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Factors affecting commercial banks participation in road infrastructure financing in Kenya.

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FACTORS AFFECTING COMMERCIAL BANKS PARTICIPATION IN ROAD INFRASTRUCTURE FINANCING IN KENYA

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DECLARATION

This research project is my original work and to the best of my knowledge has not been provided to any other institution for examination or any other purpose.

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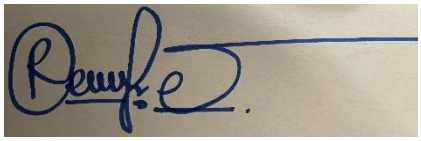

Sign.....… **Date**: 20th April, 2023

As the university supervisor, I have given my approval for this research project to be examined.

Sign..... Date.....23rd April 2023.....

Dr. Helen Osiolo

Strathmore Instutute of Mathematical Sciences

DEDICATION

To my mother

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ABSTRACT

Road infrastructure investment is paramount in the achievement of desired economic objectives. Though the contribution of roads infrastructure to the economic development is acknowledged, its quality and quantity of accessibility is below par in developing economies. The trend seems to change due to increased government expenditure and private participation through public-private partnerships (PPP) and private financing through commercial banks. Since the year 2000, private players' participation in infrastructural projects has increased from around 6.5% to almost total financing. With this growth in the financing from commercial banks, this research is motivated to analyze how specific bank characteristics, project characteristics and macroeconomic indicators have influenced the investments in infrastructural projects. Thus, the main research will be to establish how bank characteristics and macroeconomic factors on the road infrastructure financing by commercial banks in Kenya. The specific objectives of the study were to establish the effect of bank characteristics on road infrastructure project financing by commercial banks in Kenya and to investigate the effects of macroeconomic factors on road infrastructure project financing by commercial banks in Kenya. The study was guided by the modernization theory and agency theory. This study used explanatory research design. Timeseries data was collected from July 2005 to December 2022. Data was analysed using descriptive and inferential statistics through use of Eviews and Stata. Study findings were presented using figures and tables. The study found that bank characteristics had mixed effects with liquidity has inverse though not statistically significant effect on commercial banks road infrastructure financing. There was a positive effect of non-performing loans on commercial banks road infrastructure financing. Further, there was positive and not statistically significant effect of total assets and commercial bank road infrastructure financing. There was an inverse and not statistically significant effect of capital adequacy on commercial banks road infrastructure financing. Secondly, regarding the effect of project characteristics on commercial banks road infrastructure financing. Thirdly, an examination on the effect of macro-economic characteristics on commercial banks road infrastructure financing in Kenya depicts that there was an inverse effect of inflation rate on commercial bank road infrastructure financing. There was a positive effect of increase GDP growth rate and road infrastructure financing. There was an inverse effect of exchange rate on commercial bank's road infrastructure financing. There was positive effect of interest rate on commercial banks road infrastructure financing. This indicates that there was a positive effect of interest rate on commercial banks road infrastructure financing. There is need for policy development that will liberalize commercial banks operations to enhance its participation public private partnership. There is need for commercial banks to develop strategies on liquidity, profitability, non-performing loans and capital adequacy so as to optimize their credit creation capacity. There are higher odds of increased information asymmetry regarding project costs hence the need for commercial banks to have robust department that would aid in evaluation of value benefits associated with respective projects level of involvement.

Key words: Project Financing, Public-Private Partnership (PPP), Commercial Banks

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LIST OF ABBREVIATIONS AND ACRONYMS

ADB	Africa Development Bank
BI	Benefit to the Investor
BPS	Budget Policy Statement
EAC	East Africa Community
ER	Exchange Rate
FC	Financial Cost
FR	Financial Risk
GDP	Gross Domestic Product
IA	Investment Ability
ICT	Information Communication and Technology
IS	Investment Size
JICA	Japan International Cooperation Agency
KES	Kenya Shillings
KPI	Key Performance Indicators
KRB	Kenya Roads Board
LIC(s)	Low Income Countries
LMIC(s)	Low- and Middle-Income Countries
MIC(s)	Middle Income Countries
MOTI	Ministry of Transport and Infrastructure
MPPM	Master of Public Policy and Management
NPL	Nonperforming Loans
PFI	Private Finance Initiative
PLT	Project Loan Tenure

PPP	Public-Private Partnership
ROA	Return on Assets
RSIP	Road Sector Investment Programme
SBS	Strathmore Business School
SDG(s)	Sustainable Development Goals
SOE	State – Owned Enterprises
SSA	Sub-Sahara Africa
STATA	Statistical Software for Data Science
UN	United Nations

OPERATIONAL DEFINITION OF KEY TERMS

Bank Characteristics	These are unique attributes that differentiates one bank from another. They include liquidity, profitability, non-performing loans, capital adequacy and total assets (Gatti, 2012; Pham, 2015).
Project characteristics	These are attributes that differentiates project been undertaken by the government (Corrielli, Gatti & Steffanoni, 2010).
Public Private Partnership	According to World Bank (2017), Public Private Partnerships (PPP) can be defined as partnership between public and private sectors through a contractual agreement which aims to facilitate private sector involvement in infrastructure provision so as to increase the availability and quality infrastructure across the world.
Macroeconomic characteristics	These are economic factors that affect infrastructural projects. They include gross domestic product, inflation rate, exchange rate and interest rate (Bosire, 2015).
Road infrastructure commercial bank financing	This is the proportion of loans allocated by commercial banks to infrastructural projects (Cornelli et al., 2010).

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Before 1980s, the principal provider of public infrastructure in many nations were both the state-owned enterprises (SOE) and the government. Many public sector organizations had been established by governments both in the developing and developed world to provide the necessary goods, services and other infrastructural services. However, after 1980, the position of government control in most countries took a different direction. There was massive privatization of state-owned assets and enterprises, which led to the disposal of public-owned assets to the private sector either partially or completely. Privatization basically entails massive assets transfers, economic activities or employees from the public sector to the private sector. Privatization therefore drove governments to encourage increased involvement of the private sector in public goods and services' delivery in the fields that were initially perceived as the responsibilities of the state (Park, 2014).

Corielli, Stefano and Alessandro (2010) define project financing as the raising of finances as per the benefits of the project to be executed. Hoffman elaborates rather lengthily on this definition by stating that project financing is generally used to imply to a limited financing structure in which equity, credit and debt enhancement are combined for the refinancing, operation and construction of a specific facility in an industry that is capital intensive. According to Hoffman (1989) lenders in project financing use projected revenues from a facility's operation to base credit appraisals instead of the credit or general assets of the facility's sponsors and depend on the assets of the facility including all contracts which generate revenue and other forms of cash flows coming from the facility as debt collateral.

Lack of adequate infrastructure in Kenya has been cited as a major concern for sustaining the real Gross Domestic Product (GDP) growth. Policy makers indicate that in order for Kenya to compete with other nations, it needs to improve its infrastructure such as rail and bridges, water system, sewer system and energy. However, the limited resources will not cover the needed expansion of these services. Road infrastructure development in Kenya has not kept pace with the growth in demand, thereby creating a huge deficit. Kenya, like other African countries, face higher access costs compared with other developing countries. The country's total road density is approximately

284km per 1,000 square kilometres of land area with approximately fifteen percent (15%) paved, compared to world average of 944 km per 1,000 square kilometres of land area with approximately fifty (50%) paved. In terms of accessibility, the country's total road network per capita is approximately 3.17km per thousand populations relative to a world average of 7.07 km per thousand populations. However, the paved road network per capita for the country is 0.47 km per thousand population compared to world average of 3.95 km per thousand populations (Ndachi & Kimutai, 2018).

Rao (2018) did an empirical analysis of the factors that influence infrastructure project financing by banks in select Asian Economies. The study was motivated by the need to encourage private sector participation to meet investment requirements by expanding infrastructure finance. The study used secondary data drawn from various sources such as balance sheet for a period of 2011 – 2016. A growing increase in demand for infrastructure with the main aim of realising developed nation status, has forced many governments across the world to seek smart partnerships with the private sector. Lasa, Ahmad and Takim (2015) researched on critical factors on obtaining project financing for privet initiative projects in Malaysia. The results of the study illustrate that four main dimensions of critical success factors in obtaining finance for project finance initiative (PFI) projects include project attributes, special purpose vehicle attributes; government attributes and financing attributes. On external factors, economic and political factors were also considered critical, and need to be effectively addressed to boost chances of obtaining PFI.

1.1.1 Road Infrastructure Stock in Kenya: The Infrastructure Gap

While the government is keen on scaling up growth to 10 percent per annum, this would require, among other factors, scaling up of the quantity and quality of infrastructure especially the condition of roads, reliable access to water and electricity and efficient transport systems especially port and rail transport systems. Poor infrastructure has over time been cited as one of the major constraints to doing business.

In comparative terms, the country's road density relative other Sub – Sahara Africa (SSA) countries shows that the country's road indicators are much better than those of Low-Income Countries (LICs) within the region. However, compared to other Middle-Income Countries (MICs) within the region, the country has a two hundred thirty-four percentage (234%) deficit of paved road density and a twelve percentage (12%) deficit of unpaved road density. Further, the country

has an eighty-seven percentage (87%) deficit in rural accessibility compared to the MICs within the region. Additionally, the country also has a one hundred fifty-one percentage (151%) deficit of traffic movement on paved roads compared to MICs within the region, a proxy indicator of poor road network (Government of Kenya, 2019).

Procurement innovation have led to emergence of infrastructural development through Public Private Partnerships (PPPs) which is an advancement of limited period privatization based on concession or Build-Operate-Transfer (BOT) (Jeffrey, 2011). PPPs are preferred since they may have stronger positive contribution in economic development in developing countries (Montanheiro, 2008). To enhance provision of social economic services, Private Finance Initiative (PFI) have partnered with the government to solve infrastructural problems (OECD, 2012). Hence, there is a growth in demand for private sector involvement in provision of public infrastructure and services in different industry and sectors such as power supply, schools, health facilities, telecommunication, military training and mining (Sharma et al., 2010). The key drivers of PPPs are public resources scarcity, government deregulation policies of infrastructure, globalization and financial innovation (Nwangwu, 2011). Creation of partnership platforms would aid in identification of roles that can be played by private sectors in pursuance of social economic development.

Public Private Partnership (PPPs) arrangements may complement capital deficits in the public sector and provide competency and skills that aid in efficient implementation of infrastructural projects (Muhu, 2012). Since the government may focus on different sectors concurrently, then different states have adopted PPPs in implementation of their infrastructural projects. Initially, empirical scholars examined on measures adopted to enhance utilization of PPPs but currently there are evaluating on what are its critical success factors. Even though, early adoption of PPPs was aimed at attracting private investment and minimize public expenditure in social infrastructural projects the trends have been reversed with involvement of stakeholders prior to undertaking of community-based projects.

Kenya's Africa Infrastructure Country Diagnostic (AICD) report estimates that, in order to address the deficit in country's infrastructure it will call for sustained expenditures of approximately 20% of GDP which in the next decade would be equivalent to 4 billion dollars each year (Republic of Kenya, 2013). To achieve this goal, the Government of Kenya has been pursuing alternative

mechanisms geared towards sourcing additional funding, adopting lower-cost latest technologies, while giving priority to investments in infrastructure. In this case, the Government of Kenya (GOK) has made development in infrastructure through Public Private Partnerships (PPPs) a priority as a means through which it can help meet the major shortfalls in infrastructure development in the country. Lack of adequate infrastructure is one of the major constraints for growth and business in Kenya. By establishing PPP's, the Government is able to fast track development goals through a joint effort.

1.1.2 Public-Private Partnerships

According to World Bank (2017), Public Private Partnerships (PPP) can be defined as partnership between public and private sectors through a contractual agreement which aims to facilitate private sector involvement in infrastructure provision so as to increase the availability and quality infrastructure across the world. Therefore, PPP can exist only in the event that there exists good working relationship between public and private sectors, and typically, the contract involves risk-sharing mechanism between the two institutions. Successfully, for a given infrastructure, be it road and energy, the private sector can bring financing and management expertise, and being profit-driven, efficiency and self-sustainability of the infrastructure facilities, and improved quality of services with maximum supervision of project in each stage can be enhanced (World Bank, 2017).

When these occurs, the public sector can provide a conducive business environment, access to credit as well as investor protection. However, studies have shown that the viability of PPP project may not be successful at times. Some PPI projects such as construction of physical road networks may require extensive capital with profits spread out over the long-run and low rates of return on investments or assets (Mengitsu & School, 2013). Also, in the absence of strong credit markets, providing debt financing opportunities by the private sector for PPS, may not be feasible without credit enhancement or guarantees from the government and/or multilateral agencies. (Mengitsu & School, 2013). The terms and tenure of the projects are significant determinants for private players. When creating a conducive environment, government must also ensure that physical fiscal and monetary policies are stable (Gatti, 2017). Given these considerations, three relevant determinants of banks' capacity towards PPPs (road infrastructure) and which will guide the study variables are discussed.

Public Private Partnership (PPPs) procurement methods have gained prominence in delivery of social economic services in developed and developing countries (Ng, Wong & Wong, 2012). According to Syuhaida and Aminah (2009) private sector have been brought on board to complement provision of infrastructural projects which the government may be constrained in provision of funding. Udechukwu (2012) asserts that PPPs aids government in optimal allocation of merge resources in heterogenous sectors. According to RICS (2011) though PPPs is beneficial its adoption as procurement method is low in relation to public expenditure in developed and developing countries. The need for reliable road network is an initiative pursued by government since poor road network is associated with sub-optimal economic performance and quality of life (Rapajia et al., 2013).

1.1.3 Trends of Public Private Partnership

PPPs have become more common not only in the aftermath of the 2008 financial crisis, as governments are eager to leverage scarce public funds but have seen a rise in developing countries over the last two decades. More than 134 developing countries apply PPPs, contributing about 15–20 percent of total infrastructure investment. Widely utilized because of their purported advantages in off-budget funding, anticipated efficiency gains, and improved service quality, PPPs are a mechanism that governments regularly turn to in fulfilling their responsibilities regarding public infrastructure and service—a phenomenon increasingly taking hold in developing countries (Colverson and others 2011).

Independent Evaluation Group (IEG) looks at the core types of PPP arrangements that have in common a similar level of risk sharing between public and private. This evaluation adopts the definition of the World Bank Institute, according to which PPPs are “long-term contracts between a private party and a government agency, for providing a public asset or service, in which the private party bears significant risk and management responsibility” (WBI 2012, p.36). This definition appears to be a good common denominator also across the PPP concepts of the International Monetary Fund and the Organisation for Economic Co-operation and Development (OECD) (WBI 2012; IMF 2004; OECD 2008) and translates into a well-defined spectrum of contractual arrangements. These have in common that they are long term, usually bundling design, construction, and maintenance and possibly operation, and contain performance-based elements

with private capital at stake. The essential forms of PPP are operations and management contracts, asset acquisition or leasing deal, design build finance operate, build own operate, build own operate transfer and joint venture.

PPPs implemented in Tanzania are concession agreements for running existing enterprises with limited provisions for rehabilitation and new investments. Following adoption of liberalization policies, there has been an increased involvement of the private sector in investment and provision of services which previously were being provided by the Government. For example, in the case of services, PPPs have been implemented successfully by Faith Based Organizations (FBOs) in education, health and water sectors for many years. In the case of other sectors, the performance has been mixed largely due to the complexity of such undertakings and lack of clear guidelines on the criteria for public and private sector partnership (Bori & Zhu, 2016).

Previous studies such as Rao (2018) assessed factors influencing infrastructure project financing by banks in Asian countries, Hyun, Park and Tian (2018) investigated determinants of PPPs in infrastructure in Asia. Locally, Bosire (2015) and Mbithi and Okiro (2018) assessed determinants of PPPs financing. A review of these studies however, did not intuitively illustrate the determinants of road infrastructure project financing (PPPs) from the concept of commercial banks' capacity. Therefore, in response to this gap, this study proposes to determine how commercial banks' capacity in relation to bank variables, project variables and macroeconomic variables can affect successful financing of road infrastructure projects in Kenya.

The research is being done to assess the determinants towards road infrastructure projects financing by commercial banks in Kenya; the research will be most helpful to the commercial banks in Kenya during project financing for the management will be aware and be able to put in place the aspects they need in order to successfully finance road construction projects among other similar ones in Kenya. The bank managers will also be able to judge which viable road construction projects to finance.

1.1.4 Factors Influencing Commercial Banks Role in Project Financing

Commercial banks play an important role in the business environment. Therefore, a strong banking system is vital to a country's economic, social and political development (Borio & Zhu, 2016). In the case of increased need for project financing across the world, banks have been identified as the

most viable partners in the PPPs infrastructure projects. According to Hyun, Park and Tian (2018), PPP projects depend on market access to private borrowing, requiring the private sector such as commercial banks to source the initial capital for projects upfront. World Economic Forum (2013) indicated that banks remain major fund suppliers to private infrastructure projects investments.

Pinto and Alves (2016) stated that project finance is an economically significant growing financial market segment, which is still under studied. In their investigation to determine the pricing of project financing and non-project finance loans, as well as the factors that influence the borrower's choice between project financing and corporate financing, they found out that borrowers choose project financing when they seek long-term financing and funding cost reduction. Also, of importance is that transaction cost considerations, the financial crisis and country risk affect the financing choice. Pinto and Alves (2016) continue that publicly traded institutions who prefer project financing to corporate financing are larger, less profitable, more financially distressed and have a higher asset tangibility. The study used sample of 210,273 syndicated loans closed between 2000 and 2014 in the US and West Europe.

According to Emilia, Stefano Gatti, and Giacomo (2017) public sector agencies are mandated to ensure successful development of the PFI with updated regulations, policies and guidelines. Government participation can be enhanced through initiation of engagement policies which guarantee success in project implementation, execution and an assurance of project continuity until the objectives are achieved (Mwangi, 2007). The confidence of the financers is driven by adequate government support. There are various forms of government support including subsidies, tax exemption, and guarantee revenue and equity participation.

1.1.5 Commercial Banks' Role of Project Financing

Beyond their traditional role in project finance transactions, commercial banks are developing new roles in providing advisory services; construction financing; intermediation to permanent long-term fixed-rate financing; commodity, currency, and interest rate risk management; foreign tax absorption; and working capital financing for projects throughout the world (Brude, Goldsmith & Valila, 2012). Looked at separately, the development of these roles is a response to increasing competition both among commercial banks and between commercial banks and other institutional lenders and intermediaries to meet an explosion of worldwide project finance needs (Laukkanen, 2009).

According to Gatti (2017) the division of work within a syndicate is often functional, and has become quite efficient, with individual banks designated as technical agent, documentation agent, syndication agent, and variations thereof. A project's sponsor normally requests commitments from its commercial banks for both construction financing and then the permanent long-term financing of its project. A typical commitment for construction financing is for two years and permanent financing is usually from ten to fifteen years, although in rare cases commercial banks have provided permanent financing commitments of twenty years or more. Most permanent financing commitments by commercial banks include specified increases in the applicable interest rate ("step-ups" in the applicable margin or spread over the bank's cost of funds) to provide incentives for the commercial bank financing to be refinanced before its scheduled maturity.

1.1.6 Commercial Banks

One of the key functions of commercial banks is intermediation. To achieve this there are at least 44 banking institutions licensed in Kenya (Banking Supervision Annual Report, 2015). CBK is the sole regulator of microfinance banks, foreign exchange trading bureaus, credit reference bureaus and commercial banks. Commercial banks are distributed as 31 local banks, 3 publicly owned and 28 privately held banks and 13 are foreign. Currently, only 11 commercial banks are listed in Nairobi securities exchange. Moreover, Chase, imperial and Dubai banks are under receivership. Though, Chase has been taken over by SBM bank, Jamii bora by Cooperative bank and Spire bank by Equity bank.

