



**THE RISK APPETITE OF DEVELOPMENT FINANCE INSTITUTIONS (DFIs) AND
FUNDING OF STARTUPS IN SOUTH AFRICA**

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Abstract

Using publicly available data from three South African Development Finance Institutions (DFI's), this study examines the risk appetite of Business Partners (BP), the National Empowerment Fund (NEF) and the Small Enterprise Finance Agency (SEFA). This study analyses data between 2011 and 2015 to determine the DFI's risk appetite and to identify key determinants of risk appetite with regard to funding SMEs, specifically startups. The study's findings reveal that South African DFI's have a high to extremely high-risk appetite level and that state-owned DFI's, NEF and SEFA have a higher risk appetite for funding SMEs specifically startup related loan products than private DFI BP. The study's findings also illustrates that South African DFI's risk appetites have a weaker negative relationship with shorter-term financial products than longer-term financial products indicating a higher risk appetite for funding shorter-term financial products.

Keywords: Development Finance Institution, Risk Appetite, SME, Startup.

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GLOSSARY OF TERMS

BBBEE:	Broad-Based Black Economic Empowerment
BER:	Bureau of Economic Research
DFIID:	Development Finance Institutions Identity
DFIT:	Development Finance Institution Type
FRC:	Financial Reporting Council
GDP:	Gross Domestic Product
GDPGSALG:	Gross Domestic Product Growth for South Africa – lagged variable
GEM:	Global Entrepreneurship Monitor
GLS:	Generalized Least Squares
IPFA:	The International Project Finance Association
ISO:	International Organization for Standardization
KCI:	Key Control Indicators
KI:	Key Indicators
KPE:	Key Performance Enablers
KPI:	Key Performance Indicators
KRI:	Key Risk Indicators
LTLE:	Long-term Loan Exposure
NCR:	National Credit Regulator
OECD:	Organization for Economic Co-operation and Development
RA:	Risk Appetite
RAF:	Risk Appetite Framework
RIMS:	The Risk Management Society
SME:	Small and medium enterprises
SMME:	Small, micro and medium enterprise
STLE:	Short-term Loan Exposure
TALA:	Total Approved Loan Amount
TNPLSALG:	Total Non-performing Loans South Africa – lagged variable
WESS:	World Economic and Social Survey

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CHAPTER ONE

INTRODUCTION

1.1. Background of the study

Development Finance Institutions (DFIs) play a crucial role in the development of entrepreneurship in a manner that spurs growth and creates jobs. DFIs contribute to economic development through direct impact investing in small and medium enterprises (SMEs) to stimulate economic activity and positively drive growth rates. SMEs, especially startup enterprises, are critical for ensuring economic expansion and accelerated stimulation of socio-economic growth and development (Mass and Herrington, 2006) which is vital for sustained economic growth.

DFIs are specialised development focused government or private controlled financial institutions that provide finance to enterprises in order to address market failure resulting from SMEs failure to secure finance from commercial financial institutions (Dalberg, 2010). This study analyses the Risk Appetite levels of three South African DFIs whose mandate is to provide higher risk funding for enterprise development and the funding of startup ventures.

DFIs, as custodians of investments that are made into their development funds, operate within certain risk parameters which are developed and guided by their Board of Directors whose role it is to oversee their development mandate in order to achieve maximum returns while limiting levels of risk exposure. The parameters are articulated and conveyed within the funding institutions' risk appetite framework, which details the total exposure that the financial institution is prepared to undertake on the basis of risk-return trade-offs for one or more desired and expected outcomes (RIMS, 2012).

The Board of Directors, who are elected to guide the institution, are responsible for the development and implementation of their organisation's risk appetite framework. The "board determines the nature, and extent, of the significant risk the company is willing to embrace in the implementation of its strategy" (Financial Reporting Council, 2011: 3).

