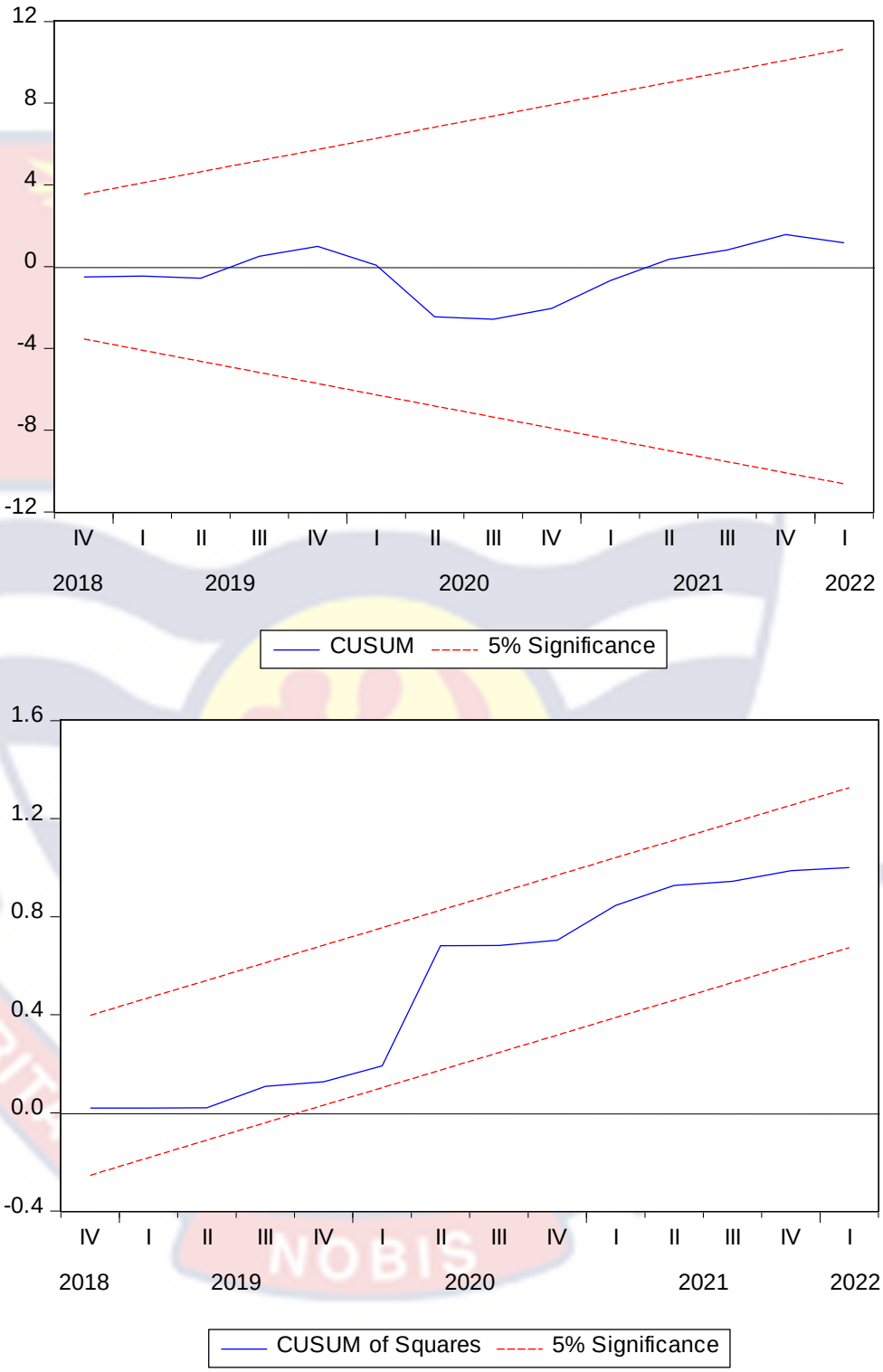


D (AFSI)