1.2 Statement of the Problem

Infrastructure investment is paramount in achievement of desired economic objectives. Though, its contribution is acknowledged, its quality and quantity of accessibility is below par in developing economies. The trend seems to change due to increased government expenditure and private participation through public private partnership and commercial banks financing. Since, 2000 private player’s participation in infrastructural projects has increased from around 6.5% to almost total financing. Notable project financed by local and international private financiers is central corridor integrated transport program financed by around USD 18 billion (World Economic Forum, 2015). Infrastructure financing poses key challenges for potential investors, key among them: (i) long-term commitments of financial resources to an investment which is typically not liquid (ii) an inherent difficulty to price the associated long-term risks (Ellers, 2014). This calls for

the need to find alternative ways of financing. Even though, there are other financial institutions that can execute PPPs commercial banks has high preference owing to their ability to generate finances and when compared to insurance and pension funds their funds may not be in regular demand. For instance, commercial banks have been estimated to be the second largest source of infrastructure finance in India, contributing about 24 percent of total infrastructure spending (Chakrabarty, 2013).

Different studies have been done on project financing by financial institutions or other recognized bodies. For example, Mustapa (2013) carried out a study on facilities management knowledge in financing of healthcare projects in UK. The study pose contextual gap since UK is more developed compared to Kenya thus a need for localized empirical examination. Olufemi (2013) examined allocation preferences and risk perceptions the Nigerian public-private partnerships in road construction sector. The results showed that there were three vital risk factors which are: construction cost overrun, construction time delay and excessive contract variation. The study presents conceptual gap since it never explored the antecedents of commercial banks participation in road infrastructure projects. Minjire (2015) carried out a study on the factors influencing the public-private partnerships' performance in the Kenyan healthcare projects. The project may have had unique specific risks as compared to road infrastructure thus the need for the current study. The findings of the study revealed that regulatory environment and partnership governance are among the major challenges influencing PPP projects at MoH, then funding of projects. Hence, the need for empirical examination on factors affecting commercial banks participation in road infrastructure financing in Kenya.

1.3 Objective of the Study

1.3.1 General Objective

The main purpose of the study was to examine factors affecting commercial banks participation in road infrastructure in Kenya.

1.3.2 Specific Objectives

The specific objectives of the study were:

i. To establish the effect of of bank characteristics on road infrastructure project financing by commercial banks in Kenya.
ii. To establish the effect of project characteristics on the road infrastructure project financing by commercial banks in Kenya.
iii. To investigate the effect of macroeconomic factors on road infrastructure project financing by commercial banks in Kenya.

1.4 Research Questions

This study aimed at answering the following questions:

i. What is the effect of bank characteristics on road infrastructure projects financing by commercial banks in Kenya?
ii. What is the effect of project characteristics on the road infrastructure project financing by commercial banks in Kenya.
iii. How do macroeconomic factors affect road infrastructure project financing by commercial banks in Kenya?

1.5 Scope of the Study

The scopes of this study will road infrastructure financing by commercial banks in Kenya. The justification is based on the fact that there are regular statistics on infrastructural loan portfolio of commercial banks in Kenya. The study seeks to use secondary data (financial statements e.g., statement of financial position) which was extracted from the capital market authority, National Treasury and Central Bank of Kenya. The study period will be from July 2005 to December 2022. The explanatory variables were supply side characteristics (weighted average of commercial banks performance, weighted average of commercial banks non-performing loans, the weighting factors was total assets, liquidity and capital adequacy), macro-economic variables (Gross Domestic Product, inflation rate, exchange rate and interest rate) and project characteristics (project length – kms-, project costs). The dependent variable was road infrastructural financing by commercial banks in Kenya.

1.6 Significance of the Study

This study is significant to the Government of Kenya and especially through the ministry in charge of roads, county departments of roads, and agencies concerned with the registration and operations of aviation firms in Kenya. The results may also be of significance to other policy makers and donors in that they may understand more on how the government attributes, political environment

and economic environment constitute the important and critical aspects that commercial banks must consider before finance initiatives.

The findings to be obtained from this study may play a significant role to researchers and scholars as there is additions to the existing body of knowledge and information related to the transport industry and associated issues. They may also necessitate further research in the same field as well as in the related research fields especially in the road construction projects financing.

The study made methodological contribution through modelling data through multivariate time series analysis. Since supply side characteristics and commercial banks may have been segregated to respective banks the current study calculated weighted average of respective variables so as to form an index that was time series in nature. This enhance the modelling of heteregeous aspects that may have value contribution on success of public private participation in road infrastructural projects.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents literature review on factors influence road infrastructure financing by commercial banks in Kenya. Specifically, the chapter have empirical literature as articulated by study variables and theories as argued by past empirical scholars. Finally, there summary of the literature is presented.

2.2 Theoretical Review

This study was guided by the following theories; modernization theory, agency theory and public choice theory.

2.2.1 Modernization Theory

According to Blokland, Weesep and Smyth (2006), modernization theory first came into the limelight through the work of Max Weber (1864 – 1920) and Talcott Parsons (1902 – 1979). According to the theory, Blokland, Weesep and Smyth (2006) indicated that it explains the process of modernization within the societies. Modernization refers to a situation in which a progressive transition from under-developed to modern-developed society. This theory looks at the internal factors of a country while assuming that with assistance from various sources, under-developed or developing countries can achieve sustainable development in the same manner as developed countries in the context of living standards, economic growth as well as infrastructural development (Bernstein, 1971).

Modernization theory attempts to establish social variables that can contribute to social and economic progress and development of various countries, and the process of how these developments can be obtained (Bernstein, 1971). Key issues captured in the modernization theory are the process of change, response of change and internal dynamics as important structures for adaptation of new ways of achieving development (Bernstein, 1971). The theory continues to indicate that developing countries will only grow as they continue to adopt modern practices. This theory therefore can be connected to the current study. We argue that as the level of globalization rises and the need to have quality road infrastructure, as well as the call of PPP project financing, countries must develop process that are easy to implement, and aim to improve economic growth.

Previously, infrastructural development was solely left for public sector. However, due to modernization practices such as public-private partnerships came into the limelight, there has been calls for private sector especially commercial banks to play key role in the development of infrastructure project financing through PPP process (Blokland, Weesep, & Smyth, 2006). Modernization of transport sector (infrastructure) of developing countries is a recognition that transitioning from least developing to modern developing is not merely the advancement of technology, but also the introduction of stable macroeconomic aspects, achievable projects as well as effective management practices within the institutions involved in PPP projects financing (Hart, 2003). Now, this are the practices that the current study aims to address. PPP players such as banks must ensure that bank factors which may affect funding are effectively managed, while the government must also ensure that there is a stable macroeconomic environment that attract PPP funding among various private partnerships.

The theory was appropriate for the study since there is need for examination of bank characteristics such as bank characteristics such as liquidity, non-performing loans and profitability influence in commercial banks project financing. Understanding of causality between bank characteristics and project financing would aid in understanding of short and long run effect of selected attributes. Achievement of reliable and affordable road infrastructure projects would enable in expansion of economic activities. These activities would lead to job creation, wealth creation and eradication of poverty and unemployment levels.

2.2.2 Agency Theory

This theory was developed by Jensen and Meckling (1976). The agency theory holds the assumption that the interests of the principal (shareholders) and the agent (managers) vary with each seeking to maximize his/ her interests: For instance, the private sector managers maximize their salaries and other non-financial benefits while the shareholders seek to attain the highest profits (Mbithi & Okiro, 2018). The principal always compels the agent to act as per his/her interests, but the control of the principal over the agent is somehow imperfect due to information asymmetry about the agent's behaviour and circumstances. Thus, the principal experiences monitoring challenges and other costs attributed to this inadequacy (Vickers & Yarrow, 1991).

This theory further argues that the principal mainly seeks to strengthen the performance and monitoring of the agent and in order to come up with the agents' best incentive scheme so as to

solve the dilemma between the principal and the agent to ensure that the firm operates efficiently. It is the responsibility of the principal to closely monitor the principal agent issues. Both the principal and agent also need to come up with a compensation agreement or contract to establish an agents' incentive, clarify and specify their rights and obligations of the agent. The concept of project financing through PPP is very critical to be addressed in the context of principal-agent relationship (Mbithi & Okiro, 2018). The governments across the world have realized that to successful finance PPP projects, there is need for adequate fund from private sector, thus bringing the public-private sector relationship concept to the study. Government as the principals may appoints agents (commercial banks) to participate in infrastructure funding. However, challenges may arise when the terms of the infrastructure contracts are not clear, since most infrastructure projects are long-term in nature (Brealey, Cooper, & Habib, 1996). The government therefore, must ensure that each stage of relationship during PPP funding is addressed promptly, taking into consideration the goals and objectives of each player at a time.

In advancing the theory, Jensen and Meckling (1976) introduced the concept of trade-off in the form of agency costs between having more or less insider ownership. Just like PPP financing, commercial banks as well as the government may decide at what level of either equity or debt financing is fundamental in PPP projects. They argue that it is critical for separation of ownership to be addressed effectively so as to ensure that there is no fundamental of conflict of interest, which may arise from misallocation of funds aimed at financing PPP projects. Thus, the theory can inform how the principals-agents' decisions on road financing investments can be informed by the bank-characteristics and macroeconomic factors in the country. PPP financing arrangements may call for involvement of all parties in the planning and execution of the said project so as to optimize the gains to be accrued by respective stakeholders. For instance commercial banks financing of road infrastructure projects should be guaranteed that they will retrieve the requisite gains and their loans will be serviced regularly.

2.3 Empirical Review

2.3.1 Bank Characteristics and Commercial Bank Infrastructure Financing

In assessing determinants of public-private partnerships in infrastructure in Asia with implications for capital market development, Hyun, Park and Tian (2018) argue that most developing countries still rely on fiscal financing for infrastructure projects. Data used for the study were sourced from

World Development Indicators database from the World Bank and International Financial Statistics from the Monetary Fund of 12 selected LMICs for a period of 1995 – 2015. Various variables such as growth rate, inflation rate, bond to GDP ratio among others to explain investment in PPP. The study findings establish the need to have a well-functioning corporate bond market in developing countries, which can offer long-term financing to private sector participation in infrastructure investments. Also, the study reveals that having effective domestic bond provides liquidity while government bond market discourages private sector participation by reducing financing access to the corporate market.

According to Mengistu and School (2013), it is widely acknowledged that infrastructure plays a fundamental role in stimulating economic growth in developing countries. In a cross-country analysis to assess determinants of private participation in infrastructure in low- and middle-income countries (LMICs), the findings indicate that for LMICs as whole the largest predictor of getting PPI has to do with structural aspect of recipients' economies, in particular, countries with larger services sectors (as a percentage of GDP) are more likely to received PPI. The study also indicates that countries with high democracy, higher levels of fiscal freedom and lower tax burdens also enjoys higher PPI. The study used secondary data of 133 LMICs drawn from World Bank database for a period of 1995 – 2008. Cross-country panel regression framework was used to show how various determinants of PPI.

The government should also provide a legal framework that is clear, consistent and enforceable through comprehensive policies and legislation governing the PFI so as to attract the participation of the private sector investor (Ndirangu, 2013). A questionnaire was established by Ismail and Ajija (2012) to examine the effects of 18 factors for embracing the PPP projects in Malaysia, and a comparison of the most vital CSFs in Malaysia and those in the U.K, Australia and Hang-Kong. It was concluded from the study that ideal governance; favourable legal framework; public and private parties' commitments; appropriate financial market and good economic policies are of great importance in the Malaysian adoption of PPP. The factors contributing to the successful attainment PPP projects in U.K are further split into five packages (1) an efficient procurement system (2) A successful project implementation process (3) government warranty (4) conducive economic circumstances and (5) accessible financial market (Li et al 2005). It was further concluded from the study that appropriate risk allocation, available financial market and strong

and good private consortium are the most vital factors influencing the U. K's successful PPP projects.

Due to persistent gap between the demand for and supply of public infrastructure in most Muslim developing countries, Kasri and Wibowo (2015) investigated the determinants of private involvement in public infrastructure provision in Muslim developing countries. The study employed advanced panel estimators to develop a cross-country analysis of private finance determinants in 48 countries for the period of 2002 – 2011. The study results show that market conditions, institutional qualities and country risks are the most crucial factors determining the private involvement in infrastructure financing in the Muslim countries. Thus, the implication of the study was that policy-makers in these countries should prioritise the PPI agenda in their efforts to attract private investment in public infrastructure so as to boost economic growth.

Examination of potential antecedents of bank credit by Pham (2019) indicates that credit supply was dependent on non-performing assets, capital needs and bank concentration. In contrast equity and profitability had no significant contribution on credit access. Kiriti (2020) indicate that bank liability structure has effect on odds of accessing floating loans. There was need for examination on the quality of assets held by respective borrowers since collateralization with less movable assets had minimal odds of accessing finance. The duo studies were carried out in developed economy hence they may not be generalized in Kenyan perspective.

2.3.2 Project Characteristics and Commercial Banks Infrastructure Financing

Project characteristics are the projects' parameters and attributes which avail important information about the project such as project size and project loan tenure (Kamau, 2016). A study by Singh and Kalidindi (2009) emphasized on a project's economic viability as the determinant in credit acquisition. Sustainable projects thus ensure adequate cash flows to service the debt; recover costs so as to derive the highest benefits out of an investment. It also demonstrates the efficiency in project completion and project management which enables the SPV to recover the initial cost and to guarantee a constant and reliable monthly loan payment without default. The concession agreements are equally vital as they provide a regulatory framework for securing value for public funds and providing users with services that are cost effective (Singh & Kalidindi, 2009).

Thierie and De Moor (2019) sought to describe a better understanding of the pricing decisions of banks for project finance (PF) loans and the main drivers affecting the cost of debt in infrastructure

deals. This was on the fact that infrastructure projects are typically highly leveraged, as well as the cost of lending was a used a factor of the overall funding costs for the projects. Using data on bank spreads of more than 700 infrastructure projects worldwide from 2006 – 2016, regression analysis of the loan's spread on four categories; project, loan, bank characteristics and economic environment was developed. Findings shows that the cost of debt is predominantly affected by the market and the business cycle, rather than structuring of the project.

According to Corielli, Gatti and Steffanoni (2010), bank managers must decide how much equity is required from the stakeholders and external debt in order to achieve financial disclose, which also bears the cost of debt that the bank can service. In providing debt for PPP projects, external lenders in the commercial banks are guided by exogenous heterogeneous risk factors and the amount of equity cushion required for providing debt. As the dependent variable of the study, it highlights a bank's capacity and the project leverage in many ways. Rao (2018) provided gearing ratio as a measure which has the following benefits; a) captures the role of equity in achieving financial close of projects and determines the amount of debt banks are willing to lend per unit of equity, and b) the leverage aspect is relevant in the context of project finance transactions.

Corielli, Gatti, and Steffanoni (2020) analyse nonfinancial contracts with third parties, which reduce the credit risk to the lender and lower financing costs. These include (i) purchasing agreements that guarantee raw material to the SPV at predefined quantities, quality, and prices (raw material cost and availability risk shifting); (ii) off-take agreements that enable the SPV to sell part or all of its output to a party that commits to buy at predetermined prices and for a given period of time (market risk shifting); and (iii) operation and maintenance agreements to provide the SPV with maintenance at a level compliant with predefined service-level agreements. They find evidence that, while nonfinancial contracts lower the risk profile of projects, lenders may be unwilling to reduce rates if the sponsor is a counterparty in the relevant contract. In addition to nonfinancial contracts, project finance transactions also rely on financial contracts to make cash flows verifiable by (i) contractual arrangements made possible by structuring the project within a single, discrete entity, legally separate from the sponsor; and (ii) private enforcement of these contracts through a network of project accounts that ensures lender control of project cash flows. Accordingly, comparing bank loans for project finance with regular corporate loans for large investments, Subramanian and Tung (2019) show that project finance is more likely in countries

with weaker laws against insider stealing and weaker creditor rights in bankruptcy. (Subramanian & Fredrick, 2016)

2.3.3 Macro-Economic Characteristics and Commercial Banks Infrastructure Financing

The findings by Hyun, Park and Tian (2018) were based on the fact that most projects are majorly financed with foreign capital in form of loans and equities. As a result, exchange rate risk may limit PPPs investments. However, it has been argued that stable macroeconomic conditions facilitate private investments. Countries with higher inflation rate however, may not experience investment in PPPs projects. Studies such as Tewodaj (2013) have shown that higher inflation is a detrimental factor to investors who hedge inflation for a period of infrastructure. Macroeconomic stability therefore encourages low inflation, which in turn, is essential for PPP investment developments (Ba, Gasmi, & Noumba Um, 2010).

Bosire (2015), in their study on determinants of success of urban infrastructure projects financed by PPP in Kenyan counties found that 26.2% changes of variations in the proportion of urban infrastructure projects funded within the PPP framework were explained by changes in macroeconomic conditions, government guarantees, project implement-ability and procurements process. They also established a significant positive relationship between government guarantees and project implement-ability and success of the projects. As for macroeconomic conditions and procurements process, they found a negative relationship between the variables and success of the projects.

Kamau (2016) also examined whether commercial banks in Kenya can benefit from the PPP market in light of evolving opportunities for PPP financing. Specifically, the study aimed to find a) roles that commercial banks play, b) some specifics of the procedure for PPP financing by the banks, c) trends in participation of banks as lead arrangers on the global PPP market, and d) presence of international banks in existing PPP projects in Kenya. The study used survey, desk study and key informant interviews approaches to gather data from 22 banks. In addition, 71 PPP pipelines were reviewed. The findings indicated that of the ongoing PPP projects 71, none of the commercial banks indicated as having participated in any activity. Moreover, knowledge provided by banks on PPP seemed to be low, and those who had knowledge of the project indicated that PPP model is too complicated. There is need for consultative meeting between banks and government about PPP financing, and how effective it can be towards infrastructure investments.

2.4 Research Gaps

This section provides a summary of the discussed empirical review of the study. First and foremost, a critical review of the empirical studies illustrated that only a few studies have been conducted in regards to commercial banks' capacity towards infrastructure projects (Rao, 2018; Hyun, Park, & Tian, 2018). However, it is quite important to note that these studies have been undertaken globally, with no similar studies undertaken locally. Locally, existing studies have either looked at factors affecting PPP projects only or those related to infrastructure projects (Bosire, 2015; Mbithi & Okiro, 2018), with less consideration to commercial banks' capacity towards PPP projects. Moreover, local studies undertaken in commercial banks have used primary data with variables which do not have secondary data (Kamau, 2016).

It is also important to note that most of these studies in the empirical review have used various methodologies (Theirie & De Moor, 2019; Kasri & Wibowo, 2015; Kamau, 2016), with only Rao (2018) and Hyun, Park and Tian (2018) the only studies which almost used similar methodologies. This could be the reason why there are inadequate mixed findings regarding various determinants of road infrastructure project financing by commercial banks. To try and fill this gap, and see how banks' capacity are critical in the successful PPP project finance, the study assesses supply side, macroeconomic variable determinants of road infrastructure projects.

Table 2.1: Summary of Empirical Literature and Research Gaps

Author(s)	Objectives/Purpose	Key Findings	Research Gaps	Focus of this Study
Hyun, Park and Tian (2018)	Examination of the antecedents of public private partnership.	Various variables such as growth rate, inflation rate, bond to GDP ratio among others to explain investment in PPP	The study was limited to macroeconomic characteristics.	The study will examine joint effect of bank characteristics, project characteristics and macroeconomic characteristics on commercial banks infrastructure financing.
Corielli, Gatti, and Steffanoni (2020)	Analysed nonfinancial contracts with third parties, which reduce the credit risk to the lender and lower financing costs	PPP projects, external lenders in the commercial banks are guided by exogenous heterogeneous risk factors and the amount of equity cushion required for providing debt.	The study was limited to commercial banks attributes.	The study will examine joint effect of bank characteristics, project characteristics and macroeconomic characteristics on commercial banks infrastructure financing.
Bosire (2015)	determinants of success of urban infrastructure projects financed by PPP in Kenyan counties	Found that 26.2% changes of variations in the proportion of urban infrastructure projects funded within	The study presented methodological gaps since	The study will examine joint effect of bank characteristics, project

		the PPP framework were explained by changes in macroeconomic conditions, government guarantees, project implement-ability and procurements process	the study did not report on diagnostic tests.	characteristics and macroeconomic characteristics on commercial banks infrastructure financing.
Thierie and De Moor (2019)	Sought to describe a better understanding of the pricing decisions of banks for project finance (PF) loans and the main drivers affecting the cost of debt in infrastructure deals	Findings shows that the cost of debt is predominantly affected by the market and the business cycle, rather than structuring of the project.	The study presented methodol ogical gaps since the study did not report on diagnostic tests.	The study will examine joint effect of bank characteristics, project characteristics and macroeconomic characteristics on commercial banks infrastructure financing.
Kamau (2016)	Examined whether commercial banks in Kenya can benefit from the PPP market in light of evolving opportunities for PPP financing	The findings indicated that of the ongoing PPP projects 71, none of the commercial banks indicated as having participated in any activity.	The study was qualitative in nature.	The study will examine joint effect of bank characteristics, project characteristics and macroeconomic characteristics on commercial banks

				infrastructure financing.

