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Effects of the Central Bank of Kenya's discount rate on aggregate agricultural lending by financial institutions in Kenya.

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EFFECTS OF THE CENTRAL BANK OF KENYA'S DISCOUNT RATE ON AGGREGATE AGRICULTURAL LENDING BY FINANCIAL INSTITUTIONS IN KENYA

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ADMISSION NO. 102286

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DECLARATION

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

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Approval

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ABSTRACT

Agriculture contributes substantially to the economy of Sub-Saharan African nations. In Kenya, it contributes up to 26% of the annual Gross Domestic Product (GDP) and is a significant employer. Previous research indicates that the sector receives minimal funding from banks, which subsequently limits production. Banks' portfolio lending to agriculture is estimated to be between 3% and 5% of their total lending business with farming considered a high-risk business. Through the monetary policy tools, which include interest on reserve, reserve requirements, discount rate, and open market operations, the Central Bank of Kenya (CBK) plays a very crucial role in regulating the flow of money within the banking system. The CBK can thus increase or limit banks' lending to borrowers. However, there is a lack of knowledge on the extent to which the monetary policy in Kenya influences lending to the agriculture sector. Notably, this study aimed at assessing the effect of the discount rate on aggregate agricultural lending by financial institutions regulated by the CBK. Specifically, the study objectives intended to establish how the discount rate's expansionary, contractionary, and incentives/ innovations measures affect aggregate lending to agriculture by CBK-regulated financial institutions. The study was anchored on the both the Klein-Monti loan-pricing model and the quantity theory of money as these models exposit the factors that lenders consider while advancing credit to borrowers. The study adopted a correlational research design and relied on a time-series approach involving data drawn from the years 2011 to 2021. The unit of analysis was the CBK with data aggregated from 38 Commercial Banks and 14 Microfinance Banks. The study employed purposive sampling to focus on the CBK-regulated financial institutions. The research involved the collection of quantitative aggregated agricultural lending and discount rate time-series data from published CBK reports and other reliable research sources. Data analysis on the relationships between the independent and dependent variables involved both descriptive and inferential statistics. From the study variables, the correlational analysis results indicated an inverse relationship between the discount rate and aggregate lending to agriculture by the CBK-regulated financial institutions ($R = -0.32$). As such, a decrease in the discount rate (expansionary measure) would lead to an increase in aggregate lending to agriculture. The reverse is also true. In addition, from the regression analysis, the study also established that changes in the discount rate had a statistically significant inverse effect on the banks' monthly aggregate lending to agriculture ($\beta = -1.68$) with a unit change in the discount rate resulting into a 168% inverse change in the monthly aggregate lending to agriculture. In other words, by decreasing the discount rate, the CBK can promote lending to the agriculture sector. Lastly, the CBK can adopt the seasonal discount window credit to allow smaller community banks with agricultural lending products to access the discount window funds thus facilitating increased lending to the agricultural sector.

Key Words; Agricultural lending, Effects, Monetary Policy, Discount Rate

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ABBREVIATIONS AND ACRONYMS

AGRA	Alliance for a Green Revolution in Africa
ANOVA	Analysis of Variance
CBK	Central Bank of Kenya
CPI	Consumer Price Index
df	Degree of Freedom
F	F-Statistics
GDP	Gross Domestic Product
N	Data Population
NACOSTI	National Commission for Science, Technology, and Innovation
NSE	Nairobi Stock Exchange
P-Value	probability value
QTM	Quantity Theory of Money
R/r	Pearson Correlation Coefficient
ROI	Return on Investments
SEE	Standard Error of the Estimate
Sig.	Significance
SPSS	Statistical Package for the Social Sciences
Std Dev/SD	Standards Deviation
USAID	United States Agency for International Development
V	Variance

DEFINITION OF TERMS

Agricultural lending	Agricultural lending as depicted in this paper refers to the aggregate loans advanced to agribusinesses by financial institutions regulated by the CBK (Mugambi, 2018).
Contractionary measures	Contractionary measures/policies refer to the decisions/actions undertaken by a Central Bank to limit the rate/level of monetary flow in the economy (Ahiabor, 2013).
Discount rate	The discount rate is the interest rate the Central Bank charges on the short-term facilities it advances to commercial banks (Were & Wambua, 2013).
Expansionary Measures	Expansionary measures/policies refer to the decisions/actions undertaken by a Central Bank to increase the rate/level of monetary flow in the economy (Ahiabor, 2013).
Inflation	Inflation is a general increase in price levels over time based on the prices of various consumer goods and services, which are evaluated and statistically represented in the Consumer Price Index (Muchiri, 2012).
Loan Pricing	Loan pricing refers to the process of resolving the interest rate at which to advance a loan (Khangalah, 2016).
Monetary policy	Monetary policy refers to all the measures that a competent monetary authority in a country such as a currency board or a Central Bank puts in place to oversee the amount of money available in an economy and the supply channels of that money (Kamaan & Nyamongo, 2014).

DEDICATION

I dedicate this work to my supportive parents Julius and Jane Kinuthia, my wife Judy Wanja and my children Dr. Patricia, Roy, Denis and Patience for all the encouragement to go beyond my limits.

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CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

This chapter presents the study's background, provides operational definition and understanding of the study variables (discount rate and aggregate lending to agriculture by the CBK-regulated financial institutions). It also provides the research objectives, questions, as well as the scope and the applicable significance of the study both to practice and theory.

Central Banks across the globe play a significant role in regulating the flow of money within the economy and the banking system (Kimani, 2013; Kamaan & Nyamongo, 2014; Itimu & Abdul, 2018). One of the most fundamental approaches employed by these entities in most jurisdictions is the formulation and implementation of monetary policies. Monetary policy refers to all the measures that a competent monetary authority in a country such as a currency board or a Central Bank puts in place to oversee the amount of money available in an economy and the supply channels of that money (Srithilat, Sun, & Thavisay, 2017). These instruments usually influence the actions of the banking system in a country. They also affect the behavior of lenders, including how these entities make decisions on lending. The major conventional tools/ measures/instruments that such authorities commonly employ include interest on reserve, reserve requirements, discount rate, and open market operations (Kamaan & Nyamongo, 2014; Conti-Brown, 2015). In Kenya, the Central Bank of Kenya (CBK) employs the monetary policy to regulate the supplies of money and credit to ensure consistency with the country's growth objectives.

Typically, CBK's guidance on these instruments at any given point usually has a ripple effect in the Kenyan banking environment. For instance, it may have direct or indirect effects on the lending decisions adopted by commercial banks and other mainstream lenders in the country (Mutwiri, 2017). It consequently influences the accessibility of credit products by the business community in the country. This includes access to financing by entrepreneurs involved in agriculture as a business.

The monetary policy instruments may have a varying individual influence on the extent of lending or access to credit facilities by the Kenyan business community, including where lending to agriculture is concerned. The monetary policy is broad and in some cases, its

application and instruments vary from one country to another. It is vital to understand how these instruments individually affect loan access to the business community. Specifically and in line with the objective of this paper, the study focuses only on the discount rate's effect on the aggregate agricultural lending by CBK-regulated financial institutions.

It is through this line of thought that this study sought to establish whether the discount rate as a monetary policy instrument in Kenya affects lending to the agriculture sector. The research aimed to establish whether the discount rate influences aggregate agricultural lending by financial institutions regulated by the CBK.

1.1.1 Discount Rate

The discount rate is the interest rate the Central Bank charges on the short-term facilities it advances to commercial banks (Were & Wambua, 2013). Typically, commercial banks often access short-term loans from the Central Bank to enhance their liquidity and ensure they can withstand all kinds of market stresses. Depending on the value of the discount rate offered by the Central Bank, commercial banks will subsequently structure their loan rates to ensure they remain profitable. CBK reviews the discount rates every two months in a period referred to as the Discount Window.

1.1.2 How the Discount Rate affects Lending

Importantly, the Central Bank would usually raise or lower the discount rate depending on the prevailing money supply trends. For instance, when there is a higher supply of money in the economy and likely to lead to inflation, CBK would typically increase the discount rate as a measure of contracting the supply hence preventing possible currency devaluation. The reverse is also true. At a higher discount rate, uptake of credit from the CBK may be low considering the associated costs and as such, the commercial banks may not have sufficient funds to lend to their customers (Were & Wambua, 2013). The CBK's raising of the discount rate is a contractionary measure because it discourages commercial banks from accessing voluminous CBK's short-term facilities. Consequently, the lower banks experience a state of limited funds that they can lend to their borrowers. Such an undertaking makes the banks increase their interest rates, which, in essence, increases the cost of borrowing. The high-interest rates further discourage borrowing by individuals and businesses.

On the other hand, lower discount rates will inspire increased credit uptake making it possible for commercial banks to have sufficient funds for their lending portfolio and possibly at lower loan rates (Were & Wambua, 2014). Importantly, if the Central Bank intends to boost lending to consumers and businesses as well as their spending motivation, it would usually lower the discount rate. Lowering the discount rate means that banks can access more funds, which they can lend to their customers (Al-Tarawneh & Khataybeh, 2015). Lowering the discount rate is thus an expansionary undertaking.

1.1.3 Aggregate Agricultural Lending

While various, active, and dynamic finance providers are present in the agricultural financing domain in Kenya, lending to the sector is by lending by CBK-regulated financial institutions is still insignificant, with less than 4% of their total lending portfolio (Mugambi, 2018). This is despite the industry contributing up to about 25% of the GDP directly (Mugambi, 2018). Typically, the 4% directed to agriculture by these institutions usually focuses on commercial agricultural enterprises mostly around cash and export crops that generate high revenues, with such lending rarely advanced to smallholder agriculture (Oketch et al., 2017).

Even with the presence of other credit providers and technologies, the advancement of credit to agriculture is still underserved. Informal agriculture practiced by the majority of the smallholder agribusinesses that dominate up to 70% of agriculture businesses in Kenya is considered a high-risk venture (Mitullah, Kamau, & Kivuva, 2017). Therefore, CBK-regulated financial institutions are usually more encouraged to forego the opportunity cost associated with lending to agriculture in favor of other high-value sectors, such as manufacturing (Ngare, Kweyu, & Huka, 2015).

CBK-regulated financial institutions usually lend to entities that have a banking history. The condition further aggravates poor credit advancement to agriculture considering a large number of these individuals are unbanked and are thus affected by the problem of financial exclusion. About 41% of smallholder agricultural businesses do not have bank accounts at any certified financial institution (Alliance for a Green Revolution in Africa, 2015). Research also indicates that only 25% of persons involved in agriculture-related occupations usually pursue formal credit (Alliance for a Green Revolution in Africa, 2015).

Importantly, CBK usually gathers financial data including the volume of credit advanced to the different sectors of the economy by CBK-regulated financial institutions. CBK then presents

this information in the form of monthly aggregated whole figures per sector in its reports, being cumulative of the figures drawn from the CBK-regulated financial institutions. Therefore, aggregate agricultural lending as embodied in this paper refers to the cumulative monthly credit advanced to the agricultural sector by all the CBK-regulated financial institutions.

1.2 Statement of the Problem

The contributory dominance of agriculture above other sectors in Sub-Saharan Africa economies, which includes Kenyan, is unmatched. It accounts for about 25% of the annual Gross Domestic Product (GDP) and employs over 61% of the Kenyan workforce (Mugambi, 2018). However, even with such immense significance, the sector remains one of the most significantly underfunded, receiving a paltry 3.3% of the total credit facilities proceeded to the economy (Ministry of Devolution and Planning, 2013). Banks' lending to the agricultural sector in Kenya stands between 3 and 5% of their total lending portfolio (Alliance for a Green Revolution in Africa, 2015).

The nature of agriculture as a business in Kenya, just like in many sub-Sahara African countries, may provide for the various impediments that have been pointed out as hindering agricultural credit access in the country. Firstly, rural small-scale agribusinesses dominate the agricultural sector in Kenya (Peters et al., 2012). Secondly, a 2012 report by the United States Agency for International Development (USAID) explains that the industry experiences poor rural infrastructure, limited bank coverage in the agricultural sites. United States Agency for International Development (2012) further explains that other challenges include writing off debts by the government encouraging poor credit culture, unclear land ownership rights, as well as limited comprehension of agricultural value chains by banking staff.