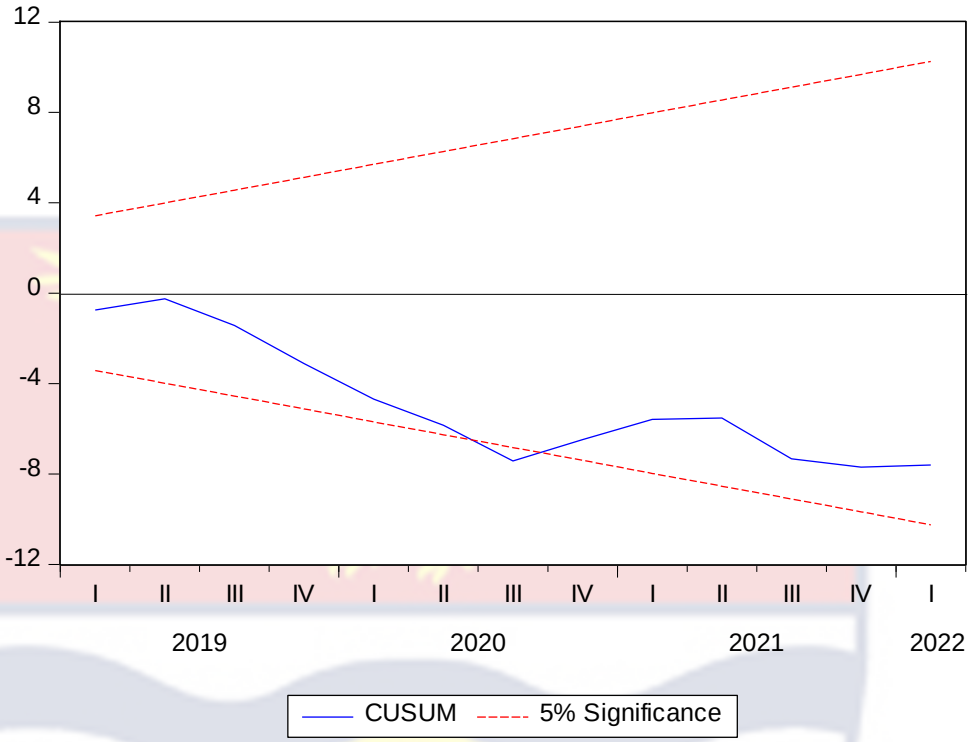


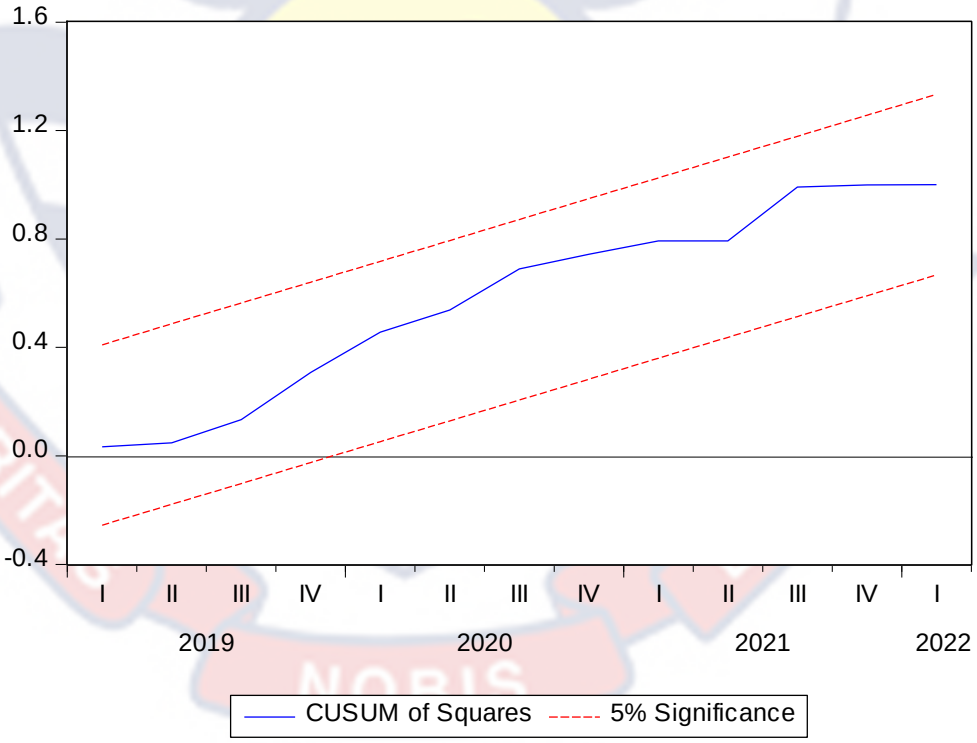
Objective 2 (model 2a)