2.5 Conceptual Framework

Conceptual framework represents the study's synthesis of literature on how illustrate the relationship between the study variables. It is based on the previous knowledge of the previous studies, their views and observations on the subject on the study. More so, a conceptual framework also explains the expected results of the study. Therefore, in this context, the conceptual framework reveals the direction of influence of independent variables on dependent variable of the study. Specific factors associated with bank capacity to participate in the PPP projects include bank capitalization, return on assets (ROA) and return on equity (ROE) (Disyatat, 2010). Previous studies have shown that nonperforming loans on assets (NPL) will negatively affect bank lending, while higher bank capitalization and higher ROA/ROE are expected to positively affect bank lending (Gatti, Kleimejer, Megginson, & Steffanoni, 2013; Gatti, 2012). Assessing a number of potential factors determining credit by banks, Pham (2015) established that key factors restricting credit supply by banks on various project financing include capital requirements, nonperforming assets/loans and bank concentration, with less or no evidence on ROA/ROE. Moreover, road infrastructure projects would call for long term financing as compared to customers deposits which creates credit capacity of institution that are short term.

The viability of infrastructure project is basically secured by future cash flows and financing costs (PriceWaterhouseCoopers, 2013). Larger market sizes and consumers' purchasing power which is measured by inflation rate, are good perspectives for potential cash flows (Kinda, 2008). However, it has been noted that countries with large populations cannot provide sufficient infrastructure access and services to the people. This is because, gross domestic product (GDP) growth is positively related to PPP investment. Therefore, it can be concluded that countries with faster rapid growth and high demand for infrastructure tend to have more PPPs. Hyun, Park and Tian (2018) indicated that macroeconomic variables such as exchange rate can critically affect the viability of the PPP project.

Corporate lending differs significantly in relation to the management and allocation of risks in PPP project finance transactions and general purpose. In banking transactions, lending on short-term maturities is considered less risky, and could be the reason why PPP financing from the bank side has never increased over the years especially in emerging economies. It is estimated that project finance relies on non-financial and financial contracts to make cash flows verifiable. Banks therefore can finance PPP projects using equity or debt financing. The concentrated ownership of bank debt encourages the lending banks to devote considerable resources to evaluating and monitoring a project on a continuing basis. It is on this note that Corielli, Gatti and Steffanoni (2010) established infrastructure financing by private PPP to consider gearing ratio as a measure of the bank's depth of long-term debt and shareholders' equity towards PPP financing.

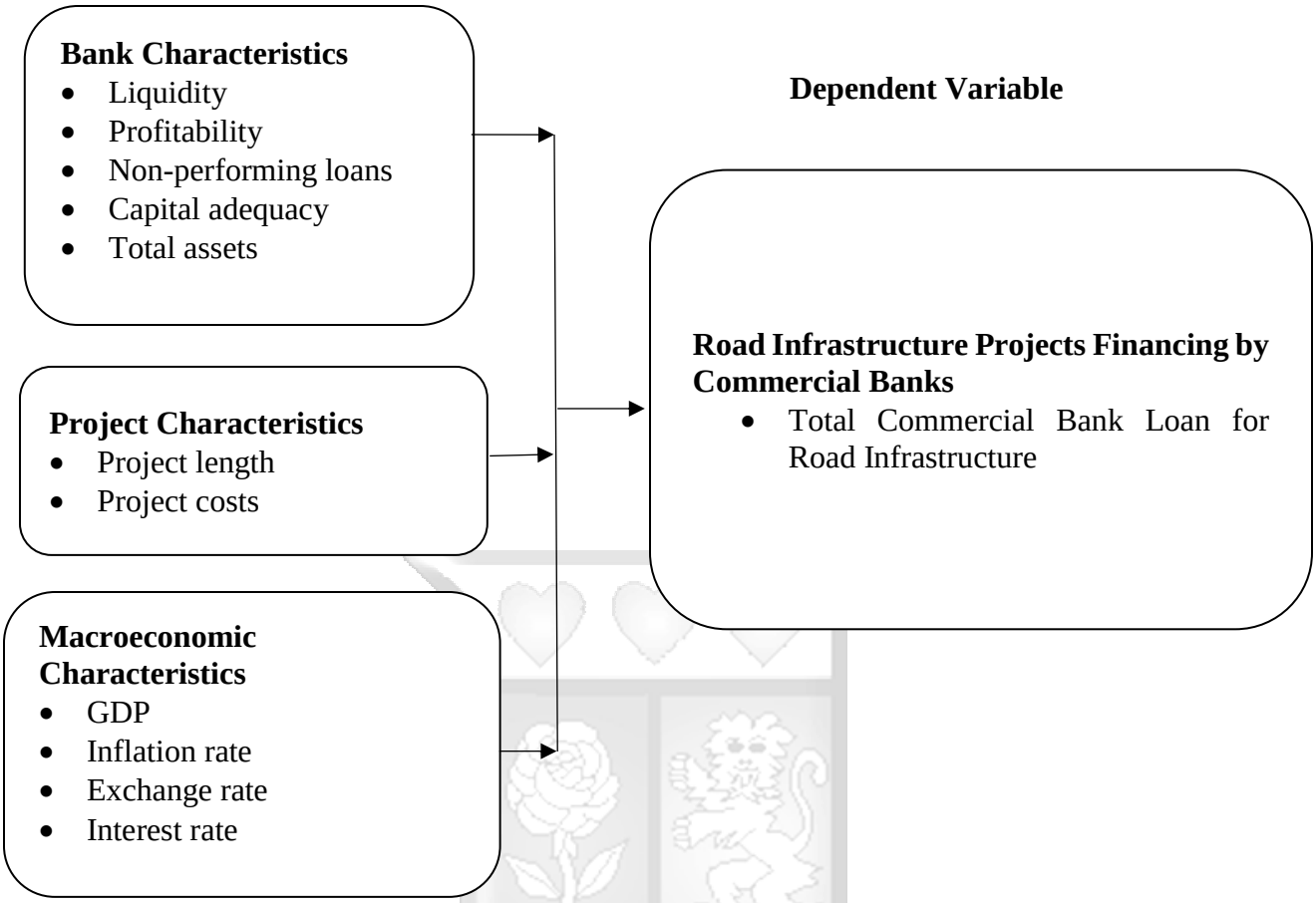

Figure 2.1: Conceptual Framework

2.6 Operationalization of Variables

Operationalization refers to how the study will define and measure specific variables as it will be used in the study. It makes it easier to researchers and the intended audiences to effectively understand how the specific study variables will be measured to answer the research questions. For the current study, measurement of study variables will be based on the previous definitions and measurements used other studies that might be directly related the current studies.

Table 2.2: Operationalization of Variables

Variable	Indicators	Measurement	Supporting Literature
Bank characteristics	• Liquidity • Profitability • Non-performing loans • Capital adequacy • Total assets	Descriptive tests Inferential tests	(Gatti, et.al, 2013; Gatti, 2012, Pham, 2015, Disyatat, 2010).
Project characteristics	• Project length • Project costs	Descriptive tests Inferential tests	(Corielli, Gatti, & Steffanoni, 2010; Theirie & De Moor, 2019; Mirzaei, Ali, & Mirzaei, 2011)
Macroeconomic factors	• GDP • Inflation rate • Exchange rate • Interest rate	Descriptive tests Inferential tests	Hyun, Park and Tian (2018); Bosire (2015)
Road infrastructure projects by commercial banks	• Total Commercial Bank Loan for Road Infrastructure	Descriptive tests Inferential tests	Corielli, Gatti and Steffanoni (2010)

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter deals with the methods, styles and techniques that are used to gather, process and analyze data. This chapter is composed of the following subsections; design of the research, target population, sample design, data collection methods and data analysis.

3.2 Research Philosophy

This is a belief about the way in which data about a phenomenon should be gathered, analyzed and used. It is the foundation of knowledge which assists the researcher to expose, understand and minimize research biases (Sekaran & Bougie, 2010). In determining the research philosophy to adopt, a researcher considers the epistemology and ontology of the paradigm. Three epistemological considerations exist in social sciences which include the positivism, post positivism/ realism and the constructivism /interpretivism (Saunders, Lewis & Thornhill, 2014). Ontology is concerned with the form and nature of reality and what there is to be known about it.

This study was based on the paradigm of positivism because the ontology of positivism paradigm states that reality is real and apprehensible, where the collection and analysis of data enables the testing of theories and proving hypotheses. Since it examined the effect of bank characteristics, project characteristics and macro economic characteristics on commercial banks financing of road infrastructure in Kenya (Gatti, et.al, 2013; Gatti, 2012, Pham, 2015, Disyatat, 2010).

3.3 Research Design

A research design is a blue print for collection, measurement and analysis of data. It outlines how the research was carried out. (Sreevidya, 2011). The quality of any research project is enhanced by a having a good comprehension of the research design as these aids in informing one's thinking and lays the foundation for the design of the project (Kothari, 2004). This study employed explanatory research design. This methodology emphasizes on the examination of causality in the variables under examination. The design disseminates the causal effect of bank characteristics, project characteristics and macro-economic on commercial banks road infrastructural financing in Kenya (Gatti, et.al, 2013; Gatti, 2012, Pham, 2015, Disyatat, 2010; Corielli, Gatti, & Steffanoni,

2010; Theirie & De Moor, 2019; Mirzaei, Ali, & Mirzaei, 2011; Corielli, Gatti & Steffanoni, 2010).

3.4 Target Population

According to Brink, Van Der Walt, & Van Rensburg (2009) target population is described as the total number of objects or people that are to be involved during the study as they bear all the necessary characteristics to be included as a sample of the study. The study limited itself to review of the commercial bank's characteristics, project characteristics and macroeconomic factors and infrastructure financing reporting by Central Bank of Kenya monthly statistical bulletins. The research utilized monthly statistical reporting for the period July 2005 to December 2022.

3.5 Data Collection Methods

Collection of data is paramount as it gives the researcher accurate information from which inferences can be drawn (Kombo & Tromp, 2006). This study used a secondary research data that was collected from the Central Bank of Kenya statistical bulletins. The choice of secondary data is based on the fact that few studies have aimed at assessing the banks' capacity towards PPP financing using data from balance sheet of the banks' statements financial statements. This study aimed at fill the gap and provide a different framework of commercial banks' capacity in relation to various determinants towards road infrastructure financing in Kenya.

3.6 Data Collection Procedures

The research will rely on secondary data that was extracted from the statistical bulletin of the Central Bank of Kenya. For supply side data it was sourced from financial statements, macro-economic data was sourced from KNBS. For commercial banks infrastructure financing was sourced from Central Bank of Kenya (CBK) annual report. The information gathered was then recorded down using data collection sheets. Where information may not be available, the researcher sought for permission from various banks to assist him or her with certain data that may be critical in answering the research questions. Instrument of data collection was prepared to ensure that key data needed for the study is captured so as to meet the research quality (Kothari, 2012).

3.7 Data Analysis

Panel data was collected and coded into the excel worksheet before transferred to statistical software for analysis. Due to constraints in the data available the study will rely on the statistical bulletin provided by the Central Bank of Kenya for the period July 2005 to December 2022. Descriptive statistics and inferential analysis using both Eviews software was conducted. Road infrastructure financing by commercial banks will be the dependent variable and was measured by natural logarithms of transport infrastructure commercial banks financing. The independent variables were measured using the percentage values and natural logarithms per case basis.

The independent variables will be 1) (supply side) bank variables and was measured by liquidity ratio, profitability, level of non-performing loans, capital adequacy and total assets of commercial banks; 2) macroeconomic variables and was measured by GDP, interest rate, exchange rate and inflation rate. The choice of these variables is based on previous studies which are similar to the current study but has been carried in developed countries (Hyun, et al., 2018; Rao, 2018; Mengitsu & School, 2013). Multivariate time series model was applied to examine the joint effect of bank characteristics, project characteristics and macro-economic characteristics on commercial bank road infrastructure financing. Specifically, the panel regression model for the study will be defined as follows;

$$\boldsymbol{Commercial\ Bank\ Road\ Infrastructure\ Financing}_t = \alpha + \beta_1 \boldsymbol{Liquidity_t} + \beta_2 \boldsymbol{NPL_t} + \beta_3 \boldsymbol{ROA_t} + \beta_4 \boldsymbol{CA_t} + \beta_5 \boldsymbol{TAt} + \beta_6 \mathrm{PL}\boldsymbol{t} + \beta_7 \boldsymbol{PCt} + \beta_8 \mathbf{GDP}\boldsymbol{t} + 9\boldsymbol{IR_t} + \beta_{10} \boldsymbol{ER_t} + \beta_{11} \boldsymbol{IR_t} + \varepsilon_t$$

Where;

$\beta_1 - \beta_{11} =$ slope coefficients

t represents the time period for the study (July 2005 – December 2022)β_1-$\beta_5 =$

$\alpha =$ Intercept of the model and represent dependent variable regardless of changes

〖Commercial Bank Road Infrastructure Financing〗 - this is dependent variable measured by the natural logarithm of road infrastructure investment in Kenya

Liquidity- Liquidity measured by the average liquidity ratio of commercial banks in Kenya

NPL – Nonperforming which was measured as the average ratio of non-performing loans of commercial banks in Kenya

ROA – Return on Assets which was measured as the average ROA of commercial banks in Kenya

Capital adequacy – This was measured as the average ratio of total capital to the total risk-weighted assets of commercial banks in Kenya

Total Assets – This was measured as the average of the natural logarithm of the total assets held by commercial banks in Kenya

PL – This was measured using the log of total length of road constructed in kms monthly

PC- This was measured using the log of total cost of road constructed in Ksh. monthly

GDP – This was measured as the average real Gross Domestic Product growth % in Kenya

Inflation – This was measured as the average inflation rate (CPI) % in Kenya

Exchange rate – This was measured as the average exchange rate of KES to USD in Kenya

Interest rate – This was measured as the average of the Central Bank Lending Rate in Kenya

ε_{it} = Within entity error term

Table 3.1: Measurement of Variables

Variable	Indicators	Measurement	Sign	Authors
Bank characteristics	Liquidity	Measured by the average liquidity ratio of commercial banks in Kenya	+	(Gatti, et.al, 2013; Gatti, 2012, Pham, 2015, Disyatat, 2010).
	Profitability	Measured as the average ROA (%) of commercial banks in Kenya		
	Non-performing loans	Measured as the average ratio of non-performing loans of commercial banks in Kenya		
	Capital adequacy	Measured as the average ratio of total capital to the total risk-weighted assets of commercial banks in Kenya		
	Total assets	Measured as the average of the natural logarithm of the total assets held by commercial banks in Kenya		
Project characteristics	Project length	This will be measured using the log of total length of road	+	(Theirie & De Moor, 2019;

		constructed in kms annually		Mirzaei, Ali, & Mirzaei, 2011
	Project costs	This will be measured using the log of total cost of road constructed in Ksh. annually		
Macroeconomic factors	GDP	Measured as the average real Gross Domestic Product growth % in Kenya	+	(Ali & Khan, 2019); (Ba, Gasmi, & Noumba Um, 2010).
	Inflation rate	Measured as the average inflation rate (CPI) % in Kenya		
	Exchange rate	Measured as the average exchange rate of KES to USD in Kenya		
	Interest rate	Measured as the average of the Central Bank Lending Rate in Kenya		
Road infrastructure investment	Commercial Bank Road Infrastructure Financing	Measured by the natural logarithm of road infrastructure investment in Kenya	+	Corielli, Gatti and Steffanoni (2010)

3.7.1 Diagnostic Tests

The following diagnostic tests was considered in the study: normality, multicollinearity, heteroscedasticity, autocorrelation, stationarity, granger causality and johansen cointegration.

Normality of study variables can be examined through graphical or statistical approach. Dominant statistical normality tests are Kolmogorov-Smirnov test, Jarque Berra test amongst others. They assume that the data is normally distributed against an alternative that it's not normally distributed. If p value is less than 0.05 then data is not be normally distributed and requisite transformation should be carried out prior to classical modelling. Graphical approaches include box plots, stem and leaf, PP plots, QQ plots and histograms. In this study Jarque Berra test will be adopted to test for normality.

Multi-collinearity was tested in the study using correlation matrix whereby the cut-off point for severe multi-collinearity will be 0.8 (Gujarati, 2003; Cooper & Schindler, 2008). Further, variance inflation factors were considered and if its value exceeded 10 then the predictor variables were highly correlated. Failure to account for perfect multi-collinearity may result into indeterminate regression coefficients and infinite standard errors while existence of imperfect multi-collinearity results into large standard errors. Large standard errors affect the precision and accuracy of rejection or failure to reject the null hypothesis. During estimation, the problem is not lack of multi-collinearity but rather its severity. A correlation coefficient greater than 0.8 among predictors, thus, indicate the presence of severe multi-collinearity.

Regression model assumes that the error term of regression model has uniform variance of the error terms. White test for heteroscedasticity was adopted for its examination. The test assumes that the data is homoscedastic against an alternative that the data is not homoscedastic.

Serial correlation is a characteristic of data in which the correlation between the values of the same variables is based on related objects. It violates the assumption of instance independence, which underlies most of the conventional models. It generally exists in those types of data-sets in which the data, instead of being randomly selected, is from the same source. Autocorrelation was tested using Breusch Pagan tests and its null hypothesis If there is no serial correlation and it is rejected if p value is less than 0.05. Feasible Generalized Model (FGLS) may have to be fitted if serial correlation is an issue.

There is need to test for the stationarity of the time series because the estimation of time series data is based on the assumption that the variables are stationary. Estimating models without taking into account the non-stationary nature of the data would lead to spurious results (Gujarati, 2003). In this thesis, the researcher employed Fisher-type test of unit root in panel data. The null hypothesis

of this test is that all panels have unit root. The alternative hypothesis is that at least one panel does not have unit roots or some panels do not have unit root (Choi, 2001). If any of the variables has unit root, the researcher differentiates it and run equations using the differenced variable. Granger causality was carried out to show the explanatory power variables under explanation (Granger, 1988). Variables under examination are said to granger cause each other whenever historical pattern can explain current features of themselves (Zou, Ladrou, Guo & Feng, 2010).

Deterministic or stochastic trends has likelihood of fitting spurious models which poses problematic interpretation. They may have high explanatory power and goodness of fit statistics. To alleviate this challenge, they ought to be differenced and ultimately, they loss long run value contribution. This can be reminded through co-integration which minimize information loss through de-trending. Moreover, it eliminates likelihood of fitting spurious regression though it accommodates correlation with non-stationary parameters.

3.8 Ethical Considerations

The researcher made use of all research ethics that aid in achieving the set study objectives (Kombo, & Tromp, 2011; Kothari, 2012). The researcher sought a data collection letter from Strathmore Business School Ethics Committee and apply for a research permit from the National Commission for Science, Technology and Innovation (NACOSTI) all of which aided in data collection from the target field. In addition to that, the researcher gave assurance of the privacy and confidentiality of the study. Finally, the research assistants who were involved in data collection were educated on the requirements of the study, as well as, how they approached the participants in an effort to securing data where we may get challenge of accessing secondary data. This required research assistant to seek for data from the various banks of the study.

CHAPTER FOUR:

PRESENTATION OF RESEAERCH FINDINGS

4.1. Introduction

This chapter present the empirical findings from the study on examination of bank characteristics, project characteristics and macroeconomic characteristics on road infrastructure commercial banks financing in Kenya. Time series data was gathered from July 2005 to December 2022. The current chapter has descriptive statistics, pre and post estimation diagnostic tests and Vector Error Corrected Model (VECM).