Because agriculture in Kenya is mainly by rural smallholders, it is mostly uncontrolled. It makes it vulnerable to exogenous factors such as a sudden change in weather patterns, pest and disease infestations, human and natural catastrophes such as fires and floods, as well as the fluctuations of commodity market prices. Due to these aspects of uncertainty, banks determine lending to the agricultural sector as a risky business undertaking and in essence, mostly shy off. It makes agricultural entrepreneurs seek other alternative forms of credit, including informal sources such as shylocks, which often charge exorbitant interest rates compared to banks that eventually diminish the return on investments (ROI) for the borrowers.

Importantly agriculture is a direct contributor to food security and is thus supposed to ease food prices (Sasson, 2012). Low agricultural production would usually lead to a spike in food prices and hence, increased inflationary pressures that force the CBK to respond accordingly.

Besides the issue of low commercial lending to agriculture, the government is to blame partly for its weak expenditure on agriculture. The total percentage expenditure of the government to the sector has been at around 6%, which is below the advisable rate of 10% (Mugambi, 2018). Therefore, a more proactive approach to counter inflationary spike in food prices by the government through the monetary policy is through the discount rate's expansionary measures. Lower discount rates encourage banks to lend to agriculture and thus increase agricultural production and food security. Ngare et al. (2015) point out that regulated expansionary measures can motivate the demand side (especially by smallholders agriculture) of agricultural credit access from banks by encouraging the lower banks to structure their products in a manner that qualifies and lowers stringency to this target groups. It is, therefore, essential to understanding how the discount rate can play a significant role as a catalyst in encouraging lending to agriculture.

1.3 Research Objectives

1.3.1 General Objective

The general objective of the study was to assess the effect of the discount rate on aggregate agricultural lending by financial institutions regulated by the CBK.

1.3.2 Specific Objectives

i. To establish how expansionary measures of the discount rate affect aggregate lending to agriculture by CBK-regulated financial institutions.
ii. To establish how contractionary measures of the discount rate affect aggregate lending to agriculture by CBK-regulated financial institutions
iii. To identify incentives and innovations around the discount rate that can stimulate increased aggregate lending to agriculture in Kenya by CBK-regulated financial institutions.

1.4 Research Questions

i. What is the effect of the expansionary measures of the discount rate on CBK-regulated financial institutions' aggregate lending to agriculture?
ii. What is the effect of the contractionary measures of the discount rate on CBK-regulated financial institutions' aggregate lending to agriculture?
iii. What discount rate incentives and innovations can stimulate increased aggregate lending to agriculture in Kenya?

1.5 Scope of the Study

Considering the study aimed to explore the effects of the discount rate on lending to the agricultural sector by financial institutions regulated by the CBK, its scope was based on the aggregated CBK data on the quantitative lending to the sector. "Aggregate agricultural lending" is operationally defined as "the combined monthly volume of lending advanced to the agriculture sector by CBK-regulated financial institutions.' The "discount rate" is operationally defined as 'the interest rate the CBK charges on the short-term loans accessed by lower banks which are reviewed (changes) every two months'. Therefore, the data were derived from published Central Bank of Kenya reports on aggregated CBK data.

1.6 Significance of the Study

It is vital to appreciate the significant contribution of the agricultural sector to the GDP of the country. Therefore, it is indispensable to make all the necessary efforts to increase the productivity of the sector, including raising banks' lending to agriculture. Firstly, the findings can help in the review of the discount rate approaches overseen by the CBK from a policy standpoint to make provisions for incentives and innovative plans that can stimulate increased financing to the agriculture sector hence the need for the proposed study.

Secondly, from a practitioners' perspective, the findings can also inspire players in Kenya's banking system to develop frameworks and strategies that can promote credit access by players in the agriculture sector. The systems and frameworks put in place should be in such a way that makes credit to the agriculture sector cheaper and with increased access. Cheaper credit to the sector is more likely to increase demand hence benefiting agribusinesses through increased production, the lenders through an expanded portfolio, and overall the government and the public through increased food production and security.

Thirdly, the study's findings are a noteworthy additional contribution to the empirical literature on the effect of the discount rate on credit access by the different sectors in an economy including agriculture. Furthermore, the paper's recommendation for future studies is a valuable point of reference for future knowledge expansion on how the Central Bank can make decisions around the discount rate to boot lending to the economy and more so the agricultural sector.

Lastly, the study's employment of the Klein-Monti loan-pricing model and the quantity theory of money in understanding how the discount rate affects lending to the agricultural sector broadens knowledge on the theoretical application of the models in the banking context and more specifically on credit access.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The chapter explores scholarly studies related to the study. It also explored the subject in light of relevant theoretical and empirical literature. The chapter also presents the identified research gaps as well as the reflective conceptual framework that guided the study.

2.2 Theoretical Review of Literature

This section evaluates the logical connection on how the discount rate as a monetary policy instrument in a country may influence lending to agriculture. Financial institutions are significant intermediaries in the savings and credit domain, and their behaviors on loans are usually tied to the prevailing monetary policy environment in a particular jurisdiction. From a theoretical standpoint, various constraints have hindered agricultural finance structuring hence the low agricultural financing compared to other sectors. Such restrictions have included irregular cash flow, market risks, and dynamics, as well as environmental and production risks (Onguka, 2014; Kabir, Alauddin, & Crimp, 2017; Mashnik et al., 2017). The theories identified in this section that detail how the discount rate influences lending to the agricultural sector are the Klein-Monti loan-pricing model and the quantity theory of money.

2.2.1 The Klein-Monti Loan Pricing Model

Michael Klein's 1971 and Mario Monti's 1972 seminal works, which gave rise to the Klein-Monti loan-pricing model, have continued to inspire vast studies on financial institutions' loan pricing decisions. The theory posits that financial institutions, including banks, typically structure the pricing of their loans to achieve adequate compensation/maximize profits to the risk associated with a credit product they are advancing (Metawa, Hassan, & Elhoseny, 2017; Itimu & Abdul, 2018; Amendola, Barra, Boccia, & Papaccio, 2021). Loan pricing is usually a systematic approach that, in most cases, is never under the influence and intent to match or beat competition nor based on a 'gut feeling.' The structured approach in loan pricing thus helps lenders to ensure that loan products are matched to the best borrowers so that the bank can achieve its profitability goals based on its loan portfolio composition while at the same time keeping the customer (Khangalah, 2016; Maigua, Njuru, & Mugendi, 2018; Deryugina, Ponomarenko, & Sinyakov, 2021). While the theory has found wide use in banking decisions

studies, critics have held that its application is best suited in a monopolistic situation rather than in an alternative environment (Toolsema & Schoonbeek, 1999; Baglioni, 2007; Fanti, 2014; Sheefeni, 2016). The model description of banks' loan pricing decisions lies solely on the bank's net position, failing to factor conditions such as competition that may exist in oligopoly, polyopoly, and monopsony markets

The critical aspects that financial institutions evaluate when it comes to pricing their loan products include the overall cost of the funds that are to be advanced. Others include the associated operations costs, including those for following up, servicing of the facility, insurance premium attached to the loan, and ensuring the profit margin is reasonable (Ngumo, 2012; Madaschi & Pablos Nuevo, 2017; Borio, Gambacorta, & Hofmann, 2017). These are essentially the borrowing costs (Altavilla, Canova, & Ciccarelli, 2020). The approach thus helps the lenders to optimize the availability of their capital, making them flexible and agile to their most assuring borrowers as well as the ability to navigate macroeconomic shifts in the environment, including new regulatory issues.

One of the regulatory roles of the Central Bank of Kenya is to set the discount rate. The discount rate is not usually market-determined. The objective of its establishment by the central banks at any given time is usually an expansionary or contractionary measure for money circulation in the banking system and overall in the economy (Munialo, 2014; Blanchard, Ostry, Ghosh, & Chamon, 2017; Nguyen, 2020; Kiaee & Mahabadi, 2021). Commercial banks usually access short-term financing from the Central Bank at this rate (Nguyen, Khoi, & Khai, 2018; Seeruttun, 2020). The relevance of the theory in the proposed study considers that the implementation of the discount rate is usually in response to the situational demand and supply for credit in the country. Whichever decision the Central Bank undertakes in raising or lowering the discount rate, it trickles down to the final pricing that banks attach to their loan products and as such, influences credit access and affordability to agriculture. (Mutwol, 2016; Mbua, 2017; Walter & Wansleben, 2020).

2.2.2 Fisher's Quantity Theory of Money

The Quantity Theory of Money postulates assumptions based on the relationship between money supply (amount of money in circulation) and the general price level of goods and services in an economy (Denbel, Ayen, & Regasa, 2016; Marcuzzo, 2017; Zhao, 2021; Lee & Huruta, 2021). While its descent dates as far back as the publications of Nicolaus Copernicus

in 1517, Irving Fisher's 1911 publication, *The Purchasing Power of Money*, is the genesis of what is now popularly known as the Fisher's Quantity Theory of Money (Volckart, 1997; Dimand, 2019). The theory stipulates the existence of a direct correlation between the pricing of goods and services and the quantity of money circulating in an economy (Teles, Uhlig, & e Azevedo, 2016; Angelina & Nugraha, 2020; Shoaib, Rafique, Nadeem, & Huang, 2020). In other words, a possible doubling of the supply of money in circulation would lead to an equal doubling of the prices of commodities and services in a country, thus limiting the expenditure capacity of the citizens. Therefore, the citizens in the country would find themselves paying twice as much for the same goods and services. The occurrence of such a phenomenon would, in most cases, lead to inflation due to the decrease in the marginal value of money; its buying capacity (Dıaz-Giménez & Kirkby, 2013; Yolanda, 2017; European Parliament, 2021). Ideally, a rapid rate in the growth of money that surpasses the economic growth rate and outputs in a country would lead to inflation. Fisher's QTM has been criticized for its dependence on money supply as a determinant of price levels. Mayer and Minford (1995) point out that the theory ignores other determinants of price levels such as population, savings, investments, and income levels. This unrealistic assumption makes the theory inappropriate considering the market is always dynamic.

The relevance of the Fisher's QTM to the proposed study employs that, as an oversight authority on the monetary environment in a country, the Central Bank bears the task of ensuring that the growth and supply of money in an economy falls below the output yielded from the economic growth. It helps to curb inflation and cushion citizens from preventable fiscal stress (Were, Kamau, Sichei, & Kiptui, 2013; Moenjak, 2014; Rostagno, Altavilla, Carboni, & Yiangou, 2021). In an instant of excessive supply or circulation of money in an economy, the Central Bank may raise the discount rate to contract the supply so that there is diminished commercial bank lending to borrowers. This contractionary measure ensures that the money regains the marginal value of its currency. The reverse is also true; when demand exceeds supply, and the economy is staggering, the Central Bank can lower the discount rate to influence increased lending by commercial banks as an expansionary measure hence the injection and increased circulation of money into the economy as a quick-fix boost to increase production (Badar, Javid, & Zulfiquar, 2013; Dimitrijević & Lovre, 2013; Udeh, 2015). The Fisher's QTM thus helps elaborate why the Central Bank may raise or lower the discount rate, which in turn may influence banks' lending to their borrowers, including those in agribusinesses.

2.3 Empirical Review

It is impossible to understate the central role that credit and its access, therefore, play in the economic development of a country. Not only do loans enhance the efficiency of market transactions it allows businesses to access the factors of production that not only augment their productivity and profitability but also contribute to employment (Amadeo, 2012; Gurung, Bhandari, & Paris, 2016; Harvie, 2019; Jadoua & Mostapha, 2020). Therefore, sanctioning credit to the business community remains one of the key deliverables of governments' governing financial authorities. This section presents an empirical review of relevant literature in line with the study's objectives.