The development of an effective and clearly understandable risk appetite model which embodies the naturally riskier nature of startup enterprise funding requirements is a challenge based on the fact that the primary risk of any SME is the lower probability of fund repayment (Dietsch and Petey, 2002). This implies that SMEs, especially startup enterprises, are more

likely to secure funding of a short-term nature as longer-term funding has a higher probability of default.

DFI's play an important role in ensuring that small enterprises have an alternative for finance which in turn increases access to finance to the unfinanced market. The Small Enterprise assistance fund conducted a study in other developing nations wherein they found that investment in smaller enterprises is able to "generate positive financial returns" (SEAF, 2004). Small enterprises provide jobs and thus assist in the elevation of poverty through employment creation. DFIs play a pivotal role in financing the unfinanced small enterprises thus improving access to finance and the provision of semi-skilled or unskilled labour through small enterprises (SEAF, 2004)

Without sufficient funding for startup enterprises, South Africa will face challenges in sustaining and increasing its economic growth in relation to other developing economies. Developing economies have seen stronger growth rates than more advanced economies (Groepe, 2015) with Africa experiencing higher real GDP growth of 3.6% in 2015, against the global economies 3.1% and Europe's 1.5% (AEO, 2016). With Africa being the second fastest growth economy in 2015, sub-Saharan Africa (excluding South Africa) experienced economic growth of 4.2% second to the East Africa growth rate of 6.3% (AEO, 2016). South Africa in contrast has experienced a low revised growth rate of 0.4% in 2016 with 2017 and 2018 forecast to reach 1.2% and 1.6%, substantially lower than the rest of Africa (MPC, 2016).

Identifying the determinants of DFI risk appetite is instrumental in analysing DFI provision of SME finance. This research paper provides insight into how DFIs risk appetite influences the type of SME finance provided by DFIs and provision of startup funding.

1.2. Statement of the problem

DFIs are established to promote access to finance for enterprises and infrastructure projects which are unable to secure funding based on their risk profile. According to Massa in a book by Triki and Faye (2013), DFIs mandates are based on three principles (i) additionality, (ii) catalytic role, and (iii) sustainability focused on bridging investment gaps. With the existence of a number of DFIs in South Africa, it is interesting to note from both the 2015 and 2016 Seed Academy Annual Startup Survey that financial support is still ranked number 1 by

entrepreneurs as the area with the greatest need. The 2016 survey results reveal that 47% of respondents were unable to raise funds. The Seed Academy Survey highlights the fact that even though sufficient SME funding is available from DFIs, their risk appetite levels may not support the provision of startup finance. Only 2% of the Seed Academy Survey respondents indicated that they received funding from DFI's which is the same percentage for banks and therefore begs the question, are DFIs fulfilling their catalytic mandate principle?

In order to fully maximise the potential of enterprise development and entrepreneurship, access to finance is a hurdle that needs to be overcome. DFIs' risk appetite level indicates its willingness to provide SME finance.

To determine the risk appetite levels of DFIs and how determinants identified from the study influence SME and startup funding using risk appetite as an indication; key research questions have been developed. Access to funding is still a challenge and thus a high risk appetite from the DFI's may positively impact small enterprise development. The study attempts to obtain answers to the following questions:

- Do privately-owned DFIs in South Africa have higher risk appetite levels than state-owned DFIs?
- Do DFIs in South Africa have a higher risk appetite for startup related (short-term) funding products than for other (long-term) products?

1.3. Research Objectives

The objective of this study is to ascertain the risk appetite levels of three DFIs and how it influences DFIs' preference with regard to the provision of SME and startup funding products.

This paper will address the following objectives:

- To determine if state-owned DFIs have a higher risk appetite than private DFIs.
- To determine if South African DFIs have a higher risk appetite for startup related funding products relative to other products.

The underlying objective of this study is to ascertain if DFIs' risk appetite levels are sufficient to enable the DFIs to play a catalytic role in SME and startup finance.