4.2 Descriptive Statistics

Results in Table 4.1 presents measures of central tendency and dispersion as well as normality test of all variables under examination. From the findings the average commercial banks road infrastructure financing was 22.7 with a standard deviation of 5.7 a clear indication of wider variations. Further, road infrastructure financing was not normally distributed hence it can be deduced that there were variations on commercial banks road infrastructure financing with the period under consideration.

The average commercial banks liquidity was 1.1 with a maximum of 1.2 a clear indication that most commercial banks preferred holding their working capital in more of current assets as compared to current liabilities. Hence, they would easily convert them into liquid items as needs arose. Regarding the profitability levels the average return on assets was 2.4% with a maximum of 41.5% though in some instance weighted average performance of commercial banks recorded losses. Hence, there were instances when commercial banks eroded shareholder's values. Concerning Non-performing loans, the mean was 6.1% with a standard deviation of 1.4. This indicates that there were minimal changes in the proportion of non-performing loans. Hence, there is need for adoption of precautionary measures to minimize odds of non-performing loans and increase credit creation of commercial banks so as to increase access of commercial banks road infrastructure financing. The average total assets were 17.7 and capital adequacy 2.6%. Surprisingly, none of banking characteristics was normally distributed a clear indication on the need to increase the sample size so as to comply with the central limit theorem whereby an increase

in sample increases chances of normality of data. Since none of bank characteristics had p value for Jarque Berra coefficient greater than 0.05 they were not normally distributed.

The mean project length was 11.3, this indicates that government projects were mostly undertaken for at least 10 kms with some running for 42 kms. Thus, these projects deserve well thought financing criterion and to be implemented in phases and financing sought in tranches. The mean project costs were 19.4 though project financial costs were not normally distributed. This indicates that the project needs were not harmonious and their budget had wider variations within the period under considerations. Thus, there is need for government to develop short, medium and longterm budget financing strategies so as to optimize achievement of social economic benefits through access of required infrastructural financial needs. Since none of the project characteristics Jarque Berra coefficient was greater than 0.05 there were not normally distributed.

Concerning macroeconomic characteristics; the mean inflation rate in Kenya was 10% from 2005 to 2022 though there were some instances it exceeded 10% to 20%. There is need for adoption of fiscal and monetary measures geared towards management of the levels of inflation rate to eradicate its multiplier effect in the financial sector. The average rate of GDP growth rate in Kenya was 4.8% with a minimum growth of -0.3% and maximum of 8.1%. Since the standard deviation was 1.9 then there are higher chances that there were wider variations on the rate of economic growth in the period under examinations and it may be associated with changes in political regimes. The average exchange rate was 90.8 for KSH against USD. Since the minimum was 61.9 and maximum of 123. There is need for exercise of precautionary measures to mitigate against depreciation of KSH against USD. This may have spillover effect on commercial banks road infrastructure financing. The average interest rate was 10% and not normally distributed because Jarque Berra had a p value less than 0.05. Fiscal and monetary measures ought to be adopted for the management of interest rate changes though there should be no interferences on the forces of demand and supply.

Table 4.1: Descriptive Statistics

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Mean	22.7	1.1	2.4	6.1	17.7	2.6	11.3	19.4	1.1	4.8	90.8	1.1
Median	23.9	1.1	2.7	6.5	17.2	1.7	11.0	21.5	1.1	5.0	88.9	1.1
Maximum	40.6	1.2	41.5	9.0	37.0	7.0	42.0	34.5	1.2	8.1	123	1.2
Minimum	3.0	1.1	-53.4	3.1	9.8	1.3	3.0	2.0	1.0	-0.3	61.9	1.0
Std. Dev.	5.7	0.0	8.0	1.4	4.3	1.7	6.2	5.1	0.0	1.9	15.1	0.0
Skewness	-0.6	1.0	-1.6	-0.3	2.1	1.3	1.3	-1.0	1.7	-0.5	0.0	1.6
Kurtosis	3.3	3.2	17.6	1.9	9.7	3.4	6.7	4.3	5.2	3.1	1.9	8.5
Jarque-Bera	11	35	1957	14	545	64	175	47	142	8	10	353
Prob	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Key: 1: Commercial bank road infrastructure financing, 2- Liquidity, 3-Profitability, 4-Non-performing loans, 5-Total assets, 6-Capital adequacy, 7-Project length, 8-Project cost, 9-Inflation rate, 10-GDP growth rate, 11- Exchange rate, 12-Interest rate.

4.3 Diagnostic Tests

Since, regression analysis is anchored on several assumptions the current study examined heteroskedasticity using white test, serial correlation using Breusch-Godfrey pagan test, multicollinearity using variance inflation factors and normality of error term using histogram and Jarque Berra test.

4.3.1 Heteroskedasticity Test

Regression analysis assumes that there is uniformity of error term variance. Results in Table 4.2 depicts that there was enough evidence for rejection of the error term hence the error term variance was not uniform. Consequently, ordinary least squares model was not the most appropriate model for examination of the effect of bank characteristics, project characteristics and macroeconomic characteristics on commercial banks road infrastructure financing in Kenya unless robust standard errors were applied. Furthermore, if OLS was applied then robust standard errors ought to have been used.

Table 4.2: Heteroskedasticity Test

F-statistic	2.21	Prob. F(77,132)	0.00
Obs*R-squared	118.15	Prob. Chi-Square (77)	0.00
Scaled explained SS	264.25	Prob. Chi-Square (77)	0.00

4.3.2 Serial Correlation Test

First order serial correlation was examined using Breusch-Godfrey test whose null hypothesis stated that there was no first order serial correlation. Results in Table 4.3 depicts presence of first order serial correlation since the p value was less than 0.05. Consequently, the OLS violated serial correlation test, hence the need for consideration of alternative modelling criterion while examining the effect of bank characteristics, project characteristics and commercial banks roads infrastructure financing in Kenya.

Table 4.3: Serial Correlation Test

F-statistic	65.47	Prob. F(2,196)	0.00
Obs*R-squared	84.11	Prob. Chi-Square(2)	0.00

4.3.3 Multicollinearity Test

Multicollinearity is a condition in which there is a high correlation among predictors. Currently it was evaluated through use of variance inflation factors and tolerance limits. In Table 4.4, the highest VIF was 6.364 for non-performing loans and the least was 1.105 for profitability. Since none of the tolerance limits was less than 0.1 then there was no multicollinearity among the selected bank characteristics, project characteristics and macroeconomic characteristics. Thus, their joint effect on commercial banks road infrastructure financing may have been examined through OLS.

Table 4.4: Multicollinearity Test

	VIF	1/VIF
Non-performing loans	6.364	0.157
Exchange rate	3.145	0.318
Capital adequacy	2.685	0.372
Liquidity	2.595	0.385
Inflation rate	2.045	0.489
Interest rate	2.004	0.499
GDP	1.676	0.597
Total assets	1.478	0.677
Project cost	1.367	0.732
Project length	1.345	0.743
Profitability	1.105	0.905

4.3.4 Normality Test

Further, regression modelling assumes normality of error term. This was examined through use of Jarque Berra tests whose null hypothesis stated that the error term was normally distributed. Figure 4.1 depicts that the error term was normally distributed since the p value was less than 0.05.

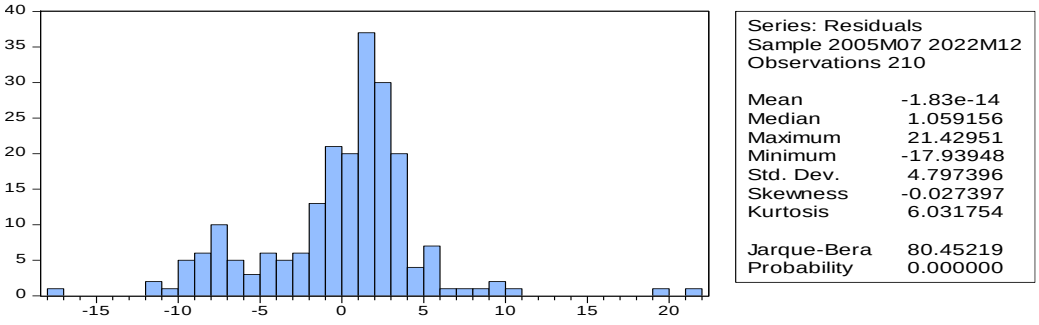

Figure 4.1: Normality

4.3.5 Product Correlation Analysis

Product moment correlation coefficient was adopted to examine the strength of the effect of bank characteristics, project characteristics and macroeconomic characteristics on commercial banks road infrastructure financing in Kenya. From the findings in Table 4.6 liquidity, non-performing loans and capital adequacy has inverse effect on commercial banks road infrastructure financing in Kenya. In contrast, there was a positive effect of profitability and total assets on road infrastructure financing in Kenya. Project length has inverse while project cost has positive effect on commercial bank road infrastructure financing in Kenya. Further, inflation rate and GDP growth rate has positive effect while exchange rate and interest rate have inverse effect on commercial banks road infrastructure financing in Kenya.

Table 4.5: Product Correlation Analysis

	1	2	3	4	5	6	7	8	9	10	11	12
Road infrastructure financing	1											
Liquidity	-0.07	1										
	0.34											
Profitability	0.07	-0.16	1									
	0.32	0.02										
Npl	-0.43	0.17	0.04	1								
	0	0.01	0.61									
Total assets	0.04	-0.33	0.05	-0.11	1							
	0.54	0	0.49	0.11								
Capital adequacy	-0.24	-0.39	0.15	0.59	0.03	1						
	0	0	0.03	0	0.71							
Project length	-0.17	-0.14	0.12	0.05	0.17	0.02	1					
	0.01	0.04	0.09	0.45	0.01	0.79						
Project cost	0.02	0.03	-0.07	-0.12	0.42	-0.11	0.2	1				
	0.82	0.7	0.3	0.08	0	0.11	0					
Inflation rate	0.24	0.16	-0.16	-0.21	-0.14	-0.21	-0.04	0.05	1			
	0	0.02	0.02	0	0.04	0	0.59	0.49				
GDP	0.09	-0.06	-0.06	-0.21	0.17	-0.14	-0.21	0.06	-0.39	1		
	0.21	0.39	0.35	0.00	0.01	0.05	0.00	0.4	0.00			
Exchange rate	-0.44	-0.26	0.02	0.68	0.06	0.56	0.29	0.04	-0.2	-0.1	1	
	0.00	0.00	0.76	0.00	0.35	0.00	0.00	0.6	0.00	0.14		
Interest rate	-0.11	0.12	-0.09	0.49	-0.08	0.14	0.03	-0.07	0.27	-0.07	0.3	1
	0.1	0.09	0.19	0.00	0.25	0.05	0.62	0.28	0.00	0.32	0.00	

4.4 Regression Analysis

Though the data was time series in nature. Preliminary examination on the effect of bank characteristics, project characteristics and macroeconomic characteristics on commercial banks road infrastructure financing was examined through ordinary least squares method. Upon fitting the model, its robustness was examined through use of diagnostic tests such as multicollinearity, serial correlation, normality of error term and heteroskedasticity.

Results in Table 4.2 has an R squared of 0.29; this indicates that 29% of the changes in commercial banks road infrastructure financing was explained by liquidity, profitability, non-performing loans, total assets, capital adequacy, project length, project costs, inflation rate, GDP growth rate, exchange rate and interest rate while the remaining percentage was associated with other aspects not included in the study. Further, the model has an f statistic of 7.42 with p value < 0.05. This depicts that OLS would have been fitted while examining the effect of project characteristics, bank characteristics and macroeconomic characteristics and commercial banks road infrastructure financing in Kenya.

Commercial bank's characteristics had no statistically significant effect on commercial banks road infrastructure financing in Kenya. For instance, liquidity, non-performing loans and capital adequacy has inverse non statistically significant effect on commercial banks road infrastructure financing in Kenya. In contrast profitability and total assets have positive and not statistically significant effect on commercial banks road infrastructure financing in Kenya. Concerning the effect of project characteristics; project length has negative effect while project cost has positive though not statistically significant effect on commercial bank road infrastructure financing in Kenya.

Further, the effect of macroeconomic characteristics on commercial banks road infrastructure financing has mixed findings. For instance, inflation rate, GDP growth rate and interest rate has positive though not statistically significant effect on commercial bank road infrastructure financing. In contrast, exchange rate has inverse and not statistically significant effect on road infrastructure financing in Kenya.

Table 4.6: Regression Analysis

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Liquidity (2)	-41.09	25.35	-1.62	0.11

Profitability (3)	0.08	0.04	1.77	0.08
NPL (4)	-0.43	0.61	-0.71	0.48
Total assets (5)	0.03	0.10	0.26	0.79
Capital adequacy (6)	-0.02	0.33	-0.07	0.94
Project length (7)	-0.08	0.06	-1.21	0.23
Project cost (8)	0.02	0.08	0.29	0.77
Inflation_rate (9)	32.58	12.35	2.64	0.01
GDP (10)	0.27	0.23	1.20	0.23
Exchange rate (11)	-0.13	0.04	-3.16	0.00
Interest rate (12)	3.06	15.44	0.20	0.84
C	44.04	33.37	1.32	0.19
R-squared	0.29	Mean dependent var		22.65
Adjusted R-squared	0.25	S.D. dependent var		5.70
S.E. of regression	4.93	Akaike info criterion		6.08
Sum squared residuals	4810.14	Schwarz criterion		6.27
Log likelihood	-626.77	Hannan-Quinn criterion.		6.16
F-statistic	7.42	Durbin-Watson stat		0.78
Prob(F-statistic)	0.00			

4.5 Timeseries Analysis

Since the data violated some regression assumptions and was time series in nature. Time series analysis was applied to examine the effect of bank characteristics, project characteristics and macroeconomic characteristics on commercial banks road infrastructure in Kenya.

4.5.1 Stationarity Test

Stationarity of the variables was examined through use of Augmented Dickey Fuller (ADF) test. The null hypothesis stated that the variables were non-stationary (presence of unit roots) against an alterative there were stationary (no unit roots). Results in Table 4.7 indicates that commercial banks road infrastructure financing, non-performing loans, total assets, exchange rate and capital adequacy were stationary at first difference while profitability, project length, project costs, inflation rate, GDP growth rate and interest rate were stationary at levels. Absence of stationarity at the same level minimizes odds of examining the effect of bank characteristics, project characteristics and macroeconomic characteristics on commercial banks road infrastructure financing using Vector Autoregressive model (VAR).

Table 4.7: Stationarity Test

	At levels			At first difference		
	T	**CV**	**Sig**	**T**	**CV**	**Sig**
Road Infrastructure Financing	-1.86	-2.91	0.38	-10.71	-2.94	0.00
Liquidity	-1.29	-2.91	0.64	-9.29	-2.94	0.00
Profitability	-5.99	-2.91	0.00			
Non-performing loans	-2.15	-2.91	0.23	-16.93	-2.94	0.00
Total assets	-2.88	-2.91	0.05	-12.86	-2.94	0.00
Capital adequacy	-1.57	-2.91	0.5	-12.92	-2.94	0.00
Project length	-4.58	-2.91	0.00			
Project costs	-11.05	-2.91	0.00			
Inflation rate	-3.89	-2.91	0.00			
GDP growth rate	-3.33	-2.91	0.02			
Exchange rate	-0.3	-2.91	0.92	-10.27	-2.94	0.00
Interest rate	-4.28	-2.91	0.00			

4.5.2 Johansen Cointegration Test

Cointegration test was carried out to examine presence of long run relationship between bank characteristics, project characteristics, macroeconomic characteristics and commercial banks road infrastructure financing in Kenya. The study has a null hypothesis that there is no cointegration. Results in Table 4.8 depicts that there are at most five cointegrations. Hence, the Vector Error Corrected Model (VECM) was applied in examination of the effect of bank characteristics, project characteristics, macroeconomic characteristics and commercial banks road infrastructure financing in Kenya.

Table 4.8: Johansen Cointegration Test

Hypothesized		**Trace**	**0.05**	
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Prob.****
None *	0.39	475.92	334.98	0.00
At most 1 *	0.34	376.13	285.14	0.00
At most 2 *	0.27	290.20	239.24	0.00

At most 3 *	0.25	225.19	197.37	0.00
At most 4 *	0.21	167.28	159.53	0.02
At most 5	0.17	119.86	125.62	0.11
At most 6	0.14	80.50	95.75	0.35
At most 7	0.08	50.20	69.82	0.63
At most 8	0.06	32.49	47.86	0.58
At most 9	0.05	19.44	29.80	0.46
At most 10	0.04	8.13	15.49	0.45
At most 11	0.00	0.02	3.84	0.88

Trace test indicates 5 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

4.5.3 Optimal Number of Lags

Selection of the optimal number of lags was guided by final prediction error, Schwarz information criterion, Hannan-Quinn information criterion and Akaike information criterion. All these indicated the optimal number of lags to be 1. Hence, all variables under examination were lagged once.

Table 4.9: Optimal Number of Lags

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-3593.83	NA	2.594819	35.00804	35.2019	35.08644
1	-1805.54	3350.862	3.03e-07*	19.04412*	21.56426*	20.06335*
2	-1697.24	190.3199	4.34E-07	19.39069	24.23711	21.35074
3	-1602.47	155.5021	7.24E-07	19.86862	27.04132	22.7695
4	-1466.37	207.4451*	8.33E-07	19.94537	29.44435	23.78708

* indicates lag order selected by the criterion

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-3593.83	NA	2.594819	35.00804	35.2019	35.08644
1	-1805.54	3350.862	3.03e-07*	19.04412*	21.56426*	20.06335*
2	-1697.24	190.3199	4.34E-07	19.39069	24.23711	21.35074
3	-1602.47	155.5021	7.24E-07	19.86862	27.04132	22.7695
4	-1466.37	207.4451*	8.33E-07	19.94537	29.44435	23.78708

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

4.5.4 Granger Causality

Results in Table of granger causality indicates commercial bank infrastructure financing has unidirectional causality with non-performing loans, exchange rate. It was notable that bank characteristics, project characteristics and macro-economic characteristics have either unidirectional or no causality with commercial bank road infrastructure financing.