2.3.1 Discount Rate's Expansionary Measures on Lending

Muchiri (2012) conducted a correlation study to investigate the impact of CBK rates on commercial banks' interest rates. The study focused on a population of all the 43 commercial banks regulated by the CBK in Kenya. The study adopted a descriptive research design with data collected through both primary and secondary sources. The researcher employed a structured questionnaire to collect primary data with the CBK's annual financial statements being the source for secondary data. Both descriptive and inferential statistics were used in data analysis to establish the relationship between the study's variables. The findings of the study indicated that the CBK's monetary expansion programs that include lowering the discount rate had a positive correlation with the commercial banks' interest rates. This is because the measures increases liquidity available to the banking system consequently lowering the lower banks' interest rates. The study focused on the general monetary expansion programs implemented by the CBK, whereas the current study narrowed down on the reduction of the discount rate as a CBK's monetary expansion undertaking.

Khangalah (2016) carried out a descriptive survey to determine banks' lending behavior in Kenya focusing only on state-owned banks. The targeted population and hence the sample comprised of the three state owned Kenyan banks. The study relied on secondary data gathered from the sampled population's official business websites. The researcher employed both inferential and descriptive statistics in the analysis of data with regression analysis being the main inferential analysis tool. The study found out that capital adequacy and liquidity ratio which were enhanced by aspects such as the expansionary measures of the discount rate affected extension of credit to the business community positively. In fact, the expansionary

measures of the CBK had statistically significant lowering effect on the banks' loan pricing essentially denominated in interest rates. The study not only looked at the liquidity ratio and capital adequacy of the three sampled banks as a significant element of credit access to the general business community in relation to a wide array of possible influences, the current study focuses on lending to the agribusiness community in line with the effect of the CBK's discount rate.

Kamaan and Nyamongo (2014) conducted an empirical investigation to establish how the monetary policy affects economic growth in Kenya. The study adopted a time-series research approach with quantitative data drawn from the Central Bank of Kenya. In addition, the researcher employed the vector autoregressions (VAR) as an inferential statistics tool to observe the relationship between the study's variables. The VAR is a statistical model functional in explaining the relationship between multiple variables as they change over a given time (Kamaan & Nyamongo, 2014). The study established that the CBK monetary policy's interest rates channel not only had a significant impact on the banking system's credit channel but also influenced both economic growth and transmission. The researchers hence recommend that the CBK as the monetary policy authority, should put in place mechanisms that ensure stable low interest rates in the country including expansionary measures of the monetary policies. The relaxation of the discount rate enhances the liquidity of the banking system, which subsequently leads to the lowering of loan interest rates by the lower banks (Kamaan & Nyamongo, 2014). The basis for such a decision otherwise referred to as an expansionary measure is usually to increase credit access to the business community to promote enterprise growth and expansion and consequently the creation of employment opportunities (Kamaan & Nyamongo, 2014). Whereas the study had a broad outlook investigating the effect of the monetary policy on elements such as economic growth, inflation and interest rates, the current study centers on the effect of the discount rate with aggregate lending to the agriculture sector as its output.

2.3.2 Discount Rate's Contractionary Measures on Lending

Kimani (2013) assessed the effects of monetary policies on lending behavior of Kenyan Banks. Using a descriptive research design, the researcher gathered both primary and secondary data using questionnaires from a sample of five most profitable commercial banks in the country with respondents selected purposively from the credit department. Data analysis involved both content and descriptive analyses with observations on both descriptive statistics as well as

inferential statistics through correlation and regression. The study established that indeed the outcomes yielded by monetary policy changes had a significant influence on the lending behavior exhibited by the commercial banks in Kenya. Specifically, the study found out that the upward adjustment of the CBK rates was also expected to signal a rise in the banks' interest rates thereby contracting the access to credit by the private sector. Notably, while the study investigated the monetary poly as a whole, the current study specifically focuses on the discount rate.

Mutwiri (2017) probed the relationship between the monetary policy tools and inflation in Kenya. The study employed time series empirical secondary data on money supply, repo rate, 91-day Treasury bill rate, exchange rate, and Price Index for inflation over a five year period (2008- 2012). Data analysis was done using a correlation analysis for the various variables. The study determined that money supply in the economy had a positive correlation with the level of inflation. The level of inflation also prompted the CBK to undertake necessary corrective monetary policy measures to regulate money supply to ensure stable retail price levels. A high money supply is more likely to lead to an upward adjustment in the cost of commodities/services hence the likelihood of inflation as evidenced by the quantity theory of money. To nip the possible occurrence of and distortions associated with inflation the Central Bank may choose to apply a contractionary policy as a countermeasure (Mutwiri, 2017). The significance of the contractionary measure is usually to reduce the rate at which money supply expands or even shrink it if need be correct the inflationary problems of the oversupply (Mutwiri, 2017). The CBK's monitoring interventions include contracting the volume of money supplies in the banking system and the economy at large, meaning measures that discourage the rates of lending at the lower banks. Raising the discount rate is one of the significant contractionary undertakings that the Central Bank usually carries out. As a monetary tightening policy, the high prime rates shrink the quantity of money loanable by lower banks hence reducing the overall quantity of money in circulation (Mutwiri, 2017). The high discount rates discourage lower financial institutions from accessing short-term facilities from the Central Bank. With the decreased quantity of money, the lower financial lenders also end up tightening their loan access thresholds including increasing the interest rates for their credit leading to reduced aggregate lending (Mutwiri, 2017). Whereas the study centered on the general economic inflationary influence of the monetary policy, this study looks only at the influence of the discount rate on aggregate lending to agriculture.

2.3.3 Discount Rate Incentives and Innovations on Lending

Amadeo and Brock (2021) carried out a desktop review with information from the American Federal Bank to explain the essence and implications of the Federal Reserve discount rate. Through a qualitative narrative analysis the researchers explain that in the American context, apart from the primary credit rate; whose equivalence is implemented by the CBK and the basic interest rate applicable to most depository institutions with sound financial status upon their access to a facility from the Federal Bank as well as the secondary credit rate applied to depository institutions experiencing financial trouble such as severe liquidity problems as such being a high-risk facility, with the rate usually being higher than the primary rate, the Federal Bank also applies the seasonal discount rate for non-emergency lending to depository institutions serving agriculture and other sectors that exhibit high seasonal credit demand. The seasonal discount rate is usually an average of prevailing local selected market rates hence targeted to the local need as much as possible (Amadeo & Brock, 2021). The seasonal discount rate is possible innovations that the CBK can consider adopting. Whereas the study was employed in the context of the American lending environment, the present study focuses on Kenya.

Sellon Jr (1985) also studied the role of the extended credit in Federal Reserve discount policy in the United Sates. The study also relying on a secondary review of existing literature sought to distinguish the traits of the seasonal credit associated with the seasonal discount rate from those tied to both the primary and secondary discount rates. The study established that the federal Bank advances the seasonal credit with an extended period, hence the term extended credit. While the Federal bank's primary and secondary discount rates are advanced on overnight terms, the seasonal discount window credit can be extended for up to nine months. This innovation has the objective of catering for most seasonal crops investments. The study was carried out in the American context whereas the present study looks at the Kenyan situation.

2.4 Summary/Critique of the Literature

Concisely, from the reviewed literature, it is evident that the government needs to increase its participation in the agricultural sector, including the initiatives undertaken by the CBK as well as increase its budgetary allocation from the current percentage rate of 6% to the recommended 10% or more. It is evident that just raising or lowering the discount rate alone may not be

sufficient to influence credit access in the economy and by extension to the agricultural sector hence the need for incentives/innovation measures. It is important to note that more than 50% of agricultural activities, whether large-scale or smallholder are centered on agribusiness (Onguka, 2014). Furthermore, these same businesses are constrained by difficulties in financial access, and as such, they need to review loan access policies in this sector.

As delineated from the reviewed studies, one of the possible approaches that the government can deepen its involvement in the agricultural industry to increase banks' lending to agriculture is through reviewing the CBK's dynamics around the discount rate including setting up seasonal credit to depository institutions. This may include shortening the period for discount window review from the current length of two months.

2.5 Research Gaps

While various studies have explored the impact of the monetary policy on general lending in the banking system in Kenya, none has carried out investigations on how the policy or each of its instruments influences agricultural lending. This study addresses how the gap between lending to Agriculture as compared to general credit in Kenya can be reduced through decisions made around the discount rate. The Table below summarizes the research gaps that this study intends to address.

Table 2. 1: Summary of the Research Gaps

Author	Title	Findings of the Study	Research Gaps
Muchiri, (2012)	The Impact of the central bank of Kenya rates on Market interest rates of Commercial Banks in Kenya.	The study indicated that the CBK rates including the discount rate had a strong impact on bank's lending rate	While the study investigated the effect of the CBK rates including the discount rate on lending as is the case with the current study, its scope was on Commercial Banks and general lending. However, the current study specializes in agricultural lending among all CBK-regulated financial institutions.

Khangalah (2016)	Determinants of banks' lending behavior in Kenya: Case of state-owned banks in Kenya.	The study found out that monetary policy and therefore the discount rate influenced banks' lending behavior	The study explored the general lending behavior of state-owned banks in Kenya only including the effect of the monetary policy. The current study explores the effect of the discount rate on agriculture lending among all CBK-regulated financial institutions.
Kamaan & Nyamongo (2014)	The effect of monetary policy on economic growth in Kenya.	The researchers determined that the monetary policy and by extension the discount rate affected a country's economic growth	The study explored the effect of monetary policy on economic growth whilst not granting detailed attention to lending. The current study's focus is on the effect of the discount rate on agricultural lending.
Kimani (2013)	Assessment of effects of monetary policies on lending behavior of Banks in Kenya.	The study found out that monetary policy and therefore the discount rate influenced banks' lending behavior	The study investigated the effects of monetary policies on banks' general lending. The current study explores the effect of the discount rate on agricultural lending among all CBK-regulated financial institutions.
Mutwiri (2017)	Monetary Policy Tools and Inflation in Kenya	The study determined that money supply in the economy had a positive correlation with the level of inflation. To nip the possible occurrence of and distortions associated with inflation the Central Bank apply	The study focused on the general economic inflationary influence of the monetary policy, this study centered only at the influence of the discount rate on aggregate lending to agriculture

		contractionary policies to correct the inflationary problems of the oversupply of money as a countermeasure thereby reducing lending	
Amadeo and Brock (2021)	Federal reserve discount rate explained.	The study found out that the Federal Bank also applies the seasonal discount rate for non-emergency lending to depository institutions serving agriculture and other sectors that exhibit high seasonal credit demand.	While the study was employed in the context of the American lending environment, the present study focuses on Kenya
Sellon Jr (1985)	The role of extended credit in Federal Reserve discount policy	The study found out that the federal Bank advances the seasonal discount window credit with an extended period, hence the term extended credit.	Whereas The study was carried out in the American context whereas the present study focuses on Kenya.

2.6 Conceptual Framework

This section discusses how the independent variable (the discount rate) influences the dependent variable (lending to agriculture) and thus the derivation of the proposed conceptual framework. It explains how a change in the independent variable would have on loan to the agriculture sector. The conceptual framework is presented in Figure 2.1 below.