D (Z-SCORE)



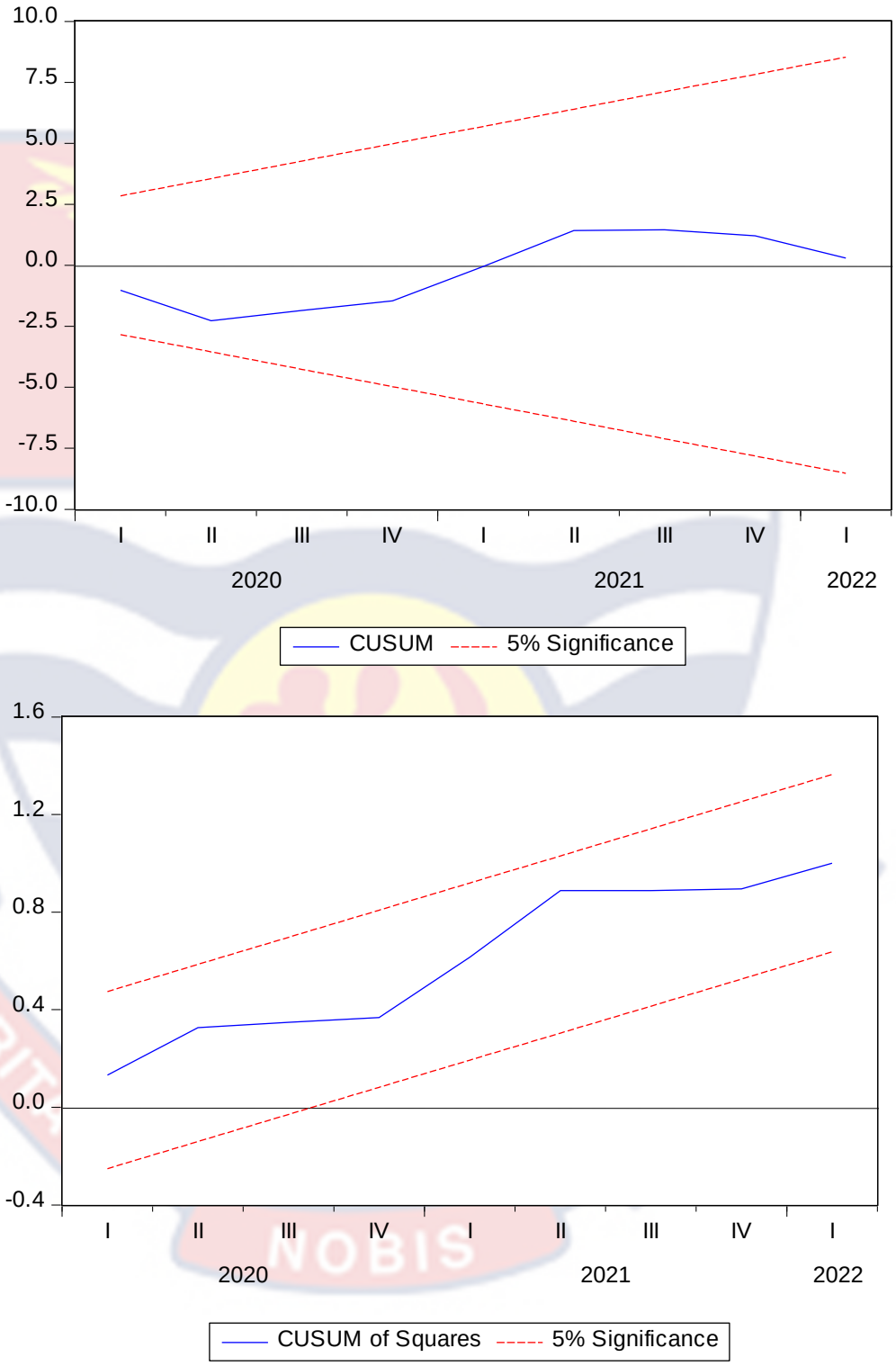
D (AFSI)