1.3.1. Hypotheses

The hypotheses developed are based on the experiences of startup enterprises who believe the risk appetite levels of the DFIs negatively impact their ability to secure funding. Taking into consideration the responses from the seed academy survey of 2015 and 2016, this study aims to determine if the below hypothesis will provide results which will enable an appropriate interpretation.

In order to address the research questions and attain the study objectives, the following hypotheses are tested:

Hypothesis 1

H₀: South African State-Owned DFIs have a higher risk appetite than private DFIs.

H₁: South African State-Owned DFIs do not have a higher risk appetite

Hypothesis 2

H₀: South African DFIs have a lower risk appetite for funding startup related funding products than other products.

H₁: South African DFIs have a higher risk appetite for funding startup related funding products.

1.4. Justification and Significance of the study

The International Organization for Standardization Guide 73 on risk management vocabulary (2009) defines risk appetite as the amount and type of risk an organisation is willing to pursue or retain. Risk appetite is developed by the board of directors of an organisation to indicate parameters and level of risk exposure the organisation is prepared to take. The risk appetite also indicates the potential acceptable loss and thus guides an organisation such as DFIs' investment committee on how much risk will be acceptable. Economic development is a key mandate point for DFIs who provide high-risk funding facilities to SMEs. In order to be effective, DFIs need to have a high-risk appetite. With SMEs ranking financial support as the

number 1 need in both the 2015 and 2016 Seed Academy Annual Startup Survey, a high-risk appetite from DFIs is critical to impacting this need.

This study shall contribute to the body of knowledge through determining the Risk Appetite levels of South African DFIs and how the risk appetite levels affect the provision of certain enterprise funding products. By identifying and analysing the determinants of DFIs risk appetite, this study will provide insight into how risk appetite levels affect the funding of SMEs and startups. In addition, this study will aid DFIs in developing Risk Appetite strategies which enable the effective and efficient implementation of their development mandate. The core indicators determined will provide policy and decision makers with crucial information regarding the effectiveness of DFIs in improving access to finance for SMEs and startups.

1.5. Organisation of the study

The research paper will be organised as follows: Chapter One introduces the reader to the background information of the study followed by the problem statement relating to the need for the study to be conducted. The problem statement is then followed by the objectives of the study and the hypothesis of the study. Chapter Two identifies and reviews relevant academic literature covering risk appetite, DFIs and the funding of startups. The literature review synthesises academic research relating to the potential impact of risk appetite and how DFIs' risk appetite can affect their funding of startups.

Chapter Three identifies and reviews relevant South Africa literature covering risk appetite, DFIs and the funding of startups in South Africa. The literature review synthesises local literature relating to the potential impact of risk appetite and how DFIs risk appetite can affect their funding of startups in South Africa. Chapter Four focuses on the research methodology used in the research study. This methodology includes the research design selected for the study, the study area, sampling procedures, sources of data, data collection instruments and methodology. Chapter Five outlines the data analysis process based on the data collected. The data collected is analysed in order to test the hypotheses developed and to provide answers to the research questions outlined in the research paper. Chapter Six draws conclusions from the data analysis and provides interpretation of the results. The findings of the research are discussed and interpreted in terms of the hypotheses and research questions. Recommendations take into consideration the constraints and limitations of the study and present actions that may address the problem statement and future research.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Development finance refers to the pool of resources available for financing development in developing countries (Ocran, 2012). This pool of resources is facilitated by DFIs mandated to address market failures through investing in the private sector to impact development and the mobilisation of private sector capital (te Velde, 2011). Development finance is underpinned by the higher levels of risk that DFIs are able to tolerate. The international development finance system can be broken down into six main groups: Bilateral Donors; Private Commercial Sector; Multilateral Donors; Global Funds; NGO's and Private Philanthropy (Ocran, 2012). This study focuses on DFIs that fall within the Bilateral Donor, Private Commercial and Multilateral Donors sectors.