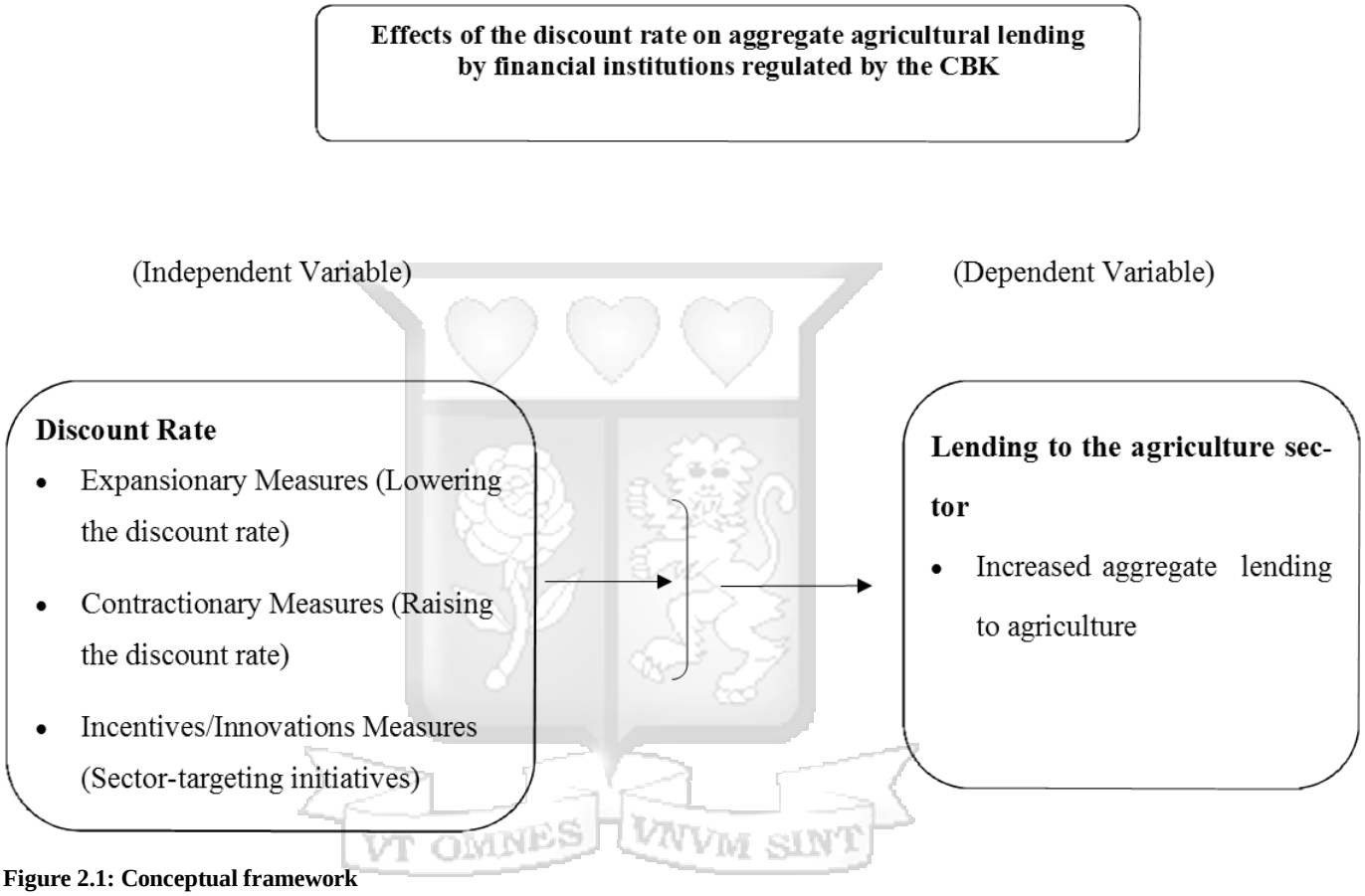

Figure 2.1: Conceptual framework

Source: Researcher, 2021

2.7 Summary of the Chapter and Operationalization of the Variables

In summary, this chapter presents the theoretical framework upon which the proposed study is entrenched. It explains the relevance of the loan pricing theory and the quantity theory of money (QTM) models to the study. It also presents an empirical analysis of the situation on agribusinesses' access to agricultural financing in Kenya and explains how the discount rate in the country influences lending to the sector. Based on both the theoretical and empirical review, the section also describes the identified research gap that inspires the proposed study and in line with this, presents a conceptual framework for the proposed correlational study. The

independent variable is outlined, and its possible influence on the dependent variable is explained.

2.7.1 Operationalization of the Variables

The Table below outlines the operationalization of the variables.

Table 2. 2: Operationalization of the variables

Objective	Variables	Measurement	Collected Reference Data	Data Analysis
To establish the effect of the expansionary measures of the discount rate on CBK-regulated financial institutions' aggregate lending to agriculture	**Independent variable** Discount rate expansionary measures **Dependent variable** Aggregate Agricultural Lending by CBK-regulated financial institutions	Quantitative data	– Discount rates data from CBK website/reports reviewed every two months – CBK's aggregated data on lending to agriculture from its regulated financial institutions	Descriptive, Linear Regression
To establish the effect of the contractionary measures of the discount rate on CBK-regulated financial institutions' aggregate lending to agriculture	**Independent variable** Discount rate contractionary measures	Quantitative data	– Discount rates data from CBK website/reports reviewed every two months	Descriptive, Paired t-test Linear Regression

	Dependent variable Aggregate Agricultural Lending by CBK-regulated financial institutions		– CBK's aggregated data on lending to agriculture from its regulated financial institutions	
To identify discount rate incentives and innovations that can stimulate increased aggregate lending to agriculture in Kenya	**Independent variable** Discount rate incentives/ innovations measures **Dependent variable** Aggregate Agricultural Lending by CBK-regulated financial institutions	Secondary data	Data from CBK and other credible websites/reports Data from CBK and other credible websites/reports	Narrative analysis

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The study aimed at investigating how the discount rate affects agricultural lending in Kenya with the Central Bank as the unit of analysis. Research is a vast process that makes use of readily known information to prove the validity of a given hypothesis or phenomenon (Sutton & Austin, 2015; Wright et al., 2016). The process of collecting data must be well organized with a greater understanding that ensures the issue being probed is provable (Paradis et al., 2016). It is evident from the reviewed literature that the discount rate plays a significant role in influencing lending in Kenya. However, studies delineating how this instrument affects lending to the agriculture sector in the country are still lacking.

Therefore, the study sought to bridge this information gap. The research methodology section delineates how the research process was conducted. It explains the research philosophy that drove the process, design of the research, the population studied, and the sampling procedure, data collection, and analysis, and addresses the quality as well as the ethical issues observed in the research.

3.2 Research Philosophy

Mkansi and Acheampong (2012) explain that a research philosophy defines the relevance and the objectives as well as the structural outline of achieving those objectives. The significance of the study was to assess the effect of the discount rate on lending to the agriculture sector. Considering that the research involved the interpretation of time-series empirical data, thus being quantitative, the study adopted a positivist philosophy. It is because the positivist philosophy usually aligns with scientific quantitative methods (Garner, Wagner, & Kawulich, 2016; Kivunja & Kuyini, 2017; Rahman, 2017; Ryan, 2018).

3.3 Research Design

The significance of the research design is that it reveals the relationship between the various components involved in carrying out the research. The study adopted a quantitative time-series research design considering its ability to present an understanding of the trend of a given behavior over time and at distinct time scales. As a correlational study, the research probed the

effects of the discount rate being the independent variable on aggregate agricultural lending by CBK-regulated financial institutions (dependent variable), which in this case is the lending to the agricultural sector over ten years running from June 2011 to June 2021. In addition, the research also referred to archival data from the Central Bank of Kenya website and reports as well as other credible secondary sources to explore possible incentives and innovations that the Bank may be offering on the discount rate.

3.4 Population and Sampling

The population adopted in the study included the 38 Commercial Banks and 14 Microfinance Banks which are all regulated by the CBK with the study relying on secondary data gathered online from credible websites with the CBK website being the primary source. Specifically, the data was collected from publicly published material by the CBK on their website. While various entities facilitate credit access to agriculture in Kenya, the study focused on those that are under the regulatory framework of the Central Bank of Kenya as depicted in Table 3.1 below and as such, whose data is accessible from the CBK. The study concentrated on the overall monthly lending to agriculture for over ten years (June 2011 to June 2021). In other words, it was a time-series study. Therefore, a purposive sampling method was applied in the research process that included gathering data from all the financial institutions (commercial and microfinance banks) regulated by the CBK as shown in in Table 3.1.

Table 3. 1: Financial Institutions Regulated by the CBK and Data Sources

CBK Licensed/Regulated Financial Institutions Lending to Agriculture	**Count**	**Collected Reference Data**
Commercial Banks	38	– Discount rates data from CBK website/reports reviewed every two months – CBK's aggregated banks' lending to agriculture
Microfinance Banks	14	– Discount rates data from CBK website/reports reviewed every two months – CBK's aggregated banks' lending to agriculture

3.5 Data Collection

This study employed a single data collection technique, also known as a mono method quantitative approach meaning that only one type of method was employed. The unit of analysis was the CBK with data aggregated from 38 Commercial Banks and 14 Microfinance Banks. The study used aggregated quantitative agricultural funding information available from published Central Bank of Kenya reports and other relevant research sources. The specific data that was useful in the probe included the monthly lending to the agriculture sector. Furthermore, on the objective for understanding the discount rate incentives and innovations on lending in Kenya, the researcher referred to archival data from the Central Bank of Kenya website and reports.

Concisely on the objectives of establishing the effect of the expansionary and contractionary measures of the discount rate on CBK-regulated financial institutions' aggregate lending to agriculture, the researcher gathered time-series data from the year 2011 to 2021 on the Discount rates and aggregated banks' lending to agriculture openly and freely available on the CBK's website. On the other hand, to identify discount rate incentives and innovations that can stimulate increased aggregate lending to agriculture in Kenya, the researcher gathered information on what has worked in other contexts and jurisdictions from other credible as well as the CBK websites/reports.

3.6 Data Quality and Analysis

On the dependent variable, agriculture credit collected data referred to the overall aggregated monthly loans given to agriculture. Secondly, data on the discount rate is applied to the discount rates reviewed every two months by the CBK. The discount rate discrete data was evaluated individually against the banks' monthly loaning to the agriculture sector for ten years between the years 2011 and 2021 making reference to 12 observations per year.

To ensure the data employed in the analysis process was credible, the researcher ensured that the referred data was from the CBK database. The study targeted to explore time series data from June 2011 to June 2021 (121 months) both for discount rate values and for the corresponding aggregate values on lending to agriculture. Primarily, data was derived from the CBK's website. The CBK's monetary policies committee reviews the discount rate every two months meaning that until the rate is reviewed in every subsequent meeting, the set value remains the same for the succeeding month/period until it is changed in the next

review/meeting. For instance, if the committee sets a 14% rate in May and is to review this again in July, the prevailing rate in June would still be 14%. In employing this understanding, the researcher collated 121 entries representing monthly values for discount rate directly from the CBK's website.

On the other hand, when it comes to the data on aggregate lending to agriculture, part of it was derived directly from the CBK's website while part of the data was derived online from the CEIC Data Global Database. The CEIC Data Global Database is a trusted online economic and investment research repository providing expansive and accurate data and information insights derived from over 200 economies by experts drawn from corporations, and universities around the world (CEIC, 2022). The motivation for mining part of the data from the CEIC website was the fact that this data is not directly available in soft copy from the CBK website but has been digitized and made available in the CEIC website with attribution of the CBK as the source (CEIC, 2018).

Specifically, data on aggregate lending to agriculture drawn from the online CEIC Data Global Database spanned from June 2011 to April 2018. The data presented in this time range is not directly accessible from the CBK website but readily accessible on the CEIC Data Global Database where its sole source has been attributed to the CBK. On the other hand, the data within the time range from May 2018 to June 2021 is directly available and accessible and was derived from the CBK's website. The aggregate data or net data on lending to agriculture is usually published as part of the monthly economic indicators reports provided by the CBK every month.

The referred quantitative data were analyzed using the statistical package for social sciences (SPSS) software. Statistical analysis using SPSS also captured descriptive references such as mean, standard deviation, median, and mode, as well as normality tests, including skewness and kurtosis. As inferential statistic tools, the bivariate correlation and the linear regression at a 95% significance level were employed to establish the significance of the correlation and the causal effect between the independent variable against the dependent variable.

3.7 Research Quality

The quality of research is usually determined in terms of its reliability and validity. While it is often that these two terms are used interchangeably, there exist subtle differences between them. Reliability delineates consistency in the measures established in a study and, thus, the

possibility of their applicability in a different context while retaining stability (Noble & Smith, 2015). In other words, if the procedure is repeated and the prior values established remain the same, the study is considered reliable. On the other hand, validity denotes the accuracy with which a research or research instrument can measure the variable it was intended to measure (Mohajan, 2017). To improve the validity of the research, the triangulation approach was employed to minimize the chances of bias and confounding.

3.8 Ethical Issues in Research

Without ethical consideration, the quality of a study may be compromised and is thus a very fundamental component of every research process (Resnick, 2015). Ethical consideration ensures that the study is conducted acceptably, and the findings remain unquestionable or undisputable. Therefore, as part of the adoption of ethical consideration measures, the researcher endeavored to obtain all the requisite approvals and permits to conduct the research as well as acknowledge the sources of the material employed in the study.