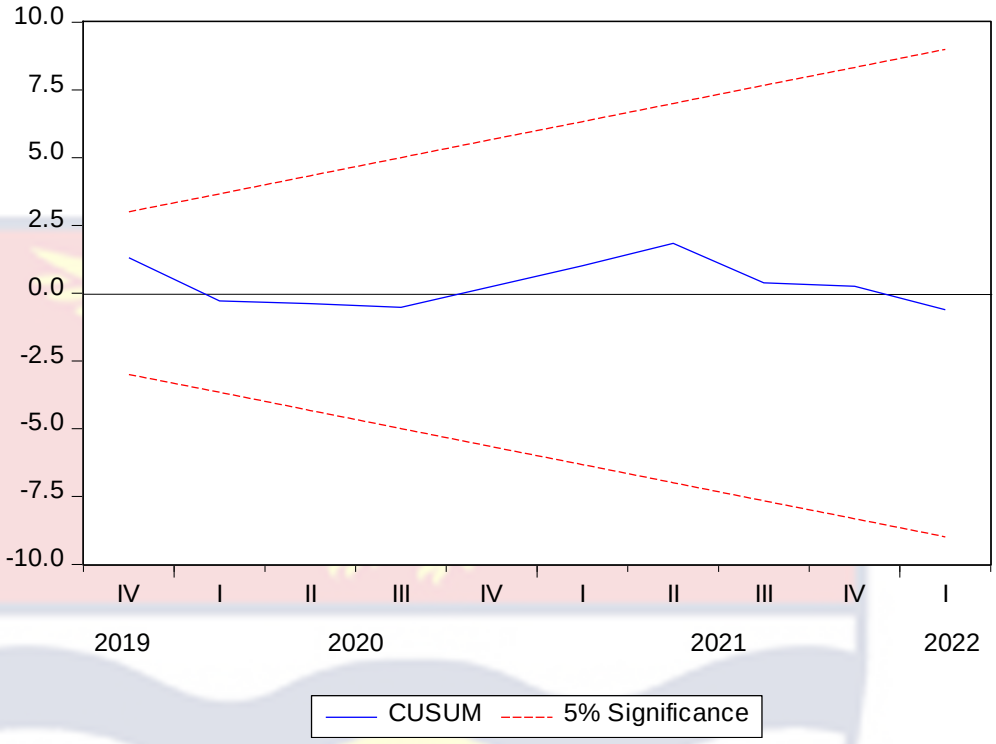


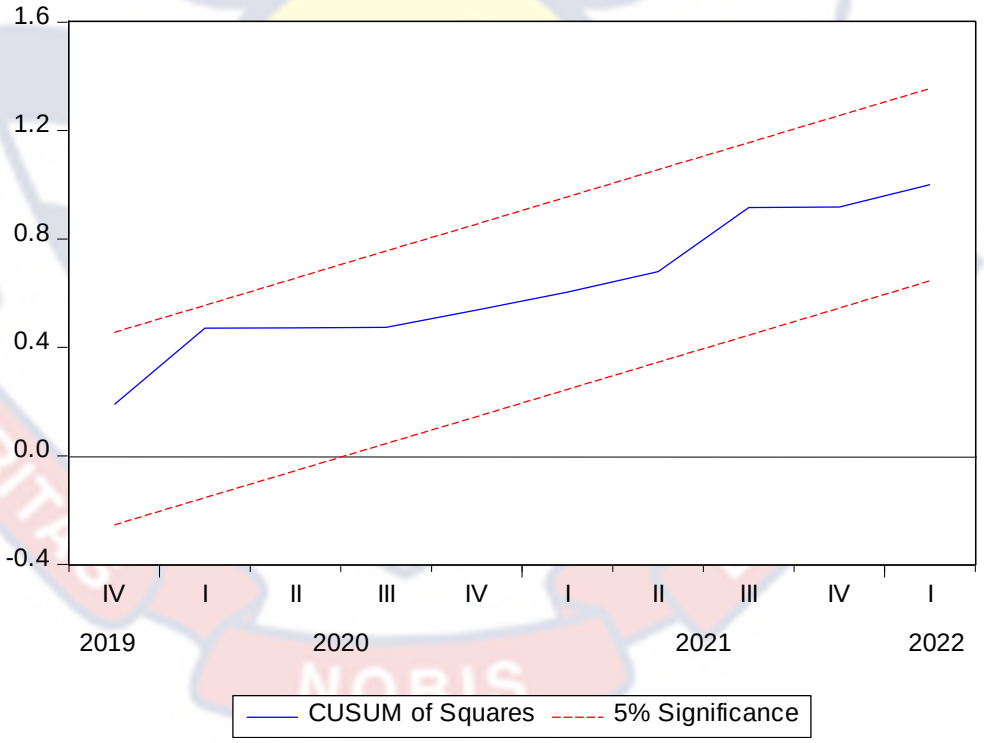
Objective 2 (model 2b)