Table 4.10: Granger Causality

Null Hypothesis:	F-Statistic	Prob.
Liquidity does not Granger Cause Road infrastructure financing	0.49	0.48
Road infrastructure financing does not Granger Cause liquidity	0.81	0.37
Profitability does not Granger Cause Road infrastructure financing	0.02	0.89
Road infrastructure financing does not Granger Cause profitability	2.18	0.14
NPL does not Granger Cause Road infrastructure financing	9.64	0.000
Road infrastructure financing does not Granger Cause NPL	0.48	0.49
Total assets does not Granger Cause road infrastructure financing	1.29	0.26
Road infrastructure financing does not Granger Cause total assets	1.23	0.27
Capital adequacy does not Granger Cause Road infrastructure financing	0.65	0.42
Road infrastructure financing does not Granger Cause capital adequacy	2.38	0.12
Project length does not Granger Cause Road infrastructure financing	2.7	0.1
Road infrastructure financing does not Granger Cause project length	0.08	0.78
Project cost does not Granger Cause Road infrastructure financing	0.22	0.64
Road infrastructure financing does not Granger Cause project cost	1.57	0.21
Inflation rate does not Granger Cause Road infrastructure financing	2.06	0.15
Road infrastructure financing does not Granger Cause inflation rate	0	0.97
GDP does not Granger Cause Road infrastructure financing	1	0.32
Road infrastructure financing does not Granger Cause GDP	0	0.98
Exchange rate does not Granger Cause road infrastructure financing	7.98	0.01
Road infrastructure financing does not Granger Cause exchange rate	0.92	0.34
Interest rate does not Granger Cause road infrastructure financing	1.02	0.31
Road infrastructure financing does not Granger Cause interest rate	0.05	0.82
Profitability does not Granger Cause liquidity	0.05	0.82
Liquidity does not Granger Cause profitability	4.16	0.04
NPL does not Granger Cause liquidity	0.11	0.75
Liquidity does not Granger Cause NPL	0	0.96
Total assets does not Granger Cause liquidity	0	0.98
Liquidity does not Granger Cause total assets	12.92	0
Capital adequacy does not Granger Cause liquidity	6.94	0.01
Liquidity does not Granger Cause capital adequacy	1.86	0.17

Table 4.10 Continued

Null Hypothesis:	F-Statistic	Prob.
Project length does not Granger Cause liquidity	0.08	0.77
Liquidity does not Granger Cause project length	1.99	0.16

Project cost does not Granger Cause liquidity	0.02	0.9
Liquidity does not Granger Cause project cost	0.36	0.55
Inflation rate does not Granger Cause liquidity	2.4	0.12
Liquidity does not Granger Cause inflation rate	1.79	0.18
GDP does not Granger Cause liquidity	0	0.97
Liquidity does not Granger Cause GDP	0.08	0.78
Exchange rate does not Granger Cause liquidity	1.51	0.22
Liquidity does not Granger Cause exchange rate	0.15	0.7
Interest rate does not Granger Cause liquidity	0.96	0.33
Liquidity does not Granger Cause interest rate	0.01	0.94
NPL does not Granger Cause profitability	0.17	0.68
Profitability does not Granger Cause NPL	0.18	0.67
Total assets does not Granger Cause profitability	1.8	0.18
Profitability does not Granger Cause total assets	1.5	0.22
Capital adequacy does not Granger Cause profitability	1.79	0.18
Profitability does not Granger Cause capital adequacy	1.87	0.17
Project length does not Granger Cause profitability	0.99	0.32
Profitability does not Granger Cause project length	0.15	0.7
Project cost does not Granger Cause profitability	0.01	0.94
Profitability does not Granger Cause project cost	0	0.95
Inflation rate does not Granger Cause profitability	2.3	0.13
Profitability does not Granger Cause inflation rate	1.26	0.26
GDP does not Granger Cause profitability	0.65	0.42
Profitability does not Granger Cause GDP	0.02	0.9
Exchange rate does not Granger Cause profitability	0.07	0.78
Profitability does not Granger Cause exchange rate	0	0.99
interest rate does not Granger Cause profitability	0.17	0.68
Profitability does not Granger Cause interest rate	0.1	0.75
Total assets does not Granger Cause NPL	0.01	0.91
NPL does not Granger Cause total assets	2.03	0.16
Capital adequacy does not Granger Cause NPL	0.32	0.57
NPL does not Granger Cause capital adequacy	0.99	0.32

Table 4.10 Continued

Null Hypothesis:	**F-Statistic**	**Prob.**
Project length does not Granger Cause NPL	0.25	0.61

NPL does not Granger Cause project length	0.12	0.73
Project cost does not Granger Cause NPL	0.2	0.65
NPL does not Granger Cause project cost	1.82	0.18
Inflation rate does not Granger Cause NPL	7.1	0.01
NPL does not Granger Cause inflation rate	13.57	0
GDP does not Granger Cause NPL	0.98	0.32
NPL does not Granger Cause GDP	0.16	0.69
Exchange rate does not Granger Cause NPL	5.08	0.03
NPL does not Granger Cause exchange rate	1.2	0.27
INTEREST_RATE does not Granger Cause NPL	19.43	0
NPL does not Granger Cause interest rate	0.49	0.49
Capital adequacy does not Granger Cause total assets	0	0.99
Total assets does not Granger Cause capital adequacy	0.02	0.9
Project length does not Granger Cause total assets	4.76	0.03
Total assets does not Granger Cause project length	0.01	0.92
Project cost does not Granger Cause total assets	0.99	0.32
Total assets does not Granger Cause project cost	2.08	0.15
Inflation rate does not Granger Cause total assets	2.49	0.12
Total assets does not Granger Cause inflation rate	0.36	0.55
GDP does not Granger Cause total assets	4.63	0.03
Total assets does not Granger Cause GDP	3.42	0.07
Exchange rate does not Granger Cause total assets	0.39	0.53
Total assets does not Granger Cause exchange rate	0.32	0.57
Interest rate does not Granger Cause total assets	0.03	0.86
Total assets does not Granger Cause interest rate	0.68	0.41
Project length does not Granger Cause capital adequacy	0.02	0.9
Capital adequacy does not Granger Cause project length	0	0.94
Project cost does not Granger Cause capital adequacy	0.16	0.69
Capital adequacy does not Granger Cause project cost	2.17	0.14
Inflation rate does not Granger Cause capital adequacy	0.01	0.94
Capital adequacy does not Granger Cause inflation rate	1.13	0.29
GDP does not Granger Cause capital adequacy	1.52	0.22

Table 4.10 Continued

Null Hypothesis:	**F-Statistic**	**Prob.**
Capital adequacy does not Granger Cause GDP	0.01	0.93

Exchange rate does not Granger Cause capital adequacy	1.83	0.18
Capital adequacy does not Granger Cause exchange rate	0.57	0.45
Interest rate does not Granger Cause capital adequacy	0	0.98
Capital adequacy does not Granger Cause interest rate	0.4	0.53
Project cost does not Granger Cause project length	0.06	0.8
Project length does not Granger Cause project cost	10.27	0
Inflation rate does not Granger Cause project length	0.48	0.49
Project length does not Granger Cause inflation rate	0.18	0.67
GDP does not Granger Cause project length	1.24	0.27
Project length does not Granger Cause GDP	0.57	0.45
Exchange rate does not Granger Cause project length	1.03	0.31
Project length does not Granger Cause exchange rate	1.58	0.21
Interest rate does not Granger Cause project length	0.07	0.79
Project length does not Granger Cause interest rate	0.72	0.4
Inflation rate does not Granger Cause project cost	0.03	0.87
Project cost does not Granger Cause inflation rate	3.03	0.08
GDP does not Granger Cause project cost	2.59	0.11
Project cost does not Granger Cause GDP	0.81	0.37
Exchange rate does not Granger Cause project cost	0.09	0.76
Project cost does not Granger Cause exchange rate	0.76	0.38
Interest rate does not Granger Cause project cost	0.38	0.54
Project cost does not Granger Cause interest rate	0.02	0.88
GDP does not Granger Cause inflation rate	0.32	0.57
Inflation rate does not Granger Cause GDP	1.71	0.19
Exchange rate does not Granger Cause inflation rate	1.02	0.31
Inflation rate does not Granger Cause exchange rate	0.37	0.55
Interest rate does not Granger Cause inflation rate	3.29	0.07
Inflation rate does not Granger Cause interest rate	6.11	0.01
Exchange rate does not Granger Cause GDP	0.02	0.89
GDP does not Granger Cause exchange rate	1.04	0.31
Interest rate does not Granger Cause GDP	0.02	0.9
GDP does not Granger Cause interest rate	0.73	0.39
Interest rate does not Granger Cause exchange rate	10.62	0
Exchange rate does not Granger Cause interest rate	3.66	0.06

4.6 Vector Error Correction Model

Since there five cointegrations the study adopted VECM to examine the effect of bank characteristics, project characteristics, macroeconomic characteristics and commercial road infrastructure financing. All variables were lagged once which was the optimal number of lags. The resultant equation is as follows:

D(Road Infrastructure Financing) = C(1)*(Road Infrastructure Financing (-1) - 2.48*Capital Adequacy(-1) + 1.194*Project Length(-1) -5.63*Project Cost(-1) + 65.22*Inflation_Rate(-1) + 1.84*GDP (-1) + 0.31*Exchange rate (-1) + 10.86*Interest Rate(-1) -39.22) + C(2)*(Liquidity(-1) - 0.002*Capital Adequacy(-1) + 0.00794757748287*Project Length(-1) - 0.02*Project Cost(-1) + 1.43*Inflation_Rate(-1) + 0.02*GDP (-1) + 0.002*Exchange Rate(-1) - 2.07*Interest Rate(-1) - 0.41) + C(3)*(Profitability(-1) - 2.39*Capital Adequacy(-1) + 0.67*Project Length(-1) - 3.95*Project Cost(-1) +162.64*Inflation_Rate(-1) + 2.92*GDP(-1) +0.24*Exchange Rate(-1) - 27.77*Interest Rate(-1) - 107.13) + C(4)*(NPL(-1) -0.35*Capital Adequacy(-1) + 0.22*Project Length(-1) - 0.54*Project Cost(-1) + 43.25*Inflation_Rate(-1) + 0.68*GDP(-1) + 0.02*Exchange Rate(-1) - 71.06*Interest Rate(-1) + 28.59) + C(5)*(Total Assets(-1) + 0.27*Capital Adequacy(-1) - 0.51*Project Length(-1) + 0.82*Project Cost(-1) -84.43*Inflation_Rate(-1) - 1.47*GDP(-1) - 0.17*Exchange Rate(-1) + 153.35*Interest Rate(-1) - 81.91) + C(6)*D(Road Infrastructure Financing (-1)) + C(7)*D(Liquidity(-1)) + C(8)*D(Profitability(-1)) + C(9)*D(NPL(-1)) + C(10)*D(Total Assets(-1)) + C(11) *D(capital Adequacy(-1)) + C(12)*D(Project Length(-1)) + C(13)*D(Project Cost(-1)) + C(14)*D(Inflation_Rate(-1)) + C(15)*D(GDP (-1)) + C(16)*D(Exchange Rate(-1)) + C(17) *D(Interest Rate(-1)) + C(18)

There was a positive statistically significant effect of current period commercial banks infrastructure financing to past period financing. Thus, unit increase in current period road infrastructure financing was associated with past increment of 0.29 units. Liquidity has inverse though not statistically significant effect on commercial banks road infrastructure financing. This manifest that positive changes in liquidity discouraged commercial banks from lending into specific government projects. There was a positive effect of non-performing loans on commercial banks road infrastructure financing. Thus, it can be deduced that positive changes in percentage of non-performing loans precipitated demand for commercial banks infrastructure financing. This may have acted as a precautionary strategy against the likelihood of defaults and minimization of profitability due to changes in provision for bad debts. Further, there was positive and not statistically significant effect of total assets and commercial bank road infrastructure financing. This depicts those positive changes in asset base catalyzed commercial banks road infrastructure financing. This may be attributed to access to capacity of commercial banks to create credit creation capacity. There was an inverse and not statistically significant effect of capital adequacy

on commercial banks road infrastructure financing. This indicates that positive changes of commercial banks road infrastructure financing demanding syndicated loan financing so as to bridge odds of non-compliance with operational guidelines as stipulated by commercial banks single credit lending.

Secondly, regarding the effect of project characteristics on commercial banks road infrastructure financing. Results of the study indicates that there was an inverse effect of project financing and project costs on road infrastructure financing. This indicates that an increase in project costs and project length deterred local commercial banks from investing on the road infrastructure financing. Thus, it can be deduced that lenders from commercial banks in Kenya may have been constrained in providing desired financial support or the borrowers lacked capacity to borrow locally. This may catalyze the demand for services from those contractors who may manage to raise funds from external sources.

Thirdly, an examination on the effect of macro-economic characteristics on commercial banks road infrastructure financing in Kenya depicts that there was an inverse effect of inflation rate on commercial bank road infrastructure financing. Thus, it can be deduced that positive changes in inflation rates inhibited access to road infrastructure financing from local institutions. There was a positive effect of increase GDP growth rate and road infrastructure financing. This indicates that positive changes in GDP growth catalyzed the lending capacity of local financial institutions on road infrastructure projects. There was an inverse effect of exchange rate on commercial bank's road infrastructure financing. This depicts that the rate of Kenyan currency depreciation against US dollars deterred commercial banks from lending on road infrastructural based projects. There was positive effect of interest rate on commercial banks road infrastructure financing. This indicates that there was a positive effect of interest rate on commercial banks road infrastructure financing. Hence, it can be deduced that road infrastructure financing products amongst commercial banks ought to be financed competitively so as to stimulate their participation.

The error correction term ($ce1$) in the results depicts the speed of adjustment towards equilibrium. Further, the error terms depict presence or absence of short or long run effect against the variables under examination. Since $ce1$ has a negative sign and is not significant at 5% level of significance, suggesting that the previous year's errors (or deviation from the long-run equilibrium) are not

corrected for within the current year at a convergence speed of 0.08. Consequently, the study found that there was a long run relationship between bank characteristics, project characteristics and macroeconomic characteristics and commercial banks road infrastructure financing in Kenya.

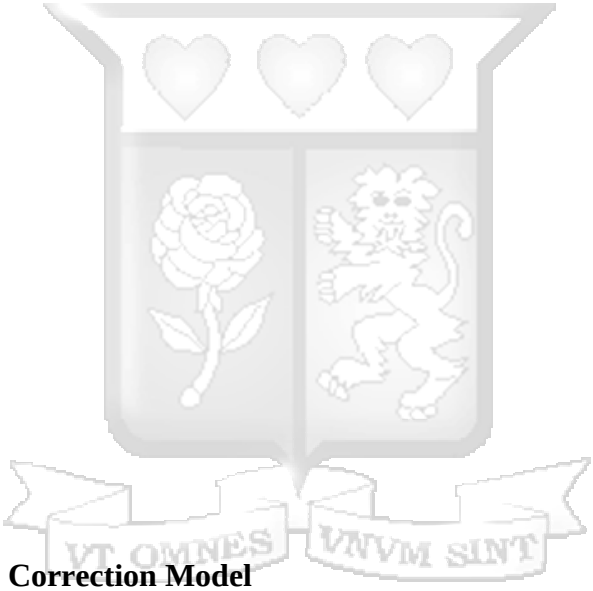

Table 4.11:Vector Error Correction Model

	Coefficient	**Std. Error**	**t-Statistic**	**Prob.**
C(1)	-0.08	0.03	-2.43	0.02
C(2)	17.55	17.80	0.99	0.32
C(3)	0.02	0.04	0.52	0.60
C(4)	-0.19	0.55	-0.35	0.73
C(5)	0.07	0.10	0.66	0.51
C(6)	0.29	0.07	4.25	0.00
C(7)	-11.07	30.45	-0.36	0.72
C(8)	0.02	0.04	0.60	0.55
C(9)	0.33	0.75	0.45	0.65
C(10)	0.002	0.08	0.06	0.95
C(11)	-0.37	0.82	-0.46	0.65
C(12)	-0.08	0.08	-0.98	0.33
C(13)	-0.16	0.06	-2.52	0.01

C(14)	-5.10	23.79	-0.21	0.83
C(15)	0.49	0.33	1.48	0.14
C(16)	-0.09	0.19	-0.48	0.63
C(17)	16.18	17.62	0.92	0.36
C(18)	0.04	0.27	0.14	0.89
D(Road Infrastructure Financing) = C(1)*(Road Infrastructure Financing (-1) - 2.48*Capital Adequacy(-1) + 1.194*Project Length(-1) -5.63*Project Cost(-1) + 65.22*Inflation_Rate(-1) + 1.84*GDP (-1) + 0.31*Exchange rate (-1) + 10.86*Interest Rate(-1) -39.22) + C(2)*(Liquidity(-1) - 0.002*Capital Adequacy(-1) + 0.00794757748287*Project Length(-1) - 0.02*Project Cost(-1) + 1.43*Inflation_Rate(-1) + 0.02*GDP (-1) + 0.002*Exchange Rate(-1) - 2.07*Interest Rate(-1) - 0.41) + C(3)*(Profitability(-1) - 2.39*Capital Adequacy(-1) + 0.67*Project Length(-1) - 3.95*Project Cost(-1) +162.64*Inflation_Rate(-1) + 2.92*GDP(-1) +0.24*Exchange Rate(-1) - 27.77*Interest Rate(-1) - 107.13) + C(4)*(NPL(-1) -0.35*Capital Adequacy(-1) + 0.22*Project Length(-1) - 0.54*Project Cost(-1) + 43.25*Inflation_Rate(-1) + 0.68*GDP(-1) + 0.02*Exchange Rate(-1) - 71.06*Interest Rate(-1) + 28.59) + C(5)*(Total Assets(-1) + 0.27*Capital Adequacy(-1) - 0.51*Project Length(-1) + 0.82*Project Cost(-1) -84.43*Inflation_Rate(-1) - 1.47*GDP(-1) -0.17*Exchange Rate(-1) + 153.35*Interest Rate(-1) - 81.91) + C(6)*D(Road Infrastructure Financing (-1)) + C(7)*D(Liquidity(-1)) + C(8)*D(Profitability(-1)) + C(9)*D(NPL(-1)) + C(10)*D(Total Assets(-1)) + C(11) *D(capital Adequacy(-1)) + C(12)*D(Project Length(-1)) + C(13)*D(Project Cost(-1)) + C(14)*D(Inflation_Rate(-1)) + C(15)*D(GDP (-1)) + C(16)*D(Exchange Rate(-1)) + C(17) *D(Interest Rate(-1)) + C(18)				
R-squared	0.204727	Mean dependent var		0.002546
Adjusted R-squared	0.13357	S.D. dependent var		4.114267
S.E. of regression	3.82965	Sum squared residuals		2786.582
Durbin-Watson stat	2.125481			

4.6.1 Test for the Short run Effect

Short term causality of liquidity, profitability, non-performing loans, total assets, capital adequacy, project length, project cost, inflation rate, GDP growth rate, exchange rate, interest rate and commercial bank infrastructure financing indicated that only project costs and road infrastructure financing had short run effect while the other characteristics had no short run causality with commercial banks road infrastructure financing.

Table 4.12: Test for the Short Run Effect

Dependent variable: D(Road Infrastructure Financing)				
Excluded	**Chi-sq**	**df**	**Prob.**	**Inference**
D(LIQUIDITY)	0.13	1	0.72	No short run causality
D(PROFITABILITY)	0.36	1	0.55	No short run causality
D(NPL)	0.20	1	0.65	No short run causality
D(TOTAL_ASSETS)	0.00	1	0.95	No short run causality
D(CAPITAL_ADEQUACY)	0.21	1	0.65	No short run causality
D(PROJECT_LENGTH)	0.95	1	0.33	No short run causality
D(PROJECT_COST)	6.36	1	0.01	Short run causality
D(INFLATION_RATE)	0.05	1	0.83	No short run causality
D(GDP)	2.18	1	0.14	No Short run causality

D(EXCHANGE RATE)	0.23	1	0.63	No short run causality
D(INTEREST_RATE)	0.84	1	0.36	No short run causality
All	14.96	11	0.18	No short run causality

4.7 Post Estimation Analysis

After VECM to examine the effect of bank characteristics, project characteristics and macroeconomic characteristics and commercial bank road infrastructure financing. Model robustness was evaluated through post estimation diagnostic tests that included stability test and serial correlation analysis.

4.7.1 Roots Characteristics Polynomial

Pictorial presentation in Figure 4.2 depicts model stability since none of the root's characteristics polynomial exceeded one.

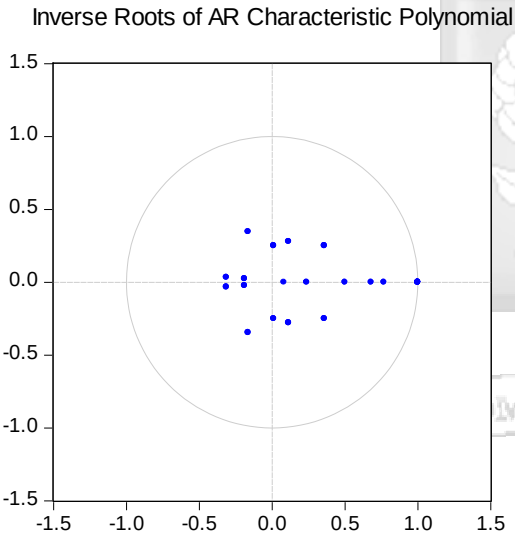

Figure 4.2: Roots Characteristics Polynomial

4.7.2 Post Estimation Serial Correlation Analysis

Post estimation serial correlation was carried out with a null hypothesis that there was no serial correlation against an alternative of first order serial correlation. Results in Table 4.13 depicts that there was no serial correlation since the p value was greater than 0.05.

Table 4.13: Post Estimation Serial Correlation Analysis

Lags	LM-Stat	Prob

1	146.461	0.427

4.8 Impulse Response

Results in Table 4.14 indicates that road infrastructure financing in Kenya responded inversely to shocks on bank characteristics, project characteristics and macroeconomic characteristics.