CHAPTER FOUR

PRESENTATION OF RESEARCH FINDINGS

4.1 Introduction

The chapter presents the findings of the study based on the analyzed data and in line with the objectives of the study. It presents a discussion and clarity on the quality of the data gathered in the study. Apart from the quality of the data employed in the research, it also describes the characteristics of the research data, making cognizance of the traits of the data representing each of the variables (independent and dependent). It lastly presents the outcome of the data analysis process in reflection on the objectives of the study.

4.3 Characteristics of the Research Data

This section describes the nature and traits of the data collected, cleaned, and analyzed to inform the outcomes of the research process. The description presented is both for the discount rate data as well as the information representing aggregate lending to agriculture.

4.3.1 Discount Rate Data

What was notable from the raw discount rate data was the fact that while the bi-monthly approach of reviewing the discount rate was not consistent within the selected study timeframe, it was evident in certain periods the discount rate was reviewed as much as 11 times within the same month. Case in point includes October 2011, September 2011, and August 2011 where the discount rate was reviewed 11, 8, and 8 times respectively within the same month. On the other hand, in some instances, the intervals between subsequent reviews of the discount rate took up to six months or more. For example, the subsequent review from December 2011 occurred in May 2012. In addition, there was no review; whether upward or downward, of the discount rate in the year 2014, with the last change occurring in May 2013 and the next one following up in January 2015 as depicted in the raw data for the discount rate presented in appendix III. To derive the representative monthly discount rate for months that experienced multiple reviews, the researcher pinned an average of all the rates presented within that given month as the representative rate or that month. For example, the average rate yielded for the month of August 2011 derived from the 8 entries evident in the month was 20.11%. Figure 4.1 below presents the graphical representation of the behavior of discount rate change within the

selected study period (June 2011-June 2021) drawn from the cleaned data sets provided in Appendix II.

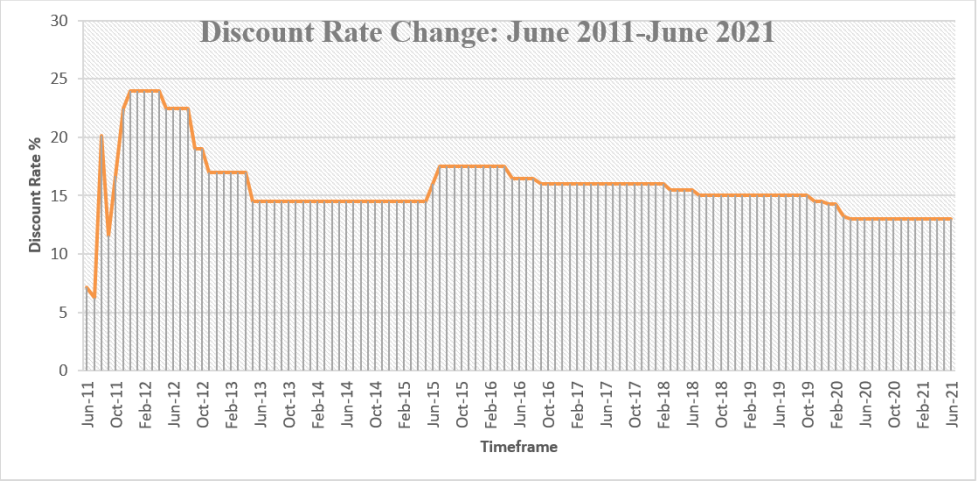

Figure 4. 1: Discount Rate Change: June 2011-June 2021

4.3.2 Aggregate Lending to Agriculture Data

The aggregate data on lending to agriculture was consistent every month considering its publication in the CBK's monthly economic indicators reports. Figure 4.2 below shows the graphical representation of the behavior of the change in lending to agriculture within the selected study period as evident from the data sets Table in Appendix II.

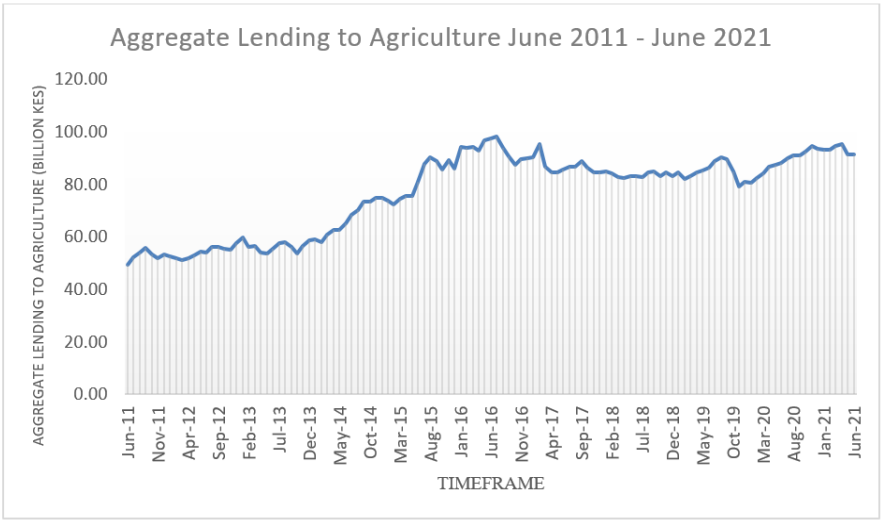

Figure 4. 2: Aggregate Lending to Agriculture June 2011 - June 2021

4.4 Descriptive Statistics

This section presents the descriptive statistics of the independent and dependent variables explored in the study. The descriptive statistical measures of the data for both the discount rate

and the aggregate lending to agriculture analyzed in the study include the mean, the standard deviations, variance, range, and minimum and maximum values.

4.4.1 Discount Rate Descriptive Statistics

Table 4.1 below highlights the descriptive statistics derived from the discount rate data including the relevant measures of central tendencies.

Table 4.1: Discount Rate Descriptive Statistics

Table: Valid cases = 121; cases with missing value(s) = 0.							
Variable	**N**	**Mean**	**Std Dev**	**Variance**	**Range**	**Minimum**	**Maximum**
Discount Rate	121	15.78	2.9	8.42	17.75	6.25	24

In analyzing the descriptive statistical measures of the gathered data to establish their averages as indicated in Table 4.1, the results indicated that the mean discount rate and the associated standard deviation within the study period were relatively low (*M = 15.78, SD = 2.9*). The value of the yielded standard deviation as well as the variance (*V = 8.42*) concerning the mean indicated a smaller variability in the discount rate changes experienced within the selected study period. Notably, the value of the standard deviation and variance being lesser than the value of the mean is indicative that the data had a small coefficient of variation (Ospina & Marmolejo-Ramos, 2019; Pélabon, Hilde, Einum, & Gamelon, 2020). However, the data was also reflective of a huge range between the minimum and maximum discount rates (*R = 17.75*).

4.4.2 Aggregate Lending to Agriculture Descriptive Statistics

The researcher also carried out an analysis to establish the descriptive statistics of the relevant measures of central tendencies from the collected data on aggregate lending to agriculture. The findings are highlighted in Table 4.2 presented below.

Table 4. 2: Aggregate Lending to Agriculture Descriptive Statistics

Table: Valid cases = 121; cases with missing value(s) = 0.							
Variable	**N**	**Mean**	**Std Dev**	**Variance**	**Range**	**Minimum**	**Maximum**
Aggregate Lending to Agriculture	121	76.75	15.14	229.17	48.9	49.3	98.2

From Table 4.2, it is evident that the mean aggregate lending to agriculture and the resulting standard deviation is relatively high (*M = 76.75, SD = 15.14*). In addition, the fact that the variance (*V = 229.17*) is greater than the mean is a sure indication that the data reflects a greater coefficient of variation. The results also show a huge range between the minimum and maximum values lent monthly to agriculture within the study period.

4.5 The Expansionary and Contractionary Relationship between Discount Rate and Aggregate Lending to Agriculture

The relationship between the discount rate and aggregate lending to agriculture connote the determination of whether there exists a causal-effect relationship between the two variables with the intent of establishing the significance of such a relationship as a basis for guiding decision-making. On a one-on-one basis, the Figure below shows a comparative outlook between the discount rate and aggregate lending to agriculture time-series changes.

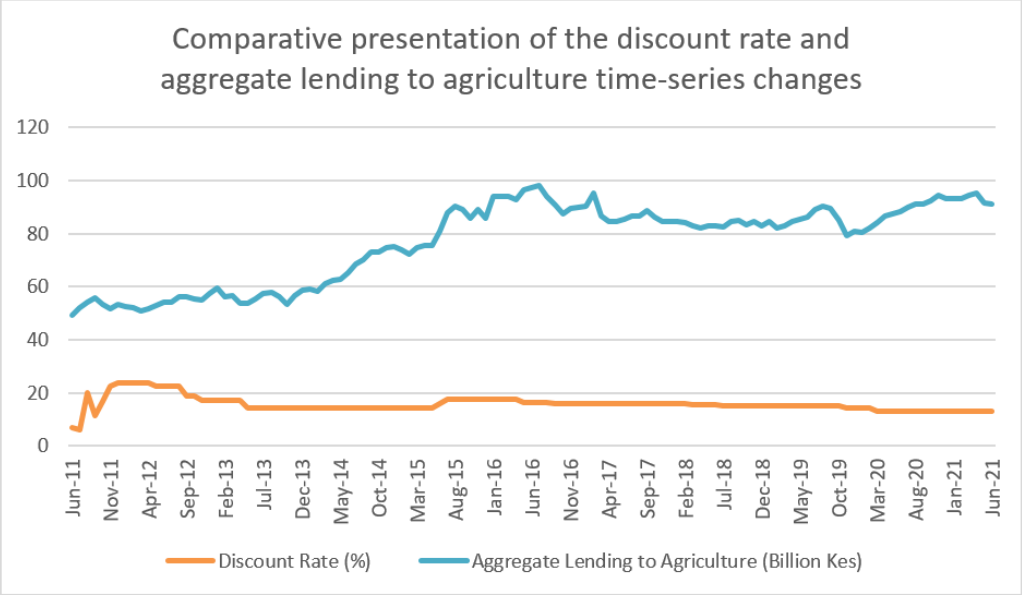

Figure 4. 3: Comparative presentation of the discount rate and aggregate lending to agriculture time-series changes

The study also explored the bivariate scatter plot between the discount rate and the aggregate lending to agriculture data to determine whether the data points exhibited a linear relationship. The data scatter plot is presented in Figure 4.4 below.

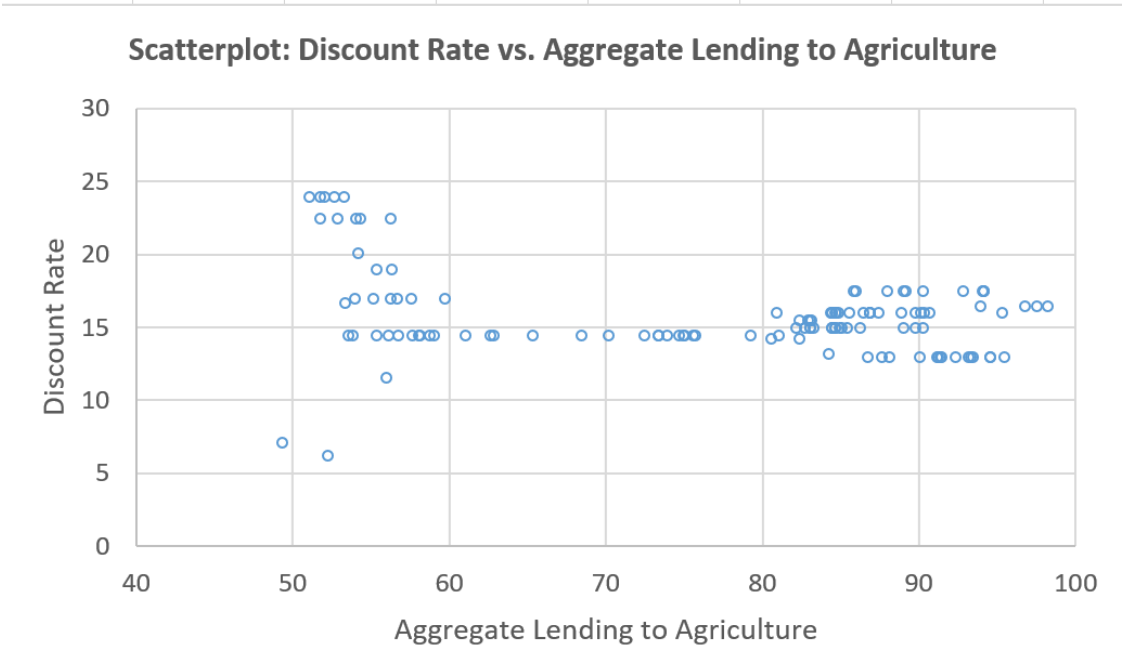

Figure 4. 4: Scatterplot Discount Rate vs. Aggregate Lending

Noting how widely and sparsely the data points in Figure 4.4 are scattered, it is evident that there is no apparent linear relationship between the discount rate and the aggregate lending to agriculture variables. In other words, it is not possible to directly and confidently point out

whether there exists a positive or negative linear relationship between the independent and dependent variables.