D (Z-SCORE)



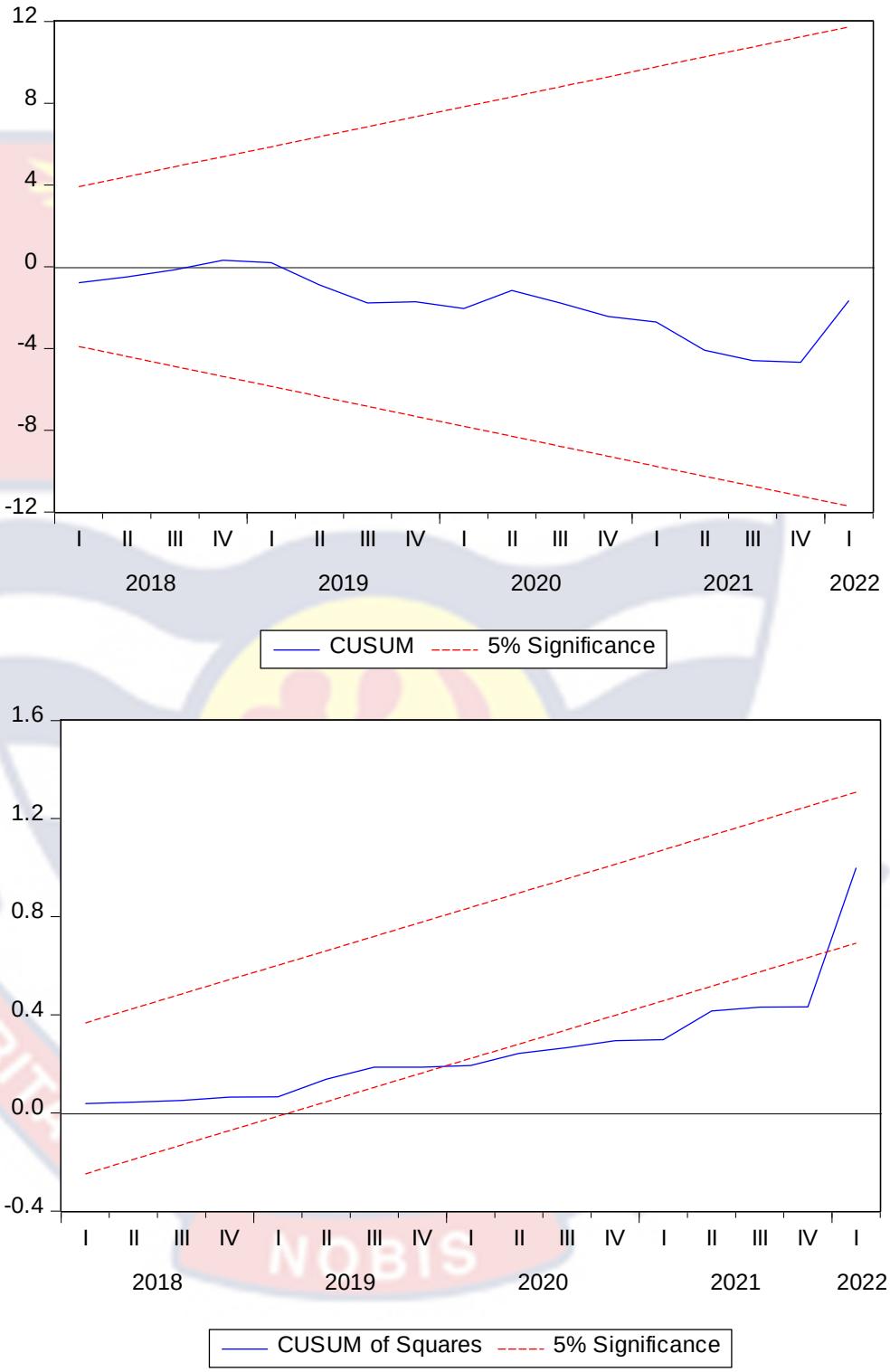
D (AFSI)