Table 4.14: Impulse Response

Period	1	2	3	4	5	6	7	8	9	10	11	12
1	3.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	2.39	0.06	0.27	0.04	0.20	-0.05	-0.47	-0.11	0.01	0.47	-0.12	0.04
3	2.59	0.20	0.09	-0.13	0.50	0.12	-0.33	0.63	0.04	0.28	-0.05	-0.20
4	2.55	0.23	0.11	-0.16	0.39	0.20	-0.26	0.44	0.19	0.34	-0.07	-0.28
5	2.45	0.28	0.09	-0.19	0.45	0.21	-0.22	0.40	0.27	0.35	-0.02	-0.46
6	2.43	0.32	0.08	-0.25	0.45	0.25	-0.18	0.43	0.30	0.36	0.02	-0.55
7	2.41	0.34	0.07	-0.28	0.43	0.28	-0.17	0.43	0.34	0.36	0.04	-0.61
8	2.39	0.36	0.06	-0.31	0.44	0.30	-0.15	0.44	0.37	0.37	0.07	-0.66
9	2.37	0.37	0.05	-0.33	0.44	0.31	-0.14	0.44	0.39	0.37	0.08	-0.70
10	2.36	0.38	0.04	-0.34	0.44	0.33	-0.13	0.45	0.40	0.37	0.09	-0.73
11	2.36	0.39	0.04	-0.35	0.44	0.34	-0.12	0.45	0.41	0.37	0.10	-0.75
12	2.35	0.40	0.03	-0.36	0.44	0.34	-0.11	0.45	0.42	0.37	0.11	-0.77
13	2.34	0.41	0.03	-0.37	0.44	0.35	-0.11	0.45	0.43	0.38	0.12	-0.79
14	2.34	0.41	0.03	-0.37	0.44	0.35	-0.11	0.46	0.44	0.38	0.12	-0.80
15	2.34	0.41	0.03	-0.37	0.44	0.36	-0.10	0.46	0.44	0.38	0.12	-0.81

4.9 Variance Decomposition

The study findings in Table 4.15 indicates that variance due to shocks was 100% initially and it declines with notable changes in response to bank characteristics, project characteristics and macroeconomic characteristics.

Table 4.15: Variance Decomposition

Period	S.E.	1	2	3	4	5	6	7	8	9	10	11	12
1	3.83	100	0	0	0	0	0	0	0	0	0	0	0
2	4.58	97.2	0.0	0.4	0.0	0.2	0.0	1.0	0.1	0.0	1.1	0.1	0.0
3	5.35	94.6	0.1	0.3	0.1	1.0	0.1	1.1	1.4	0.0	1.1	0.1	0.1
4	5.99	93.5	0.3	0.3	0.1	1.2	0.2	1.1	1.7	0.1	1.2	0.1	0.3
5	6.55	92.3	0.4	0.2	0.2	1.5	0.2	1.0	1.8	0.3	1.3	0.1	0.8
6	7.07	91.0	0.5	0.2	0.3	1.7	0.3	1.0	1.9	0.4	1.3	0.0	1.3
7	7.55	89.8	0.7	0.2	0.4	1.8	0.4	0.9	2.0	0.6	1.4	0.0	1.8
8	8.01	88.7	0.8	0.2	0.5	1.9	0.5	0.8	2.1	0.7	1.5	0.0	2.3
9	8.45	87.7	0.9	0.2	0.6	2.0	0.6	0.8	2.1	0.9	1.5	0.1	2.7
10	8.86	86.8	1.0	0.2	0.7	2.0	0.7	0.7	2.2	1.0	1.5	0.1	3.2
11	9.26	85.9	1.1	0.1	0.8	2.1	0.8	0.7	2.2	1.1	1.6	0.1	3.6
12	9.65	85.1	1.2	0.1	0.9	2.1	0.8	0.6	2.3	1.2	1.6	0.1	3.9
13	10.02	84.4	1.3	0.1	0.9	2.2	0.9	0.6	2.3	1.3	1.6	0.1	4.2
14	10.38	83.8	1.4	0.1	1.0	2.2	0.9	0.6	2.4	1.4	1.6	0.1	4.6
15	10.72	83.2	1.4	0.1	1.0	2.3	1.0	0.5	2.4	1.5	1.7	0.1	4.8

CHAPTER FIVE

SUMMARY, DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

5.1 Introduction

The study investigated the effect of bank characteristics, project characteristics and macroeconomic characteristics on road infrastructure commercial banks in Kenya. The study relied on time series secondary data that was sourced from July 2005 to December 2022. Specifically, the study investigated how bank characteristics (liquidity, profitability, non-performing loans, total assets and capital adequacy), project characteristics (project length and project cost) and macroeconomic characteristics (inflation rate, GDP growth rate, exchange rate and interest rate). Through a time, series analysis, the study ran a Vector Error Correction Model (VECM) because the variables of the study were found to be cointegrated and some were not stationary at the level and needed differencing to be stationary.

5.2 Summary of the Key Findings

The study found that bank characteristics had mixed effects with liquidity has inverse though not statistically significant effect on commercial banks road infrastructure financing. There was a positive effect of non-performing loans on commercial banks road infrastructure financing. Further, there was positive and not statistically significant effect of total assets and commercial bank road infrastructure financing. There was an inverse and not statistically significant effect of capital adequacy on commercial banks road infrastructure financing. Secondly, regarding the effect of project characteristics on commercial banks road infrastructure financing. Thirdly, an examination on the effect of macro-economic characteristics on commercial banks road infrastructure financing in Kenya depicts that there was an inverse effect of inflation rate on commercial bank road infrastructure financing. There was a positive effect of increase GDP growth rate and road infrastructure financing. There was an inverse effect of exchange rate on commercial bank's road infrastructure financing. There was positive effect of interest rate on commercial banks road infrastructure financing. This indicates that there was a positive effect of interest rate on commercial banks road infrastructure financing.

5.3 Discussions

The study findings were in agreement with Hyun et al. (2018) who alluded that effective bond financing activities enhanced liquidity since there was a reduction on inefficiencies associated with access to corporate market. The study supported Mengistu and School (2013) since financial liberalization through enhanced fiscal freedom and tax laws stimulated participation in public private partnership. The study had no significant effect of profitability on credit access. The results mirrored Phan (2009) who found that credit supply was contingent to non-performing loans, capital needs and bank concentration. Further, the study refutes Kiriti (2020) who asserted that credit access was likely to be influenced by bank liability structure. Another study by Mirzaei and Mirzaei (2011) found out that factors such as cost to income ratio and capital ratio are the key determinants of a bank's profitability. Implying that higher levels of capitalization reduce funding costs for banks. While the study argues that short term lending by banks negatively affects their profitability, banks have been reluctant in investing in PPP projects as a long-term investment. However, according to Kirti (2017), a bank's liability structure drives the rate exposure of assets. Therefore, banks with more floating rate liabilities make more floating rate loans. This is important in establishing the relationship between private funding structure and the types of PPP contracts.

The allocation and management of risks in PPP project finance transactions and general-purpose corporate lending differ. As project finance lenders are dependent on project cash flows and do not have recourse to the sponsor balance sheets, short-term exposure can put pressure on the early stage of a project, and thus increases the risk of default (Sorge & Gadanecz 2019). This contrasts with corporate finance lending where shorter maturities are considered less risky, suggesting that the standard upward sloping relationship between credit risk and loan maturity may not apply in project finance. In addition, projects usually go through construction and operations phases, each of them characterized by specific risks and mitigates. Thus, it is likely that incrementally extending loan maturities after the scheduled time for the project to be operational might drive up the ex-ante risk premium but at a decreasing rate, based on the risk allocation mechanism and availability of mitigates such as guarantees.

The findings mirror arguments that in periods of crisis and pandemics allocation of funds would only be possible due to availability of sound financial institutions (Ali & Khan, 2019). This has been supported by financial liberalization. Moreover, emergence of difference sources of credit

has created competition and lowering of credit screening procedures that have altered odds of credit risk (Ali & Hysemi, 2015). Causes of credit risk has been associated with macroeconomic characteristics, bank variables and industry specific characteristics (Ali & Khan, 2019). Examination of credit risk and macroeconomic characteristics have indicated that gross domestic product, unemployment, export goods and services, exchange rate, stock exchange capitalization and inflation rate (Ali & Hysemi, 2019).

5.4 Conclusions

From the above findings, the study has found that bank characteristics have effect on commercial bank infrastructure financing. Therefore, there is need for continuous monitoring of liquidity, profitability, non-performing loans, total assets and capital adequacy so as to optimize odds of accessing road infrastructure financing and success of public private partnership.

Secondly, the mixed of project length and project cost on commercial bank road infrastructure financing. Inverse effect depicts withdrawal strategies by commercial banks in participation in public private partnership. Maybe this may be attributed to levels of information asymmetry in the financing arrangements and project undertaking.

Thirdly, macroeconomic characteristics has effect on commercial banks road infrastructure financing. Since, there were some with positive effects there is need for alignment of fiscal and monetary policies and financial liberalization strategies so as to optimize access to road infrastructure financing and value contribution of public private partnership.

5.5 Recommendations

5.5.1 Policy Recommendations

Public private partnership has significant value contribution on economic growth and development as well as achievement of desired social economic agendas. Its success is contingent to value contribution of relevant stakeholders who include and not limited to commercial banks, government and contractors. From the current findings there is need for policy development that will liberalize commercial banks operations to enhance its participation public private partnership. There is need for commercial banks to develop policies that would enhance value contribution of bank characteristics, project characteristics and macroeconomic characteristics on road infrastructure financing in Kenya. To the government there is need for continued examination of

leading and lagging macroeconomic aspects so as to align fiscal and monetary policies on positive support of public private partnership.

5.5.2 Practical Recommendations

Based on the findings on the effect of bank characteristics on road infrastructure financing in Kenya. There is need for commercial banks to develop strategies on liquidity, profitability, non-performing loans and capital adequacy so as to optimize their credit creation capacity. Further, commercial banks ought to evaluate their level of non-core assets accumulation so as to enhance bank participation in public and private partnership projects.

Since the level of commercial road infrastructure financing there is need for project implementors to enhance the level of information access so as to minimize agency costs that is associated with moral hazard and adverse selection. Further, there are higher odds of increased information asymmetry regarding project costs hence the need for commercial banks to have robust department that would aid in evaluation of value benefits associated with respective projects level of involvement.

Further, there was notable contribution of macroeconomic characteristics on commercial bank road infrastructure financing. The central bank of Kenya ought to continuously evaluate leading and lagging macroeconomic indicators since in some instances financing arrangements maybe in form of currencies whose exchange rate to Kenyan shilling have depreciating features thus may jeopardize some parties in the contract.

5.5.3 Areas for Further Research

The study was limited in getting data on all the variables of interest and especially bank characteristics, project characteristics and macroeconomic characteristics. Furthermore, the study was limited to direct effect bank characteristics, project characteristics and macroeconomic characteristics. Future studies may also look at other variables that may describe bank characteristics, project characteristics and macroeconomic characteristics. Future studies may explore panel data and do more than one bank analysis and compare and contrast how banking characteristics affects commercial banks road infrastructure financing in Kenya.

5.6 Limitations of the Study

The study initially aimed at investigating the effect of bank characteristics, project characteristics and macroeconomic characteristics on road infrastructure financing through panel data modelling. Unfortunately, data on all the variables of the study was only available in time series aspects furthermore, there would have been duplication of macroeconomic aspects for each commercial banks. Secondly, the study did not factor in time invariant characteristics and political risks that may have implications on project implementation and financing model adopted. Moreover, the study may have considered the project implementers whether they were local or foreign investors since it may have impacted in the choice of financing model.

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APPENDICES

Appendix I: Letter of Introduction

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

Strathmore UNIVERSITY
BUSINESS SCHOOL

Thursday, 09 March 2023

To Whom It May Concern,

RE: FACILITATION OF RESEARCH – WILFRED OGINGA

This is to introduce Wilfred Oginga who is a **Master's in Public Policy and Management** (MPPM) student at Strathmore University Business School, admission number MPPM 110023. As part of our MPPM Program, Wilfred is expected to do applied research and undertake a project. This is in partial fulfilment of the requirements of the MPPM course. To this effect, he would like to request for appropriate data from your organization.

Wilfred is undertaking a research paper on **"Effect of Bank Characteristics, Project Characteristics and Macroeconomic Factors on Road Infrastructure Financing by Commercial Banks in Kenya."** The information obtained from your organization shall be treated confidentially and shall be used for academic purposes only.

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

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

Yours Faithfully,

Njoki Kiagiri.
Manager – Graduate Programmes

Association of African Business Schools AABS

Strathmore Business School is a Proud member of:
EFMD AACSB

Appendix II: Ethical Approval Letter

Strathmore UNIVERSITY

7th March 2023

Mr Oginga Wilfred,
wilfredsdesk@gmail.com

Dear Mr Oginga,

RE: Effect of Bank Characteristics, Project Characteristics and Macroeconomic Factors on the Road Infrastructure Financing by Commercial Banks in Kenya

This is to inform you that SU-ISERC has reviewed and **approved** your above **SU- master's** research proposal. Your application reference number is **SU-ISERC1628/23.** The approval period is from **7th March 2023 to 6th March 2024.**

This approval is subject to compliance with the following requirements:

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

Before 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,

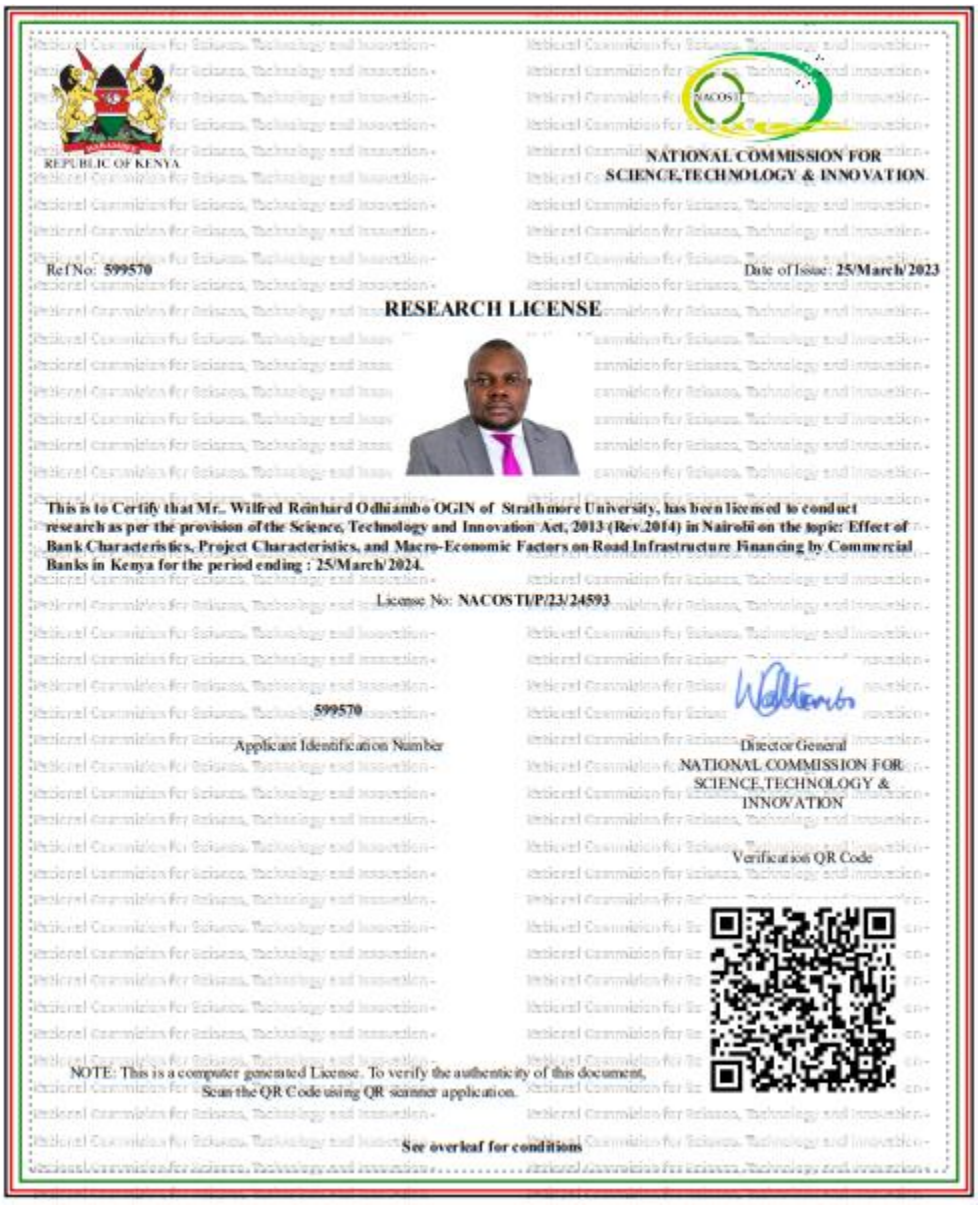
Dr Ben Ngoye,
Secretary; SU-ISERC

STRATHMORE UNIVERSITY INSTITUTIONAL SCIENTIFIC AND ETHICAL REVIEW COMMITTEE
(SU-ISERC)
07-Mar-2023
Email:ethicsreview@strathmore.edu
P.O BOX 59857-00200
NAIROBI-KENYA

Cc: Mr Ambrose Rachier,
Chairperson; SU-ISERC

Ole Sangale Rd, Madaraka Estate. PO Box 59857-00200, Nairobi, Kenya. Tel +254 (0)703 034000
Email admissions@strathmore.edu www.strathmore.edu

Appendix III: NACOSTI Permit



REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: 599570

Date of Issue: 25/March/2023

RESEARCH LICENSE

This is to Certify that Mr.. Wilfred Reinhard Odhiambo OGIN of Strathmore University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Nairobi on the topic: Effect of Bank Characteristics, Project Characteristics, and Macro-Economic Factors on Road Infrastructure Financing by Commercial Banks in Kenya for the period ending : 25/March/2024.