4.5.1 Correlation Analysis

One of the inferential statistics tests undertaken to investigate the relationship between changes in the discount rate and aggregate lending to agriculture was correlation analysis. The researcher employed the Pearson product-moment correlation coefficient (r) to measure the various components associated with the study variables. The outcome suggested the existence of a significant relationship between changes in the discount rate on aggregate lending to agriculture since *p-value < 0.05* yet with an inverse correlation (*R= - 0.32, p-value = 0.00*).

Table 4. 3: Correlations Matrix for Discount Rate vs. Aggregate Lending to Agriculture

Table: Correlations			
		Discount Rate	Aggregate Lending to Agriculture
Discount Rate	Pearson Correlation	1	- 0.32
	Sig. (2-tailed)		0.00*
	N	121	121
Aggregate Lending to Agriculture	Pearson Correlation	- 0.32	1
	Sig. (2-tailed)	0.00*	
	N	121	121
*. Correlation is significant at the 0.05 level (2-tailed).			

The inverse relationship is evident with the value of R being negative (*R= - 0.32*) as shown in Table 4.3. Therefore, an increase in the discount rate which is a contractionary measure would lead to a decrease in the amount of credit that financial institutions would lend to agriculture. On the other hand, a decrease in the discount rate which is an expansionary measure would lead to an increase in the amount of aggregate lending to agriculture.

Typically, the Pearson's correlation coefficient (r) usually highlights the strength of the relationship between the set of two variables under investigation while at the same time denoting the direction of the scatter plot (Mukaka, 2012; Mindrila & Balentyne, 2017; Alsaqr, 2021). The value of R can be negative or positive within the range of negative one to positive

one; – 1 to + 1 (Ratner, 2009; Mukaka, 2012; Schober, Boer, & Schwarte, 2018). A negative gradient denotes an inverse linear correlation as it indicates that an increase in the independent variable results in a decrease in the dependent variable hence the existence of an inverse relationship (Ahlgren, Jarneving, & Rousseau, 2003; Obilor & Amadi, 2018). On the other hand, a positive gradient denotes a positive correlation (Asuero, Sayago, & Gonzalez, 2006; Sedgwick, 2012). Thus an increase in the independent variable also reflects a notable increase in the dependent variable hence the existence of a positive relationship.

4.5.2 Regression Analysis

Apart from investigating the relationship between the discount rate and the aggregate lending to agriculture using the correlation analysis test, the researcher also conducted a regression analysis to establish the effects of discount rate on the aggregate lending to agriculture. In other words, while correlation analysis measures the relationship between variables, regression determines the effect of one variable on another (Bewick, Cheek, & Ball, 2003; Pandis, 2016; Aggarwal & Ranganathan, 2017; Pandey, 2020; Tanni, Patino, & Ferreira, 2020; Janse et al., 2021). As such regression expresses the relationship between the independent and dependent variables in the form of an equation (Bewick et al., 2013; Pandis, 2016; Gogtay, Deshpande, & Thatte, 2017; Kumari & Yadav, 2018; Dakhlan, Hamdani, & Sulastri, 2020). The data analysis outcomes show the value of the correlation coefficient (R), R Square, Adjusted R Square, and the Standard Error of the Estimate are presented in Table 4.5 below.

Table 4. 4: Model Summary (Aggregate Lending to Agriculture)

R	R Square	Adjusted R Square	Std. Error of the Estimate
- 0.32	0.1	0.1	14.4
a. Predictors: (Constant): Discount rate			
b. Dependent Variable: Aggregate Lending to Agriculture			

In the regression model, the coefficient of determination (R square) is usually an important measure of the goodness of fit between variables and usually interprets the percentage of the independent variables that can be employed in predicting the dependent variable (Pandis, 2016; Kumari & Yadav, 2018; Chicco, Warrens, & Jurman, 2021). In other words, R^2 reflects the degree of variability of the dependent variable due to the changes in the independent variable (Kumari & Yadav, 2018). Based on the study's findings, it is evident from Table 4.5

that R square= 0.1. This means that 10% of the independent variable (discount rate) can be used to predict the dependent variable. As such, the remaining 90% is contributed by other factors indicating that the discount rate is not the only predictor of the resultant monthly aggregate lending to agriculture. However, the 10% influence is still of a higher magnitude as the changes in the value of aggregate lending to agriculture occurs in billions. On the other hand, when the number of independent variables is taken into consideration, the adjusted R square (R^2) highlights the extent of variation of the dependent variable concerning the independent variable. In other words, it shows the proportion of variation in the dependent variables due to the effect of the independent variable. The observed results for the adjusted R square ($R^2 = 0.1$) are the same as those for R square.

Lastly, the standard error of the estimate denoted as SEE typically depicts the estimation of the accuracy of a given set of predictions made by a regression model (Davern, Jones Jr, Lepkowski, Davidson, Blewett, 2007; Palmer & O'Connell, 2009; Wang et al., 2017). Usually, the standard error of the estimate normally shows how well a regression model fits a dataset in a manner where a smaller value depicts a better fit while a larger value shows a bad fit. A smaller standard error of the estimate in a regression model would graphically be depicted with the data points closely packed around the estimated best line of fit; regression line (Bartlett et al., 2012; Langwig et al., 2012; Emmott, Das, Dietterich, Fern, & Wong, 2013). On the other hand, a larger standard error of the estimate in a regression model would show a graph with the data points loosely scattered around the estimated regression line (Bartlett et al., 2012; Langwig et al., 2012; Emmott, Das, Dietterich, Fern, & Wong, 2013).

In probing the regression line from the bivariate scatter plot carried out initially between the discount rate and the aggregate lending to agriculture data determine the nature of the best line of fit. The data scatter plot with the regression line (best line of fit) is presented in Figure 4.5 below.

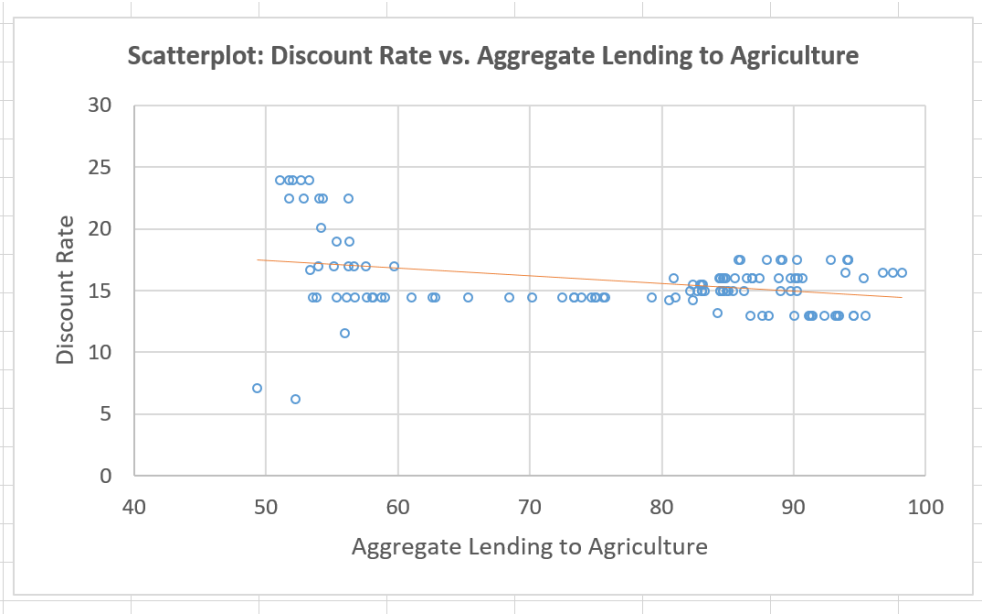

Figure 4. 5: Scatterplot with line of best fit: Discount Rate vs. Aggregate Lending

The value of the standard error of the estimate (*SEE= 14.4*) is large hence the notable data points being loosely scattered around the estimated regression line. In addition, noting the nature of the best line of fit from Figure 4.5 it is acceptable to deduce that there exists an inverse relationship between the discount rate and the aggregate lending to agriculture. In other words, an increase in the discount rate (a contractionary measure) results in a notable decrease in the amount of aggregate lending available to the agriculture sector. The converse (expansionary measure) is also true.

Furthermore, the study assessed the overall significance of the regression model using the Analysis of variance (ANOVA) tool with the outcomes shown in Table 4.6 presented below.

Table 4. 5: ANOVA (Aggregate Lending to Agriculture)

ANOVA[a]					
	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Regression	2833.97	1	2833.97	13.67	.00[b]
Residual	24666.79	119	207.28		
Total	27500.76	120			
[a]. Dependent variable (Aggregate Lending to Agriculture)					
[b]. Model statistically significant at the 0.05 level.					

The model is statistically significant (*p-value = 0.00*), with a larger measure of dispersion as shown by the value of the F-statistics (*F = 13.67, p-value < 0.05*). Based on the regression

results as shown in Table 4.7, the discount rate was statistically significant in affecting the extent of aggregate lending to agriculture.

Table 4. 6: Coefficients of Independent Variable - Discount Rate

Coefficients[a]					
	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	103.19	7.27	0	14.2	.00
Discount Rate	- 1.68	0.45	- 0.32	- 3.7	.00
[a]. Dependent variable (Aggregate Lending to Agriculture)					

Drawing from the regression results, it is evident that the discount rate has a statistically significant effect (*p-value = 0.00*) on aggregate lending to the agriculture sector in the country. Changes in the discount rate had a significant inverse effect on the aggregate lending to agriculture ($t = -3.7$, *p-value* < 0.05). From the outcomes in Table 4.7, the implication is that when all other factors are held constant, a unit increase in the discount rate (a contractionary measure) would result in a 168% ($\beta = -1.68$, $R = -0.32$) decrease in the aggregate lending to the agriculture sector in the country. On the contrary, a unit decrease in the discount rate (an expansionary measure) would result in a 168% increase in the aggregate lending to agriculture. The 168% change in the dependent variable as a result of a unit change in the independent variable is quite significant and must be taken into consideration in the course of the routine review of the discount rate.

4.6 Discount Rate Incentives and Innovations that Can Stimulate Increased Aggregate Lending to Agriculture in Kenya

This section presents findings based on secondary data and information derived from official government sources and relevant scholarly publications. The narrative approach was thus employed in analysis of the data and presentation of the findings thereof. The key innovation and incentive established and discussed on the discount window in this segment is that of the seasonal extended credit. The seasonal extended credit emanates from the seasonal discount rate.

The seasonal discount rate is a special and convenient rate that a central bank can offer depository and credit institutions, especially small community banks to cater for local non-

emergency borrowing and lending needs to serve sectors that exhibit high seasonal credit demands such as agriculture and tourism (Federal Reserve, 2021; Amadeo & Brock, 2021).

4.6.1 Agriculture Sector-Targeting Seasonal Discount Rate

The adoption and implementation of an agriculture sector-specific seasonal discount rate would be a complimentary discount rate incentive and innovation that the CBK can employ to boost lending to the agriculture sector in Kenya. The most important aspect of the seasonal discount rate is the fact that it takes into consideration the needs and traits of a particular local market hence its ability to target a local sectorial need as much as possible (Federal Reserve, 2021).