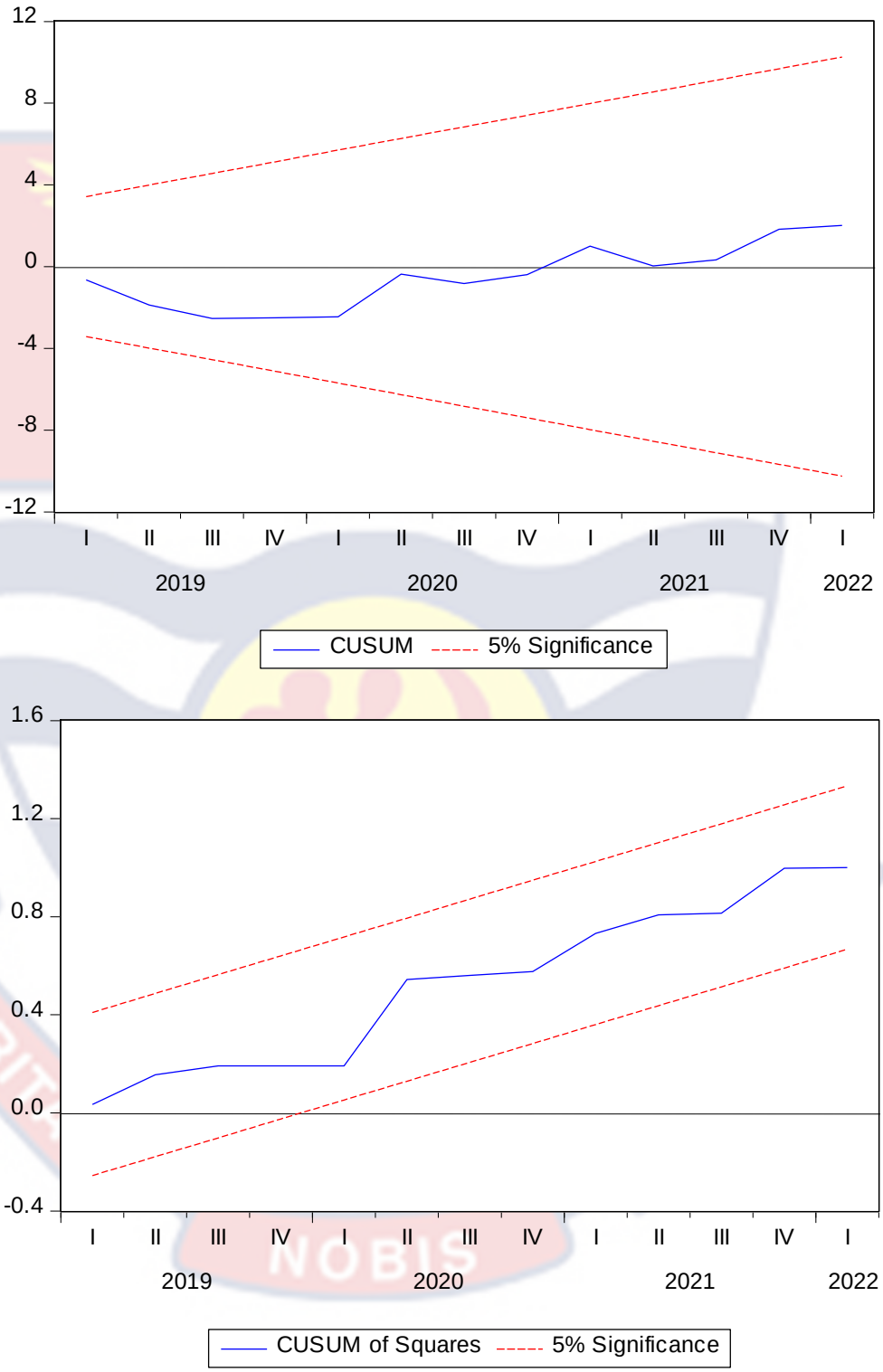
Objective 3

D (PS)