License No: NACOSTI/P/23/24593

599570

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

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See overleaf for conditions

Appendix IV: Data Collection Sheet

	Years - July 2005 to December 2021											
	Bank characteristics					Project characteristics		Macroeconomic Factors				Commercial Bank Financing
	Liquidity	ROA	Non-performing loans	Total assets	Capital Adequacy	Project length	Project costs	Inflation rate (CPI) %	GDP growth rate %	Exchange rate	Interest Rate	Commercial bank road infrastructure finance
Jan												
Feb												
Mar												
Apr												
May												
Jun												
Jul												
Aug												
Sep												
Oct												
Nov												
Dec												

Appendix V: Commercial Banks in Kenya

Bank	Peer Group	Branches
ABSA Bank Kenya Plc	Large	85
Access Bank (Kenya) PLC	Small	28
African Banking Corporation Limited	Small	13
Bank of Africa Kenya Limited	Medium	30
Bank of Baroda (Kenya) Limited	Medium	14
Bank of India	Medium	5
Citibank N.A Kenya	Medium	3
Consolidated Bank of Kenya Limited	Medium	18
Co-operative Bank of Kenya Limited	Large	155
Credit Bank PLC	Small	18
Development Bank of Kenya Limited	Small	2
Diamond Trust Bank Kenya Limited	Medium	70
DIB Bank Kenya Limited		5
Ecobank Kenya Limited	Medium	18
Equity Bank Kenya Limited	Large	178
Family Bank Limited	Medium	91
First Community Bank Limited	Small	18
Guaranty Trust Bank (K) Ltd	Medium	9
Guardian Bank Limited	Small	19
Gulf African Bank Limited	Small	17
Habib Bank A.G Zurich	Small	4
I&M Bank Limited	Large	41
KCB Bank Kenya Limited	Large	198
Kingdom Bank Limited	Small	27
Mayfair CIB Bank Limited	Small	6
Middle East Bank (K) Limited	Small	4
M-Oriental Bank Limited	Small	8
National Bank of Kenya Limited	Medium	79
NCBA Bank Kenya PLC	Large	60
Paramount Bank Limited	Small	7
Prime Bank Limited	Medium	20
SBM Bank Kenya Limited	Small	45
Sidian Bank Limited	Small	42

Spire Bank Ltd	Small	12
Stanbic Bank Kenya Limited	Medium	25
Standard Chartered Bank Kenya Limited	Large	31
UBA Kenya Bank Limited	Small	3
Victoria Commercial Bank Limited	Small	5
HFC Limited	Medium	27

Appendix VI: VECM Results

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.08	0.03	-2.43	0.02
C(2)	17.55	17.80	0.99	0.32
C(3)	0.02	0.04	0.52	0.60
C(4)	-0.19	0.55	-0.35	0.73
C(5)	0.07	0.10	0.66	0.51
C(6)	-0.29	0.07	-4.25	0.00
C(7)	-11.07	30.45	-0.36	0.72
C(8)	0.02	0.04	0.60	0.55
C(9)	0.33	0.75	0.45	0.65
C(10)	0.00	0.08	-0.06	0.95
C(11)	-0.37	0.82	-0.46	0.65
C(12)	-0.08	0.08	-0.98	0.33
C(13)	-0.16	0.06	-2.52	0.01
C(14)	-5.10	23.79	-0.21	0.83
C(15)	0.49	0.33	1.48	0.14
C(16)	-0.09	0.19	-0.48	0.63
C(17)	16.18	17.62	0.92	0.36
C(18)	0.04	0.27	0.14	0.89

D(ROAD INFRASTRUCTURE FINANCING) = C(1)*(ROAD INFRASTRUCTURE FINANCING (-1) - 2.48*CAPITAL_ADEQUACY(-1) + 1.194*PROJECT_LENGTH(-1) -5.63*PROJECT_COST(-1) + 65.22*INFLATION_RATE(-1) + 1.84*GDP(-1) + 0.31*EXCHANGE RATE(-1) + 10.86*INTEREST_RATE(-1) -39.22) + C(2)*(LIQUIDITY(-1) - 0.002*CAPITAL_ADEQUACY(-1) + 0.00794757748287*PROJECT_LENGTH(-1) - 0.02*PROJECT_COST(-1) + 1.43*INFLATION_RATE(-1) + 0.02*GDP(-1) + 0.002*EXCHANGE RATE(-1) - 2.07*INTEREST_RATE(-1) - 0.41) + C(3)*(PROFITABILITY(-1) - 2.39*CAPITAL_ADEQUACY(-1) + 0.67*PROJECT_LENGTH(-1) - 3.95*PROJECT_COST(-1) +162.64*INFLATION_RATE(-1) + 2.92*GDP(-1) +0.24*EXCHANGE RATE(-1) - 27.77*INTEREST_RATE(-1) - 107.13) + C(4)*(NPL(-1) -0.35*CAPITAL_ADEQUACY(-1) + 0.22*PROJECT_LENGTH(-1) - 0.54*PROJECT_COST(-1) + 43.25*INFLATION_RATE(-1) + 0.68*GDP(-1) + 0.02*EXCHANGE RATE(-1) - 71.06*INTEREST_RATE(-1) + 28.59) + C(5)*(TOTAL_ASSETS(-1) + 0.27*CAPITAL_ADEQUACY(-1) - 0.51*PROJECT_LENGTH(-1) + 0.82*PROJECT_COST(-1) - 84.43*INFLATION_RATE(-1) - 1.47*GDP(-1) -0.17*EXCHANGE RATE(-1) + 153.35*INTEREST_RATE(-1) - 81.91) + C(6)*D(ROAD INFRASTRUCTURE FINANCING (-1)) + C(7)*D(LIQUIDITY(-1)) + C(8)*D(PROFITABILITY(-1)) + C(9)*D(NPL(-1)) + C(10)*D(TOTAL_ASSETS(-1)) + C(11) *D(CAPITAL_ADEQUACY(-1)) + C(12)*D(PROJECT_LENGTH(-1)) + C(13)*D(PROJECT_COST(-1)) + C(14)*D(INFLATION_RATE(-1)) + C(15)*D(GDP(-1)) + C(16)*D(EXCHANGE RATE(-1)) + C(17) *D(INTEREST_RATE(-1)) + C(18)

R-squared	0.204727	Mean dependent var		0.002546
Adjusted R-squared	0.13357	S.D. dependent var		4.114267
S.E. of regression	3.82965	Sum squared resid		2786.582
Durbin-Watson stat	2.125481			
Equation: D(LIQUIDITY) = C(19)*(ROAD INFRASTRUCTURE FINANCING (-1) -				
2.48037308436*CAPITAL_ADEQUACY(-1) + 1.19367060655				
*PROJECT_LENGTH(-1) - 5.63376251932*PROJECT_COST(-1) +				
65.2257969288*INFLATION_RATE(-1) + 1.83905445128*GDP(-1) +				
0.313123934427*EXCHANGE RATE(-1) + 10.8647974326				
INTEREST_RATE(-1) - 39.2207850488) + C(20)(LIQUIDITY(-1) -				
0.00287390299715*CAPITAL_ADEQUACY(-1) + 0.00794757748287				
*PROJECT_LENGTH(-1) - 0.0228105255566*PROJECT_COST(-1) +				
1.43479258526*INFLATION_RATE(-1) + 0.0215853190902*GDP(-1) +				
0.00251113149953*EXCHANGE RATE(-1) - 2.06583967654				
INTEREST_RATE(-1) - 0.410463298469) + C(21)(PROFITABILITY(				
-1) - 2.39723491565*CAPITAL_ADEQUACY(-1) + 0.666918002237				
*PROJECT_LENGTH(-1) - 3.94501773741*PROJECT_COST(-1) +				
162.635248106*INFLATION_RATE(-1) + 2.92410190292*GDP(-1) +				
0.241903199205*EXCHANGE RATE(-1) - 27.7712511057				
INTEREST_RATE(-1) - 107.137114614) + C(22)(NPL(-1) -				
0.348832825984*CAPITAL_ADEQUACY(-1) + 0.223031869547				
*PROJECT_LENGTH(-1) - 0.539034139833*PROJECT_COST(-1) +				

43.2469379537*INFLATION_RATE(-1) + 0.682211215805*GDP(-1) +				
0.0194845786752*EXCHANGE RATE(-1) - 71.06188907				
INTEREST_RATE(-1) + 28.5852322064) + C(23)(TOTAL_ASSETS(				
-1) + 0.273681819203*CAPITAL_ADEQUACY(-1) - 0.512048503094				
*PROJECT_LENGTH(-1) + 0.822761854024*PROJECT_COST(-1) -				
84.4308934481*INFLATION_RATE(-1) - 1.46531193894*GDP(-1) -				
0.173176503657*EXCHANGE RATE(-1) + 153.34517167				
*INTEREST_RATE(-1) - 81.9072293917) + C(24)*D(ROAD_INFRASTR				
UCTURE_FINA(-1)) + C(25)*D(LIQUIDITY(-1)) + C(26)				
*D(PROFITABILITY(-1)) + C(27)*D(NPL(-1)) + C(28)*D(TOTAL_ASSETS				
(-1)) + C(29)*D(CAPITAL_ADEQUACY(-1)) + C(30)*D(PROJECT_LENG				
TH(-1)) + C(31)*D(PROJECT_COST(-1)) + C(32)*D(INFLATION_RATE(				
-1)) + C(33)*D(GDP(-1)) + C(34)*D(EXCHANGE RATE(-1)) + C(35)				
*D(INTEREST_RATE(-1)) + C(36)				
Observations: 208				
R-squared	0.087175	Mean dependent var		-2.02E-05
Adjusted R-squared	0.005502	S.D. dependent var		0.009494
S.E. of regression	0.009468	Sum squared resid		0.017031
Durbin-Watson stat	2.031568			
Equation: D(PROFITABILITY) = C(37)*(ROAD INFRASTRUCTURE FINANCING (				
-1) - 2.48037308436*CAPITAL_ADEQUACY(-1) + 1.19367060655				
*PROJECT_LENGTH(-1) - 5.63376251932*PROJECT_COST(-1) +				

65.2257969288*INFLATION_RATE(-1) + 1.83905445128*GDP(-1) +				
0.313123934427*EXCHANGE RATE(-1) + 10.8647974326				
INTEREST_RATE(-1) - 39.2207850488) + C(38)(LIQUIDITY(-1) -				
0.00287390299715*CAPITAL_ADEQUACY(-1) + 0.00794757748287				
*PROJECT_LENGTH(-1) - 0.0228105255566*PROJECT_COST(-1) +				
1.43479258526*INFLATION_RATE(-1) + 0.0215853190902*GDP(-1) +				
0.00251113149953*EXCHANGE RATE(-1) - 2.06583967654				
INTEREST_RATE(-1) - 0.410463298469) + C(39)(PROFITABILITY(				
-1) - 2.39723491565*CAPITAL_ADEQUACY(-1) + 0.666918002237				
*PROJECT_LENGTH(-1) - 3.94501773741*PROJECT_COST(-1) +				
162.635248106*INFLATION_RATE(-1) + 2.92410190292*GDP(-1) +				
0.241903199205*EXCHANGE RATE(-1) - 27.7712511057				
INTEREST_RATE(-1) - 107.137114614) + C(40)(NPL(-1) -				
0.348832825984*CAPITAL_ADEQUACY(-1) + 0.223031869547				
*PROJECT_LENGTH(-1) - 0.539034139833*PROJECT_COST(-1) +				
43.2469379537*INFLATION_RATE(-1) + 0.682211215805*GDP(-1) +				
0.0194845786752*EXCHANGE RATE(-1) - 71.06188907				
INTEREST_RATE(-1) + 28.5852322064) + C(41)(TOTAL_ASSETS(				
-1) + 0.273681819203*CAPITAL_ADEQUACY(-1) - 0.512048503094				
*PROJECT_LENGTH(-1) + 0.822761854024*PROJECT_COST(-1) -				
84.4308934481*INFLATION_RATE(-1) - 1.46531193894*GDP(-1) -				

0.173176503657*EXCHANGE RATE(-1) + 153.34517167				
*INTEREST_RATE(-1) - 81.9072293917) + C(42)*D(ROAD_INFRASTR				
UCTURE_FINA(-1)) + C(43)*D(LIQUIDITY(-1)) + C(44)				
*D(PROFITABILITY(-1)) + C(45)*D(NPL(-1)) + C(46)*D(TOTAL_ASSETS				
(-1)) + C(47)*D(CAPITAL_ADEQUACY(-1)) + C(48)*D(PROJECT_LENG				
TH(-1)) + C(49)*D(PROJECT_COST(-1)) + C(50)*D(INFLATION_RATE(				
-1)) + C(51)*D(GDP(-1)) + C(52)*D(EXCHANGE RATE(-1)) + C(53)				
*D(INTEREST_RATE(-1)) + C(54)				
Observations: 208				
R-squared	0.359715	Mean dependent var		0.040294
Adjusted R-squared	0.302426	S.D. dependent var		8.101618
S.E. of regression	6.766543	Sum squared resid		8699.36
Durbin-Watson stat	2.012919			
Equation: D(NPL) = C(55)*(ROAD INFRASTRUCTURE FINANCING (-1) -				
2.48037308436*CAPITAL_ADEQUACY(-1) + 1.19367060655				
*PROJECT_LENGTH(-1) - 5.63376251932*PROJECT_COST(-1) +				
65.2257969288*INFLATION_RATE(-1) + 1.83905445128*GDP(-1) +				
0.313123934427*EXCHANGE RATE(-1) + 10.8647974326				
INTEREST_RATE(-1) - 39.2207850488) + C(56)(LIQUIDITY(-1) -				
0.00287390299715*CAPITAL_ADEQUACY(-1) + 0.00794757748287				
*PROJECT_LENGTH(-1) - 0.0228105255566*PROJECT_COST(-1) +				
1.43479258526*INFLATION_RATE(-1) + 0.0215853190902*GDP(-1) +				

0.00251113149953*EXCHANGE RATE(-1) - 2.06583967654				
INTEREST_RATE(-1) - 0.410463298469) + C(57)(PROFITABILITY(				
-1) - 2.39723491565*CAPITAL_ADEQUACY(-1) + 0.666918002237				
*PROJECT_LENGTH(-1) - 3.94501773741*PROJECT_COST(-1) +				
162.635248106*INFLATION_RATE(-1) + 2.92410190292*GDP(-1) +				
0.241903199205*EXCHANGE RATE(-1) - 27.7712511057				
INTEREST_RATE(-1) - 107.137114614) + C(58)(NPL(-1) -				
0.348832825984*CAPITAL_ADEQUACY(-1) + 0.223031869547				
*PROJECT_LENGTH(-1) - 0.539034139833*PROJECT_COST(-1) +				
43.2469379537*INFLATION_RATE(-1) + 0.682211215805*GDP(-1) +				
0.0194845786752*EXCHANGE RATE(-1) - 71.06188907				
INTEREST_RATE(-1) + 28.5852322064) + C(59)(TOTAL_ASSETS(				
-1) + 0.273681819203*CAPITAL_ADEQUACY(-1) - 0.512048503094				
*PROJECT_LENGTH(-1) + 0.822761854024*PROJECT_COST(-1) -				
84.4308934481*INFLATION_RATE(-1) - 1.46531193894*GDP(-1) -				
0.173176503657*EXCHANGE RATE(-1) + 153.34517167				
*INTEREST_RATE(-1) - 81.9072293917) + C(60)*D(ROAD_INFRASTR				
UCTURE_FINA(-1)) + C(61)*D(LIQUIDITY(-1)) + C(62)				
*D(PROFITABILITY(-1)) + C(63)*D(NPL(-1)) + C(64)*D(TOTAL_ASSETS				
(-1)) + C(65)*D(CAPITAL_ADEQUACY(-1)) + C(66)*D(PROJECT_LENG				
TH(-1)) + C(67)*D(PROJECT_COST(-1)) + C(68)*D(INFLATION_RATE(				

-1)) + C(69)*D(GDP(-1)) + C(70)*D(EXCHANGE RATE(-1)) + C(71)				
*D(INTEREST_RATE(-1)) + C(72)				
Observations: 208				
R-squared	0.267284	Mean dependent var		0.012788
Adjusted R-squared	0.201725	S.D. dependent var		0.394591
S.E. of regression	0.352552	Sum squared resid		23.61572
Durbin-Watson stat	2.001946			
Equation: D(TOTAL_ASSETS) = C(73)*(ROAD INFRASTRUCTURE FINANCING (				
-1) - 2.48037308436*CAPITAL_ADEQUACY(-1) + 1.19367060655				
*PROJECT_LENGTH(-1) - 5.63376251932*PROJECT_COST(-1) +				
65.2257969288*INFLATION_RATE(-1) + 1.83905445128*GDP(-1) +				
0.313123934427*EXCHANGE RATE(-1) + 10.8647974326				
INTEREST_RATE(-1) - 39.2207850488) + C(74)(LIQUIDITY(-1) -				
0.00287390299715*CAPITAL_ADEQUACY(-1) + 0.00794757748287				
*PROJECT_LENGTH(-1) - 0.0228105255566*PROJECT_COST(-1) +				
1.43479258526*INFLATION_RATE(-1) + 0.0215853190902*GDP(-1) +				
0.00251113149953*EXCHANGE RATE(-1) - 2.06583967654				
INTEREST_RATE(-1) - 0.410463298469) + C(75)(PROFITABILITY(				
-1) - 2.39723491565*CAPITAL_ADEQUACY(-1) + 0.666918002237				
*PROJECT_LENGTH(-1) - 3.94501773741*PROJECT_COST(-1) +				
162.635248106*INFLATION_RATE(-1) + 2.92410190292*GDP(-1) +				
0.241903199205*EXCHANGE RATE(-1) - 27.7712511057				

INTEREST_RATE(-1) - 107.137114614) + C(76)(NPL(-1) -				
0.348832825984*CAPITAL_ADEQUACY(-1) + 0.223031869547				
*PROJECT_LENGTH(-1) - 0.539034139833*PROJECT_COST(-1) +				
43.2469379537*INFLATION_RATE(-1) + 0.682211215805*GDP(-1) +				
0.0194845786752*EXCHANGE RATE(-1) - 71.06188907				
INTEREST_RATE(-1) + 28.5852322064) + C(77)(TOTAL_ASSETS(				
-1) + 0.273681819203*CAPITAL_ADEQUACY(-1) - 0.512048503094				
*PROJECT_LENGTH(-1) + 0.822761854024*PROJECT_COST(-1) -				
84.4308934481*INFLATION_RATE(-1) - 1.46531193894*GDP(-1) -				
0.173176503657*EXCHANGE RATE(-1) + 153.34517167				
*INTEREST_RATE(-1) - 81.9072293917) + C(78)*D(ROAD_INFRASTR				
UCTURE_FINA(-1)) + C(79)*D(LIQUIDITY(-1)) + C(80)				
*D(PROFITABILITY(-1)) + C(81)*D(NPL(-1)) + C(82)*D(TOTAL_ASSETS				
(-1)) + C(83)*D(CAPITAL_ADEQUACY(-1)) + C(84)*D(PROJECT_LENG				
TH(-1)) + C(85)*D(PROJECT_COST(-1)) + C(86)*D(INFLATION_RATE(				
-1)) + C(87)*D(GDP(-1)) + C(88)*D(EXCHANGE RATE(-1)) + C(89)				
*D(INTEREST_RATE(-1)) + C(90)				
Observations: 208				
R-squared	0.413973	Mean dependent var		-0.01414
Adjusted R-squared	0.36154	S.D. dependent var		4.767726
S.E. of regression	3.809591	Sum squared resid		2757.466
Durbin-Watson stat	1.983253			

Equation: D(CAPITAL_ADEQUACY) = C(91)*(ROAD_INFRASTRUCTURE_				
FINA(-1) - 2.48037308436*CAPITAL_ADEQUACY(-1) + 1.19367060655				
*PROJECT_LENGTH(-1) - 5.63376251932*PROJECT_COST(-1) +				
65.2257969288*INFLATION_RATE(-1) + 1.83905445128*GDP(-1) +				
0.313123934427*EXCHANGE RATE(-1) + 10.8647974326				
INTEREST_RATE(-1) - 39.2207850488) + C(92)(LIQUIDITY(-1) -				
0.00287390299715*CAPITAL_ADEQUACY(-1) + 0.00794757748287				
*PROJECT_LENGTH(-1) - 0.0228105255566*PROJECT_COST(-1) +				
1.43479258526*INFLATION_RATE(-1) + 0.0215853190902*GDP(-1) +				
0.00251113149953*EXCHANGE RATE(-1) - 2.06583967654				
INTEREST_RATE(-1) - 0.410463298469) + C(93)(PROFITABILITY(				
-1) - 2.39723491565*CAPITAL_ADEQUACY(-1) + 0.666918002237				
*PROJECT_LENGTH(-1) - 3.94501773741*PROJECT_COST(-1) +				
162.635248106*INFLATION_RATE(-1) + 2.92410190292*GDP(-1) +				
0.241903199205*EXCHANGE RATE(-1) - 27.7712511057				
INTEREST_RATE(-1) - 107.137114614) + C(94)(NPL(-1) -				
0.348832825984*CAPITAL_ADEQUACY(-1) + 0.223031869547				
*PROJECT_LENGTH(-1) - 0.539034139833*PROJECT_COST(-1) +				
43.2469379537*INFLATION_RATE(-1) + 0.682211215805*GDP(-1) +				
0.0194845786752*EXCHANGE RATE(-1) - 71.06188907				
INTEREST_RATE(-1) + 28.5852322064) + C(95)(TOTAL_ASSETS(				

-1) + 0.273681819203*CAPITAL_ADEQUACY(-1) - 0.512048503094				
*PROJECT_LENGTH(-1) + 0.822761854024*PROJECT_COST(-1) -				
84.4308934481*INFLATION_RATE(-1) - 1.46531193894*GDP(-1) -				
0.173176503657*EXCHANGE RATE(-1) + 153.34517167				
*INTEREST_RATE(-1) - 81.9072293917) + C(96)*D(ROAD_INFRASTR				
UCTURE_FINA(-1)) + C(97)*D(LIQUIDITY(-1)) + C(98)				
*D(PROFITABILITY(-1)) + C(99)*D(NPL(-1)) + C(100)				
*D(TOTAL_ASSETS(-1)) + C(101)*D(CAPITAL_ADEQUACY(-1)) +				
C(102)*D(PROJECT_LENGTH(-1)) + C(103)*D(PROJECT_COST(-1))				
+ C(104)*D(INFLATION_RATE(-1)) + C(105)*D(GDP(-1)) + C(106)				
*D(EXCHANGE RATE(-1)) + C(107)*D(INTEREST_RATE(-1)) +				
C(108)				
Observations: 208				
R-squared	0.146763	Mean dependent var		0.010192
Adjusted R-squared	0.07042	S.D. dependent var		0.357044
S.E. of regression	0.344243	Sum squared resid		22.51556
Durbin-Watson stat	1.890122			
Equation: D(PROJECT_LENGTH) = C(109)*(ROAD_INFRASTRUCTURE_F				
INA(-1) - 2.48037308436*CAPITAL_ADEQUACY(-1) + 1.19367060655				
*PROJECT_LENGTH(-1) - 5.63376251932*PROJECT_COST(-1) +				
65.2257969288*INFLATION_RATE(-1) + 1.83905445128*GDP(-1) +				
0.313123934427*EXCHANGE RATE(-1) + 10.8647974326				