The Federal Reserve System instituted the seasonal discount rate in the year 1973 with the understanding that smaller community banks experienced impediments to borrowing from the Federal Bank and other national money markets (Sellon Jr, 1985). Notably, these institutions tended to reflect a strong seasonal pattern of peak and off-peak seasonal flows on their deposits and credit. Sellon Jr (1985) explains that due to these inefficiencies, the Federal Bank decided to extend and make it possible for these institutions to have access to the discount window funds so that they can meet the local credit needs of their communities. While the agriculture sector in Kenya can greatly benefit from a seasonal discount rate if it were to be implemented by the Central Bank of Kenya, notably, this is an approach that the CBK does not presently undertake.

Unlike the credit associated with primary and secondary discount rates, seasonal credit is usually extended for a longer period. In other words, while the Federal bank's loaning to other financial institutions on the primary and secondary discount rates terms is usually on overnight terms, borrowing through the seasonal discount rate can extend up to nine months (Sellon Jr, 1985). This length of time would most likely cater to the needs of a wide spectrum of seasonal crops or investments.

However, the institutions that are to be granted access to the discount window fund must also meet certain seasonal qualifications and thresholds to qualify for such a privilege. Firstly, the institution must prove the existence of a season need for funds that persists for a minimum of four weeks. Considering that it targets smaller institutions, the deposits in such banks should not be below a given minimum (should not be critically undercapitalized) nor should not exceed a set maximum value (Sellon Jr, 1985). Similarly, the financial institutions should be

able to raise a portion/set percentage of the required funds to bridge its seasonal needed funds even as the seasonal discount window bridges the remaining portion (Sellon Jr, 1985).

4.7 Chapter Summary

The basis of the chapter was to present and interpret the research findings in answering the identified research questions and study objectives. The analysis of the research data employed both inferential and descriptive statistics. Pearson product-moment correlation analysis was used to test the strength of the relationship between the dependent and independent variables of the study. On the other hand, a regression analysis was used to establish the direct effect of the discount rate on the aggregate lending to agriculture.

CHAPTER FIVE

SUMMARY, DISCUSSION, CONCLUSION, AND RECOMMENDATIONS

5.1 Introduction

The essence of this chapter is to present the research summary while outlining the discussions of the study findings based on the three objectives of the study. The three objectives were to establish how expansionary measures of the discount rate affect aggregate lending to agriculture by CBK-regulated financial institutions, to establish how contractionary measures of the discount rate affect aggregate lending to agriculture by CBK-regulated financial institutions, and to identify incentives and innovations around the discount rate that can stimulate increased aggregate lending to agriculture in Kenya by CBK-regulated financial institutions. It also presents the conclusion of the study and highlights the yielded recommendations for policy review and academia. In addition, the chapter further points out the limitations of the study as well as the recommendations for future research work.

5.2 Summary

The research study aimed at probing the effects of the Central Bank of Kenya's discount rate on aggregate agricultural lending by financial institutions in Kenya. While the focus of the research was the Central Bank of Kenya, the study's units of observation were the periodic discount rate and the monthly aggregate lending to agriculture by financial institutions in Kenya regulated by the CBK. Specifically, the researcher determined to explore the relationship between the periodic changes in the CBK's discount rate and the monthly aggregate lending to the agriculture sector in the country. A total of 121 monthly observations for each variable was taken into consideration from time-series data derived from June 2011 to June openly and freely available on the CBK's website and another reliable online database; specifically the CEIC Data Global Database website.

Anchored on the Klein-Monti loan pricing model and the Fisher's quantity theory of money and employed descriptive statistics, inferential statistics, and archival research designs to investigate its set objectives. The study explored the relevant descriptive measures of central tendencies including the mean, standard deviation, variance, range, minimum and maximum values as well as correlation and linear regression inferential statistics for each set of data. While the correlation analysis was vital in helping to define the relationship between the

discount rate and the aggregate lending to agriculture, the regression model was useful in clarifying the direct effect the changes in the discount rate had on the aggregate lending to agriculture variable.

The study established from the regression results that there was a statistically significant effect the changes of the discount rate had on the aggregate lending to agriculture. Specifically, a unit change in the discount rate would result in a 168% change in aggregate lending to agriculture. Notably, the relationship between the two variables is inverse meaning that a change in the discount rate would cause an inverse change in the second variable. That is, an increase in the independent variable would result in a decrease in the dependent variable. What this means is that an expansionary measure associated with decreasing the discount rate will lead to a significant increase in the value of funds the agriculture sector receives from banks in the form of credit every month. On the other hand, a contractionary measure associated with an increase in the discount rate would also have a significant decrease in the monthly credit advanced to the agriculture sector.

Lastly, the study established that one of the innovations and incentives that the CBK can adopt and implement to encourage increased lending to the agriculture sector is that of the seasonal discount window targeting smaller community financial institutions with agriculture lending products. The seasonal discount window allows these smaller community banks to access the national discount window funds under favorable terms that include extended loan terms based on seasonal demands as compared to the overnight lending basis associated with the primary discount rate.

5.3 Discussion of the Findings

5.3.1 Relationship between Discount Rate and Aggregate Lending to Agriculture

The study first observed the effects of expansionary measures of the discount rate on aggregate lending to agriculture by CBK-regulated financial institutions. The findings revealed that expansionary measures of the discount rate which in essence is the action of the CBK to decrease the discount rate to entice and encourage banks to access the discount window funds had a statistically significant effect on the aggregate lending to agriculture in an inverse manner. What this means is that with the reduction of the discount rate, there is an experienced increase in the resultant monthly aggregate lending to agriculture with the reverse also being true. This also confirms the standpoint presented by the Klein-Monti Loan Pricing Model

which explains that whether by raising or lowering the discount rate, the effect trickles down to the final pricing that banks attach to their loan products which in essence influences credit access and affordability to the agriculture sector Mbua, 2017; Walter & Wansleben, 2020). The findings also confirms the basis of the Fisher's QTM which connotes that in an instant of excessive supply or circulation of money in an economy, the Central Bank may raise the discount rate to contract the supply so that there is diminished commercial bank lending to borrowers including those in agribusinesses with the reverse being also true (Javid, & Zulfiquar, 2013; Dimitrijević & Lovre, 2013).

Several studies have for sure confirmed this finding and stated that indeed, reducing the discount rate makes it possible for financial institutions to access the discount window funds which in effect increases their liquidity and the amount of money they can lend to their clients including farmers (Garcia-de-Andoain, Heider, Hoerova, & Manganelli, 2016; Rahman, 2017; Frey et al., 2018; Abuka, Alinda, Minoiu, Peydró, & Presbitero, 2019). Osabohien, Afolabi, and Godwin (2018) explain that lowering the discount rate increases farmers' access to credit since it raises the volume of liquidity for banks. The rise in banks' liquidity enhances increased access to agricultural credit and by agricultural credit guarantee (Osabohien et al., 2018).

Deng, Xu, and Luo (2021) in agreement with the above explanation point out further that one of the effects of lowering the discount rate is that it also grants room for commercial banks and other financial institutions that can access the discount window funds to reduce their interest rates and other credit-pricing modalities on their loans. Aleskerova, Mulyk, and Fedoryshyna (2018) agree with this explanation since according to their discussion, a reduced discount rate encourages a reduction in the banks' nominal interest rate on loans which in essence is attractive to farmers pursuing agricultural credit. This encourages the banks' clients in the agricultural supply chain market to pursue increased agricultural value chain credit products to finance their operations. Khou, Cheng, Leng, and Meng, (2015) point out that in various contexts, the central banks have used the discount rate as a monetary policy measure to help maintain lower interest rates among the lower banks as an approach to support rapid investments in various sectors of the economy including agribusinesses.

Secondly, the study first observed the effects of contractionary measures of the discount rate on aggregate lending to agriculture by CBK-regulated financial institutions. According to the findings established in the study, it was evident that contractionary measures reflected by the raising of the discount rate by the CBK also exhibit a statistically significant inverse

relationship with the aggregate lending to agriculture. As such, raising the discount rate would lead to a significant decrease in the monthly aggregate credit financial institutions regulated by the Central Bank of Kenya do advance to the agriculture sector. Similarly, various studies have also established similar outcomes when the Central Banks undertake such contractionary measures around the discount rate with diminished overall lending by the lower financial institutions to their clients including those in the agricultural sector (Anthony, 2010; Toby & Peterside, 2014; Mutwol, 2016; Hurford et al., 2020; Dikau & Volz, 2021; Oloukoi, 2021).

Research has shown that increasing the discount rate reduces the motivations for financial institutions to pursue funding from the discount window funds which in turn limits their financial capacity to undertake robust advancing of credit to their clients including those in agriculture (Tawose, 2012; Ayeomoni and Aladejana, 2016; Hurford et al., 2020). In other words, if the lower banks determine that the discount rate offered by the central bank on the discount window fund is high, they may withhold from pursuing credit from the central bank especially if the need for such funding would be for lending purposes. This in turn hurts their liquidity (Aboagye, Akoena, Antwi-Asare, & Gockel, 2008; Olagunju, David, & Samuel, 2012; Bech & Keister, 2017; Demiralp, Eisenschmidt, & Vlassopoulos, 2021). With diminished liquidity, the lower banks would exhibit a slowed-down motivation to lend to agricultural clients (Milić & Soleša, 2017; Khan, Scheule, & Wu, 2017; Kodongo, 2018; Maloba & Alhassan, 2019; Lombe, 2019; Kim & Katchova, 2020). This is because the agricultural sector is not only considered a high-risk investment sector for credit but is also highly seasonal (Yi, Wang, & Chen, 2021; Rozhkova, 2021). In such a case, the agriculture sector becomes a low priority investment area for credit for most banks experiencing liquidity challenges as a means of reducing the high risks exposure associated with the sector (Timsina, 2017; Tran, Nguyen, & Long, 2019; Lombe, 2019; Zheng & Escalante, 2020; Chodorow-Reich, Darmouni, Luck, & Plosser, 2021). This occurrence has been observed in rural credit access both in Vietnam, India, and China where agriculture is one of the dominant sectors in the rural setup (Kumar et al., 2015; Tang & Guo, 2017; Linh, Long, Chi, Tam, & Lebailly, 2019). Apart from the diminished motivation to lend to the agriculture sector, banks are also more likely to increase the interest rates on their loans which further discourages farmers from taking such credit facilities (Bada, 2017; Asante-Addo, Mockshell, Zeller, Siddig, & Egyir, 2017). Typically, banks need to have increased liquidity to maintain low-interest rates and payments which in retrospect would be constrained by low liquidity (Turvey, 2017; Kofarmata & Danlami, 2021).

In other words, at high bank interest rates which is contributed in part by high central bank interest rates, there is diminished participation in agricultural credit pursuit by farmers.

5.3.2 Discount Rate Innovations and Incentives to Boost Aggregate Lending to Agriculture in Kenya

In identifying incentives and innovations around the discount rate that can stimulate increased aggregate lending to agriculture in Kenya by CBK-regulated financial institutions as a research objective, the study established that formulating a seasonal discount window. The seasonal extended credit emanates from such a provision due to the extended repayment period that could last up to 9 months (Bordo & Wheelock, 2011; Ackon & Ennis, 2017; Berger, Black, Bouwman, & Dlugosz, 2014). Such an action will help banks have funds set aside specifically for agricultural lending. This would make it possible for these lower financial institutions to structure and tailor products that are favorable to the agriculture sector which is associated with high seasonal credit demands (Armantier, Krieger, & McAndrews, 2008; Afonso, Kovner, & Schoar, 2011; Fink, Jack, & Masiye, 2014; Carlson & Wheelock, 2016). Concisely, the seasonal extended credit will help the lower banks to overcome the inefficiencies associated with the strong peak and off-peak seasonal pattern exhibited by the deposits and credit demands that typically arise from the agricultural sector.