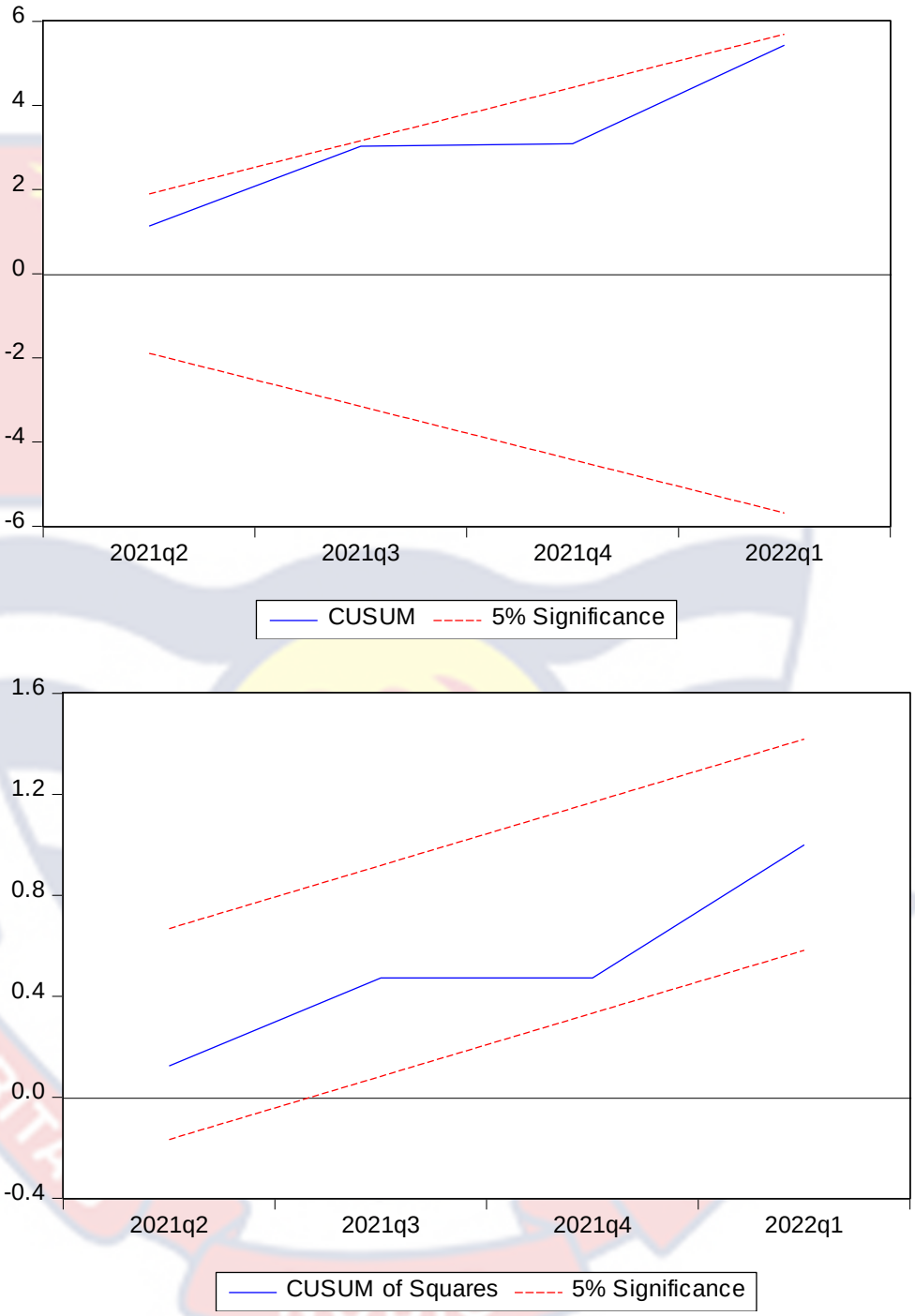
Objective 4 (model 4a)

D (PS)



Objective 4 (model 4b)

D (PS)



C: Marginal Effect Equations

$$FS_t = \gamma_0 + \gamma_1 MR_t + \gamma_2 MP_t + \gamma_3 MP * MR_t \text{ ……..***}$$

$\frac{dFS_t}{dMR} = \gamma_1 + \gamma_3 MP$ (Using minimum value of MP) …… **

$\frac{dFS_t}{dMP} = \gamma_2 + \gamma_3 MR$ (Using minimum value of MR) …… *

$$PS_t = \Phi_0 + \Phi_1 MR_t + \Phi_2 MP_t + \Phi_3 MP * MR_t \text{ ……..} ***$$

$\frac{dPS_t}{dMR} = \Phi_1 + \Phi_3 MP$ (Using minimum value of MP) …… **

$\frac{dPS_t}{dMP} = \Phi_2 + \Phi_3 MR$ (Using minimum value of MR) …….. *