INTEREST_RATE(-1) - 39.2207850488) + C(110)(LIQUIDITY(-1) -				
0.00287390299715*CAPITAL_ADEQUACY(-1) + 0.00794757748287				
*PROJECT_LENGTH(-1) - 0.0228105255566*PROJECT_COST(-1) +				
1.43479258526*INFLATION_RATE(-1) + 0.0215853190902*GDP(-1) +				
0.00251113149953*EXCHANGE RATE(-1) - 2.06583967654				
INTEREST_RATE(-1) - 0.410463298469) + C(111)(PROFITABILITY(				
-1) - 2.39723491565*CAPITAL_ADEQUACY(-1) + 0.666918002237				
*PROJECT_LENGTH(-1) - 3.94501773741*PROJECT_COST(-1) +				
162.635248106*INFLATION_RATE(-1) + 2.92410190292*GDP(-1) +				
0.241903199205*EXCHANGE RATE(-1) - 27.7712511057				
INTEREST_RATE(-1) - 107.137114614) + C(112)(NPL(-1) -				
0.348832825984*CAPITAL_ADEQUACY(-1) + 0.223031869547				
*PROJECT_LENGTH(-1) - 0.539034139833*PROJECT_COST(-1) +				
43.2469379537*INFLATION_RATE(-1) + 0.682211215805*GDP(-1) +				
0.0194845786752*EXCHANGE RATE(-1) - 71.06188907				
INTEREST_RATE(-1) + 28.5852322064) + C(113)(TOTAL_ASSETS(				
-1) + 0.273681819203*CAPITAL_ADEQUACY(-1) - 0.512048503094				
*PROJECT_LENGTH(-1) + 0.822761854024*PROJECT_COST(-1) -				
84.4308934481*INFLATION_RATE(-1) - 1.46531193894*GDP(-1) -				
0.173176503657*EXCHANGE RATE(-1) + 153.34517167				
*INTEREST_RATE(-1) - 81.9072293917) + C(114)*D(ROAD_INFRAST				

RUCTURE_FINA(-1)) + C(115)*D(LIQUIDITY(-1)) + C(116)				
*D(PROFITABILITY(-1)) + C(117)*D(NPL(-1)) + C(118)				
*D(TOTAL_ASSETS(-1)) + C(119)*D(CAPITAL_ADEQUACY(-1)) +				
C(120)*D(PROJECT_LENGTH(-1)) + C(121)*D(PROJECT_COST(-1))				
+ C(122)*D(INFLATION_RATE(-1)) + C(123)*D(GDP(-1)) + C(124)				
*D(EXCHANGE RATE(-1)) + C(125)*D(INTEREST_RATE(-1)) +				
C(126)				
Observations: 208				
R-squared	0.106592	Mean dependent var		0.038462
Adjusted R-squared	0.026655	S.D. dependent var		3.779766
S.E. of regression	3.72905	Sum squared resid		2642.105
Durbin-Watson stat	2.045492			
Equation: D(PROJECT_COST) = C(127)*(ROAD_INFRASTRUCTURE_FIN				
A(-1) - 2.48037308436*CAPITAL_ADEQUACY(-1) + 1.19367060655				
*PROJECT_LENGTH(-1) - 5.63376251932*PROJECT_COST(-1) +				
65.2257969288*INFLATION_RATE(-1) + 1.83905445128*GDP(-1) +				
0.313123934427*EXCHANGE RATE(-1) + 10.8647974326				
INTEREST_RATE(-1) - 39.2207850488) + C(128)(LIQUIDITY(-1) -				
0.00287390299715*CAPITAL_ADEQUACY(-1) + 0.00794757748287				
*PROJECT_LENGTH(-1) - 0.0228105255566*PROJECT_COST(-1) +				
1.43479258526*INFLATION_RATE(-1) + 0.0215853190902*GDP(-1) +				
0.00251113149953*EXCHANGE RATE(-1) - 2.06583967654				

INTEREST_RATE(-1) - 0.410463298469) + C(129)(PROFITABILITY(				
-1) - 2.39723491565*CAPITAL_ADEQUACY(-1) + 0.666918002237				
*PROJECT_LENGTH(-1) - 3.94501773741*PROJECT_COST(-1) +				
162.635248106*INFLATION_RATE(-1) + 2.92410190292*GDP(-1) +				
0.241903199205*EXCHANGE RATE(-1) - 27.7712511057				
INTEREST_RATE(-1) - 107.137114614) + C(130)(NPL(-1) -				
0.348832825984*CAPITAL_ADEQUACY(-1) + 0.223031869547				
*PROJECT_LENGTH(-1) - 0.539034139833*PROJECT_COST(-1) +				
43.2469379537*INFLATION_RATE(-1) + 0.682211215805*GDP(-1) +				
0.0194845786752*EXCHANGE RATE(-1) - 71.06188907				
INTEREST_RATE(-1) + 28.5852322064) + C(131)(TOTAL_ASSETS(				
-1) + 0.273681819203*CAPITAL_ADEQUACY(-1) - 0.512048503094				
*PROJECT_LENGTH(-1) + 0.822761854024*PROJECT_COST(-1) -				
84.4308934481*INFLATION_RATE(-1) - 1.46531193894*GDP(-1) -				
0.173176503657*EXCHANGE RATE(-1) + 153.34517167				
*INTEREST_RATE(-1) - 81.9072293917) + C(132)*D(ROAD_INFRAST				
RUCTURE_FINA(-1)) + C(133)*D(LIQUIDITY(-1)) + C(134)				
*D(PROFITABILITY(-1)) + C(135)*D(NPL(-1)) + C(136)				
*D(TOTAL_ASSETS(-1)) + C(137)*D(CAPITAL_ADEQUACY(-1)) +				
C(138)*D(PROJECT_LENGTH(-1)) + C(139)*D(PROJECT_COST(-1))				
+ C(140)*D(INFLATION_RATE(-1)) + C(141)*D(GDP(-1)) + C(142)				

*D(EXCHANGE RATE(-1)) + C(143)*D(INTEREST_RATE(-1)) +				
C(144)				
Observations: 208				
R-squared	0.46801	Mean dependent var		0.04946
Adjusted R-squared	0.420411	S.D. dependent var		6.221025
S.E. of regression	4.736115	Sum squared resid		4261.849
Durbin-Watson stat	2.039988			
Equation: D(INFLATION_RATE) = C(145)*(ROAD_INFRASTRUCTURE_FIN				
A(-1) - 2.48037308436*CAPITAL_ADEQUACY(-1) + 1.19367060655				
*PROJECT_LENGTH(-1) - 5.63376251932*PROJECT_COST(-1) +				
65.2257969288*INFLATION_RATE(-1) + 1.83905445128*GDP(-1) +				
0.313123934427*EXCHANGE RATE(-1) + 10.8647974326				
INTEREST_RATE(-1) - 39.2207850488) + C(146)(LIQUIDITY(-1) -				
0.00287390299715*CAPITAL_ADEQUACY(-1) + 0.00794757748287				
*PROJECT_LENGTH(-1) - 0.0228105255566*PROJECT_COST(-1) +				
1.43479258526*INFLATION_RATE(-1) + 0.0215853190902*GDP(-1) +				
0.00251113149953*EXCHANGE RATE(-1) - 2.06583967654				
INTEREST_RATE(-1) - 0.410463298469) + C(147)(PROFITABILITY(				
-1) - 2.39723491565*CAPITAL_ADEQUACY(-1) + 0.666918002237				
*PROJECT_LENGTH(-1) - 3.94501773741*PROJECT_COST(-1) +				
162.635248106*INFLATION_RATE(-1) + 2.92410190292*GDP(-1) +				
0.241903199205*EXCHANGE RATE(-1) - 27.7712511057				

INTEREST_RATE(-1) - 107.137114614) + C(148)(NPL(-1) -				
0.348832825984*CAPITAL_ADEQUACY(-1) + 0.223031869547				
*PROJECT_LENGTH(-1) - 0.539034139833*PROJECT_COST(-1) +				
43.2469379537*INFLATION_RATE(-1) + 0.682211215805*GDP(-1) +				
0.0194845786752*EXCHANGE RATE(-1) - 71.06188907				
INTEREST_RATE(-1) + 28.5852322064) + C(149)(TOTAL_ASSETS(				
-1) + 0.273681819203*CAPITAL_ADEQUACY(-1) - 0.512048503094				
*PROJECT_LENGTH(-1) + 0.822761854024*PROJECT_COST(-1) -				
84.4308934481*INFLATION_RATE(-1) - 1.46531193894*GDP(-1) -				
0.173176503657*EXCHANGE RATE(-1) + 153.34517167				
*INTEREST_RATE(-1) - 81.9072293917) + C(150)*D(ROAD_INFRAST				
RUCTURE_FINA(-1)) + C(151)*D(LIQUIDITY(-1)) + C(152)				
*D(PROFITABILITY(-1)) + C(153)*D(NPL(-1)) + C(154)				
*D(TOTAL_ASSETS(-1)) + C(155)*D(CAPITAL_ADEQUACY(-1)) +				
C(156)*D(PROJECT_LENGTH(-1)) + C(157)*D(PROJECT_COST(-1))				
+ C(158)*D(INFLATION_RATE(-1)) + C(159)*D(GDP(-1)) + C(160)				
*D(EXCHANGE RATE(-1)) + C(161)*D(INTEREST_RATE(-1)) +				
C(162)				
Observations: 208				
R-squared	0.159319	Mean dependent var		0.000128
Adjusted R-squared	0.0841	S.D. dependent var		0.012038
S.E. of regression	0.01152	Sum squared resid		0.025217
Durbin-Watson stat	2.019848			

Equation: D(GDP) = C(163)*(ROAD INFRASTRUCTURE FINANCING (-1) -				
2.48037308436*CAPITAL_ADEQUACY(-1) + 1.19367060655				
*PROJECT_LENGTH(-1) - 5.63376251932*PROJECT_COST(-1) +				
65.2257969288*INFLATION_RATE(-1) + 1.83905445128*GDP(-1) +				
0.313123934427*EXCHANGE RATE(-1) + 10.8647974326				
INTEREST_RATE(-1) - 39.2207850488) + C(164)(LIQUIDITY(-1) -				
0.00287390299715*CAPITAL_ADEQUACY(-1) + 0.00794757748287				
*PROJECT_LENGTH(-1) - 0.0228105255566*PROJECT_COST(-1) +				
1.43479258526*INFLATION_RATE(-1) + 0.0215853190902*GDP(-1) +				
0.00251113149953*EXCHANGE RATE(-1) - 2.06583967654				
INTEREST_RATE(-1) - 0.410463298469) + C(165)(PROFITABILITY(				
-1) - 2.39723491565*CAPITAL_ADEQUACY(-1) + 0.666918002237				
*PROJECT_LENGTH(-1) - 3.94501773741*PROJECT_COST(-1) +				
162.635248106*INFLATION_RATE(-1) + 2.92410190292*GDP(-1) +				
0.241903199205*EXCHANGE RATE(-1) - 27.7712511057				
INTEREST_RATE(-1) - 107.137114614) + C(166)(NPL(-1) -				
0.348832825984*CAPITAL_ADEQUACY(-1) + 0.223031869547				
*PROJECT_LENGTH(-1) - 0.539034139833*PROJECT_COST(-1) +				
43.2469379537*INFLATION_RATE(-1) + 0.682211215805*GDP(-1) +				
0.0194845786752*EXCHANGE RATE(-1) - 71.06188907				
INTEREST_RATE(-1) + 28.5852322064) + C(167)(TOTAL_ASSETS(				

-1) + 0.273681819203*CAPITAL_ADEQUACY(-1) - 0.512048503094				
*PROJECT_LENGTH(-1) + 0.822761854024*PROJECT_COST(-1) -				
84.4308934481*INFLATION_RATE(-1) - 1.46531193894*GDP(-1) -				
0.173176503657*EXCHANGE RATE(-1) + 153.34517167				
*INTEREST_RATE(-1) - 81.9072293917) + C(168)*D(ROAD_INFRAST				
RUCTURE_FINA(-1)) + C(169)*D(LIQUIDITY(-1)) + C(170)				
*D(PROFITABILITY(-1)) + C(171)*D(NPL(-1)) + C(172)				
*D(TOTAL_ASSETS(-1)) + C(173)*D(CAPITAL_ADEQUACY(-1)) +				
C(174)*D(PROJECT_LENGTH(-1)) + C(175)*D(PROJECT_COST(-1))				
+ C(176)*D(INFLATION_RATE(-1)) + C(177)*D(GDP(-1)) + C(178)				
*D(EXCHANGE RATE(-1)) + C(179)*D(INTEREST_RATE(-1)) +				
C(180)				
Observations: 208				
R-squared	0.100849	Mean dependent var		-0.00481
Adjusted R-squared	0.020398	S.D. dependent var		0.869769
S.E. of regression	0.860853	Sum squared resid		140.8028
Durbin-Watson stat	2.002741			
Equation: D(EXCHANGE RATE) = C(181)*(ROAD_INFRASTRUCTURE_				
FINA(-1) - 2.48037308436*CAPITAL_ADEQUACY(-1) + 1.19367060655				
*PROJECT_LENGTH(-1) - 5.63376251932*PROJECT_COST(-1) +				
65.2257969288*INFLATION_RATE(-1) + 1.83905445128*GDP(-1) +				
0.313123934427*EXCHANGE RATE(-1) + 10.8647974326				

INTEREST_RATE(-1) - 39.2207850488) + C(182)(LIQUIDITY(-1) -				
0.00287390299715*CAPITAL_ADEQUACY(-1) + 0.00794757748287				
*PROJECT_LENGTH(-1) - 0.0228105255566*PROJECT_COST(-1) +				
1.43479258526*INFLATION_RATE(-1) + 0.0215853190902*GDP(-1) +				
0.00251113149953*EXCHANGE RATE(-1) - 2.06583967654				
INTEREST_RATE(-1) - 0.410463298469) + C(183)(PROFITABILITY(				
-1) - 2.39723491565*CAPITAL_ADEQUACY(-1) + 0.666918002237				
*PROJECT_LENGTH(-1) - 3.94501773741*PROJECT_COST(-1) +				
162.635248106*INFLATION_RATE(-1) + 2.92410190292*GDP(-1) +				
0.241903199205*EXCHANGE RATE(-1) - 27.7712511057				
INTEREST_RATE(-1) - 107.137114614) + C(184)(NPL(-1) -				
0.348832825984*CAPITAL_ADEQUACY(-1) + 0.223031869547				
*PROJECT_LENGTH(-1) - 0.539034139833*PROJECT_COST(-1) +				
43.2469379537*INFLATION_RATE(-1) + 0.682211215805*GDP(-1) +				
0.0194845786752*EXCHANGE RATE(-1) - 71.06188907				
INTEREST_RATE(-1) + 28.5852322064) + C(185)(TOTAL_ASSETS(				
-1) + 0.273681819203*CAPITAL_ADEQUACY(-1) - 0.512048503094				
*PROJECT_LENGTH(-1) + 0.822761854024*PROJECT_COST(-1) -				
84.4308934481*INFLATION_RATE(-1) - 1.46531193894*GDP(-1) -				
0.173176503657*EXCHANGE RATE(-1) + 153.34517167				
*INTEREST_RATE(-1) - 81.9072293917) + C(186)*D(ROAD_INFRAST				

RUCTURE_FINA(-1)) + C(187)*D(LIQUIDITY(-1)) + C(188)				
*D(PROFITABILITY(-1)) + C(189)*D(NPL(-1)) + C(190)				
*D(TOTAL_ASSETS(-1)) + C(191)*D(CAPITAL_ADEQUACY(-1)) +				
C(192)*D(PROJECT_LENGTH(-1)) + C(193)*D(PROJECT_COST(-1))				
+ C(194)*D(INFLATION_RATE(-1)) + C(195)*D(GDP(-1)) + C(196)				
*D(EXCHANGE RATE(-1)) + C(197)*D(INTEREST_RATE(-1)) +				
C(198)				
Observations: 208				
R-squared	0.180555	Mean dependent var		0.249053
Adjusted R-squared	0.107236	S.D. dependent var		1.503054
S.E. of regression	1.420179	Sum squared resid		383.2126
Durbin-Watson stat	1.868403			
Equation: D(INTEREST_RATE) = C(199)*(ROAD_INFRASTRUCTURE_FIN				
A(-1) - 2.48037308436*CAPITAL_ADEQUACY(-1) + 1.19367060655				
*PROJECT_LENGTH(-1) - 5.63376251932*PROJECT_COST(-1) +				
65.2257969288*INFLATION_RATE(-1) + 1.83905445128*GDP(-1) +				
0.313123934427*EXCHANGE RATE(-1) + 10.8647974326				
INTEREST_RATE(-1) - 39.2207850488) + C(200)(LIQUIDITY(-1) -				
0.00287390299715*CAPITAL_ADEQUACY(-1) + 0.00794757748287				
*PROJECT_LENGTH(-1) - 0.0228105255566*PROJECT_COST(-1) +				
1.43479258526*INFLATION_RATE(-1) + 0.0215853190902*GDP(-1) +				
0.00251113149953*EXCHANGE RATE(-1) - 2.06583967654				

INTEREST_RATE(-1) - 0.410463298469) + C(201)(PROFITABILITY(				
-1) - 2.39723491565*CAPITAL_ADEQUACY(-1) + 0.666918002237				
*PROJECT_LENGTH(-1) - 3.94501773741*PROJECT_COST(-1) +				
162.635248106*INFLATION_RATE(-1) + 2.92410190292*GDP(-1) +				
0.241903199205*EXCHANGE RATE(-1) - 27.7712511057				
INTEREST_RATE(-1) - 107.137114614) + C(202)(NPL(-1) -				
0.348832825984*CAPITAL_ADEQUACY(-1) + 0.223031869547				
*PROJECT_LENGTH(-1) - 0.539034139833*PROJECT_COST(-1) +				
43.2469379537*INFLATION_RATE(-1) + 0.682211215805*GDP(-1) +				
0.0194845786752*EXCHANGE RATE(-1) - 71.06188907				
INTEREST_RATE(-1) + 28.5852322064) + C(203)(TOTAL_ASSETS(				
-1) + 0.273681819203*CAPITAL_ADEQUACY(-1) - 0.512048503094				
*PROJECT_LENGTH(-1) + 0.822761854024*PROJECT_COST(-1) -				
84.4308934481*INFLATION_RATE(-1) - 1.46531193894*GDP(-1) -				
0.173176503657*EXCHANGE RATE(-1) + 153.34517167				
*INTEREST_RATE(-1) - 81.9072293917) + C(204)*D(ROAD_INFRAST				
RUCTURE_FINA(-1)) + C(205)*D(LIQUIDITY(-1)) + C(206)				
*D(PROFITABILITY(-1)) + C(207)*D(NPL(-1)) + C(208)				
*D(TOTAL_ASSETS(-1)) + C(209)*D(CAPITAL_ADEQUACY(-1)) +				
C(210)*D(PROJECT_LENGTH(-1)) + C(211)*D(PROJECT_COST(-1))				
+ C(212)*D(INFLATION_RATE(-1)) + C(213)*D(GDP(-1)) + C(214)				

*D(EXCHANGE RATE(-1)) + C(215)*D(INTEREST_RATE(-1)) +				
C(216)				
Observations: 208				
R-squared	0.160453	Mean dependent var		-2.79E-05
Adjusted R-squared	0.085336	S.D. dependent var		0.017909
S.E. of regression	0.017128	Sum squared resid		0.055741
Durbin-Watson stat	1.960459			