5.4 Conclusions

The goal of this research study was to determine the effects of the Central Bank of Kenya's discount rate on aggregate agricultural lending by financial institutions in Kenya. The findings from the study's measure of the regression between the independent and dependent variables indicated that only 10% ($R^{2} = 0.1$) of the variations notable on the monthly aggregate lending to agriculture (dependent variable) was due to changes in the discount rate. The implication is that, apart from the discount rate, there is a certainty that there exist other factors beyond the scope of this study that influences the overall outcome of the monthly aggregate lending to the agriculture sector. However, apart from this partial influence on the dependent variable, changes in the discount rate exhibited a statistically significant inverse effect on the monthly aggregate lending to the agriculture in the sense that a unit change in the discount rate resulted in a 168% ($\beta = -1.68$, $p\text{-value} < 0.05$) change on the former. Therefore, raising the discount rate by a single unit will cause the monthly aggregate lending to agriculture to diminish by a value of 168% while lowering the discount rate would result in an increase in the dependent

variable by the said percentage. In summary, while a contractionary measure around the discount rate would significantly diminish the monthly aggregate lending to the agricultural sector, an expansionary measure would lead to its increase. Within the same findings of the study, the researcher also determined that one of the most notable innovations and incentives the Central Bank of Kenya can employ to boost agricultural lensing in Kenya is to institute the implementation of a seasonal discount window to enable financial institutions with lending products targeting the agricultural sector to access the national discount window funds through a special seasonal discount rate. The basis of such a facility is that it is advanced over a longer period compared to the overnight model associated with the primary discount rate. The banks that receive such funds must account for them in respect of how they have been used to target the agricultural sector. In summary, the central bank's micro and macroeconomic decisions around the discount rate are significant indicators for increased or diminished aggregate lending to the agricultural sector in the country.

5.5 Recommendations

5.5.1 Policymakers

1. The government as a key policymaker should formulate regulations that would make it possible for the Central Bank of Kenya to establish a seasonal discount window that targets enhancing increased lending to the agricultural sector by qualified financial institutions.

5.5.2 The Monetary Policy Committee

1. The Central Bank of Kenya's Monetary Policy Committee should come up with stable policy expansionary guidelines around the discount rate to encourage commercial banks and other financial institutions under its watch to advance credit to the agriculture sector at a very lower interest rate

5.5.3 Scholars

The findings in the study are a significant addition to the existing body of knowledge especially in the banking sector, especially in tailoring financial credit products that are best suited to the agricultural sector. Furthermore, the study points out other areas for future research not only in lending to agriculture but also in the banking sector as a whole.

5.6 Limitation of the Study

The study's sole focus was the effect of the discount rate as a monetary policy tool on monthly aggregate lending to the agriculture sector. However, the monetary policy comprises other multiple instruments that have not been explored within the scope of this research study. As such, future studies could focus on the effect of the other monetary policy instruments on agricultural lending individually or even collectively. In addition, further studies could go beyond lending to the agriculture sector and focus on other sectors such as manufacturing as well.

5.7 Recommendations for Further Research

i. Future research can consider exploring the individual or even collective effects of the other monetary policy instruments on lending to agriculture.
ii. Future studies can replicate this research study to focus on the other sectors of the economy.
iii. Future studies can investigate the individual or even collective effects of the other monetary policy instruments on lending to the other sectors of the economy.

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LIST OF APPENDICES

APPENDIX I: Ethical Clearance Letter

Strathmore UNIVERSITY

14th March 2022

Mr Kinuthia Simon,
simon.kinuthia@strathmore.edu

Dear Mr Kinuthia,

RE: Effects of the Central Bank of Kenya's discount rate on aggregate agricultural lending by financila institutions in Kenya.

This is to inform you that SU-IERC has reviewed and **approved** your above **SU masters'** research proposal. Your application reference number is **SU-IERC1247/21.** The approval period is **11th March 2022 to 10th March 2023.**

This approval is subject to compliance with the following requirements:

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

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

Yours sincerely,

for: **Dr Ben Ngoye,**
Secretary; SU-IERC

Cc: Prof Fred Were,
Chairperson; SU-IERC

STRATHMORE UNIVERSITY INSTITUTIONAL
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APPENDIX III: Cleaned Data Sets Employed in the Research Analysis

Date	Discount Rate (%)	Aggregate Lending to Agriculture (Billion Kes)
Jun-11	7.13	49.30
Jul-11	6.25	52.20
Aug-11	20.11	54.10
Sep-11	11.58	55.90
Oct-11	16.68	53.30
Nov-11	22.5	51.70
Dec-11	24	53.20
Jan-12	24	52.60
Feb-12	24	52.00
Mar-12	24	51.00
Apr-12	24	51.70
May-12	22.5	52.80
Jun-12	22.5	54.30
Jul-12	22.5	54.00
Aug-12	22.5	56.20
Sep-12	19	56.30
Oct-12	19	55.30
Nov-12	17	55.10
Dec-12	17	57.50
Jan-13	17	59.70
Feb-13	17	56.20
Mar-13	17	56.60
Apr-13	17	53.90
May-13	14.5	53.80
Jun-13	14.5	55.30
Jul-13	14.5	57.60
Aug-13	14.5	58.00
Sep-13	14.5	56.10
Oct-13	14.5	53.50

Nov-13	14.5	56.70
Dec-13	14.5	58.70
Jan-14	14.5	59.00
Feb-14	14.5	58.10
Mar-14	14.5	61.00
Apr-14	14.5	62.56
May-14	14.5	62.80
Jun-14	14.5	65.270
Jul-14	14.5	68.400
Aug-14	14.5	70.100
Sep-14	14.5	73.300
Oct-14	14.5	73.300
Nov-14	14.5	74.900
Dec-14	14.5	75.000
Jan-15	14.5	73.900
Feb-15	14.5	72.400
Mar-15	14.5	74.600
Apr-15	14.5	75.550
May-15	14.5	75.700
Jun-15	16	80.90
Jul-15	17.5	87.90
Aug-15	17.5	90.20
Sep-15	17.5	89.00
Oct-15	17.5	85.80
Nov-15	17.5	89.10
Dec-15	17.5	85.90
Jan-16	17.5	94.10
Feb-16	17.5	94.00
Mar-16	17.5	94.10
Apr-16	17.5	92.80
May-16	16.5	96.70
Jun-16	16.5	97.50

Jul-16	16.5	98.20
Aug-16	16.5	93.90
Sep-16	16	90.60
Oct-16	16	87.40
Nov-16	16	89.70
Dec-16	16	90.10
Jan-17	16	90.30
Feb-17	16	95.30
Mar-17	16	86.80
Apr-17	16	84.60
May-17	16	84.40
Jun-17	16	85.50
Jul-17	16	86.80
Aug-17	16	86.80
Sep-17	16	88.80
Oct-17	16	86.40
Nov-17	16	84.40
Dec-17	16	84.70
Jan-18	16	84.80
Feb-18	16	84.30
Mar-18	15.5	82.90
Apr-18	15.5	82.30
May-18	15.5	83.10
Jun-18	15.5	83.00
Jul-18	15	82.70
Aug-18	15	84.60
Sep-18	15	85.00
Oct-18	15	83.20
Nov-18	15	84.40
Dec-18	15	83.00
Jan-19	15	84.60
Feb-19	15	82.10

Mar-19	15	83.00
Apr-19	15	84.40
May-19	15	85.40
Jun-19	15	86.20
Jul-19	15	89.00
Aug-19	15	90.20
Sep-19	15	89.70
Oct-19	15	84.90
Nov-19	14.5	79.20
Dec-19	14.5	81.00
Jan-20	14.25	80.50
Feb-20	14.25	82.30
Mar-20	13.25	84.20
Apr-20	13	86.70
May-20	13	87.60
Jun-20	13	88.1
Jul-20	13	90
Aug-20	13	91.1
Sep-20	13	91.2
Oct-20	13	92.3
Nov-20	13	94.5
Dec-20	13	93.4
Jan-21	13	93.1
Feb-21	13	93.3
Mar-21	13	94.5
Apr-21	13	95.4
May-21	13	91.4
Jun-21	13	91.3
Source: Central Bank of Kenya		

APPENDIX IV: Raw Discount Rate Data Set

Date	Discount Rate (5)
26/01/2022	13
29/11/2021	13
28/09/2021	13
28/07/2021	13
26/05/2021	13
29/03/2021	13
27/01/2021	13
26/11/2020	13
29/09/2020	13
29/07/2020	13
25/06/2020	13
27/05/2020	13
29/04/2020	13
23/03/2020	13.25
27/01/2020	14.25
25/11/2019	14.5
23/09/2019	15
23/09/2019	15
24/07/2019	15
27/05/2019	15
27/03/2019	15
28/01/2019	15
27/11/2018	15
25/09/2018	15
30/07/2018	15
19/03/2018	15.5
22/01/2018	16
23/11/2017	16
18/09/2017	16
29/05/2017	16

27/03/2017	16
30/01/2017	16
28/11/2016	16
20/09/2016	16
23/05/2016	16.5
25/01/2016	17.5
09/07/2015	17.5
12/06/2015	16
26/05/2015	14.5
22/01/2015	14.5
07/05/2013	14.5
07/11/2012	17
10/09/2012	19
20/05/2012	22.5
02/12/2011	24
02/11/2011	22.5
31/10/2011	22
28/10/2011	20.98
27/10/2011	20.49
21/10/2011	18
17/10/2011	14
14/10/2011	15.56
13/10/2011	15.08
12/10/2011	14.66
11/10/2011	14.3
10/10/2011	14.36
05/10/2011	14
15/09/2011	10
14/09/2011	9.25
13/09/2011	9.25
12/09/2011	9.34
09/09/2011	10.13

07/09/2011	11.76
02/09/2011	15
01/09/2011	17.87
30/08/2011	20.17
26/08/2011	29.37
25/08/2011	27.25
24/08/2011	25.29
18/08/2011	17.89
17/08/2011	15.68
16/08/2011	13.87
15/08/2011	11.34
12/07/2011	6.25
29/06/2011	8
02/06/2011	6.25
28/03/2011	6
07/02/2011	5.75
03/01/2011	6

APPENDIX V: List of CBK's Regulated Financial Institutions in the sample

CBK Licensed Commercial Banks, Mortgage Finance Institutions And Authorized Non-Operating Holding Companies	**CBK Licensed Microfinance Banks**
1. ABSA Bank Kenya Plc 2. Access Bank (Kenya) PLC 3. African Banking Corporation Limited 4. Bank of Africa Kenya Limited 5. Bank of Baroda (Kenya) Limited 6. Bank of India 7. Citibank N.A Kenya 8. Consolidated Bank of Kenya Limited 9. Co-operative Bank of Kenya Limited 10. Credit Bank Limited 11. Development Bank of Kenya Limited 12. Diamond Trust Bank Kenya Limited 13. DIB Bank Kenya Limited 14. Ecobank Kenya Limited 15. Equity Bank Kenya Limited 16. Family Bank Limited 17. First Community Bank Limited 18. Guaranty Trust Bank (K) Ltd 19. Guardian Bank Limited 20. Gulf African Bank Limited 21. Habib Bank A.G Zurich 22. I&M Bank Limited 23. KCB Bank Kenya Limited 24. Kingdom Bank Limited 25. Mayfair CIB Bank Limited 26. Middle East Bank (K) Limited 27. M-Oriental Bank Limited 28. National Bank of Kenya Limited	**1.** Caritas Microfinance Bank Limited 2. Century Microfinance Bank Limited 3. Choice Microfinance Bank Limited 4. Daraja Microfinance Bank Limited 5. Faulu Microfinance Bank Limited 6. Kenya Women Microfinance Bank PLC 7. Rafiki Microfinance Bank Limited 8. Key Microfinance Bank PLC 9. SMEP Microfinance Bank Limited 10. Sumac Microfinance Bank Limited 11. U & I Microfinance Bank Limited 12. Uwezo Microfinance Bank Limited 13. Maisha Microfinance Bank Ltd 14. Muungano Microfinance Bank PLC

29. NCBA Bank Kenya PLC 30. Paramount Bank Limited 31. Prime Bank Limited 32. SBM Bank Kenya Limited 33. Sidian Bank Limited 34. Spire Bank Ltd 35. Stanbic Bank Kenya Limited 36. Standard Chartered Bank Kenya Limited 37. UBA Kenya Bank Limited 38. Victoria Commercial Bank Limited	
Source: Central Bank of Kenya	