In this chapter, the literature concerning the role of DFIs in improving access to finance for SMEs and startups will be reviewed. The type of funding products provided by DFIs will be outlined and literature about the challenges and risks of access to finance will be reviewed. The concept of risk appetite will be explored and the determinants of risk appetite will be examined. Finally, the economic impact of startups will be discussed.

2.2 Role of DFIs in improving access to finance for SMEs

The role of DFIs is underpinned by their mandate to foster and develop sustainable economic growth through the projects and enterprises they invest in. DFIs have the capacity to provide a range of financial services aimed at addressing high-risk enterprise requirements with instruments such as loans and guarantees to investors and entrepreneurs. The development nature of DFIs enables investment and financial services to be provided to applicants who would not qualify for such services from the commercial banking sector due to their lack of collateral or security which give them a higher risk profile.

DFIs main role is the addressing of market failures through the provision of financial products which maximise the development impact in their strategic area. DFIs are regarded as “catalysts for accelerated industrialisation, economic growth and human resource development” (Gumede et al., 2011:1). In established and developing nations, DFIs have

shown the critical role that they can play in terms of transforming entire economies and providing game-changing industrial and economic intervention which results in dramatically scaled economic growth paths for impacted economies (Gumede et al., 2011). DFIs' role focuses on one or many of the following objectives: investment in a sustainable private sector; maximising development impact while ensuring long-term institutional financial stability and the mobilisation of private sector capital through financial intermediation (te Velde, 2011).

DFIs should inherently have a higher risk appetite in terms of provision of loans when compared to commercial private financial institutions as a result of their development mandate and higher tolerance levels. It is the objective of this research paper to determine if this is the case with regards to South African DFIs as a major challenge for DFIs is to refrain from crowding out private investments in lower risk projects but rather maintain focus on actively expanding access to finance to under-developed, under-invested high-risk enterprises and sectors which may have a large development impact on the economy. The success of DFIs with regards to impacting economic growth is affected by their approach to certain financial concepts of: Transaction costs; Economics of contracts; The principal-agent problem; Asymmetric Information and Moral Hazard.

2.2.1 Transaction costs

Transaction costs encompass the costs incurred by financial institutions when engaging and undertaking transactions. DFIs which are financial intermediaries have four critical roles to play with regards to transaction costs: 1) provision of adequate liquidity risk sharing; 2) reduction of inefficiencies arising from asymmetric information; 3) ensuring the incentives are well aligned, to pre-empt the problems of moral hazard and adverse selection; 4) facilitation of scale economies in the conduct of transaction and the provision of logistics (Hasman, Samartin and van Bommel, 2010). This, in essence, implies that effective DFIs should contribute immensely to the reduction of transaction costs (Ocran, 2010) which is critical for developing economies. Transaction costs are reduced by DFIs through reduced transaction processing costs and the provision of certain risk-reducing financial products thus enabling higher risk enterprises to benefit from their financial products.

2.2.2 Economics of contracts

Economic contracts impact the manner in which DFIs can reduce transaction costs. Contracts are predominately not complete as they can never unambiguously measure and address every foreseeable contingency or situation that may arise which is what defines a complete contract. In the economy, a legally incomplete contract is where parties to the contract accept the terms of the agreement which are subject to available information (Rao, 2003). The contracts have a negative impact on transaction costs which are the basis for the determination of principal and interest payments, repayment periods, collateral arrangements and other terms and conditions pursuant to the contract and thus DFIs objective is to limit these costs and their possible negative cost implications (Ocran, 2012).

2.2.3 The Principal-Agent Problem

Financial intermediation and the provision of financial services is a challenge which is hampered by the Principal-Agent problem, also referred to as the agency dilemma, which is based on the seminal work of Ross (1973) and Jensen and Meckling (1976). The Principal-Agent problem occurs as a result of asymmetric information where the principal and agent enter into a contract to perform which results in a delegation of certain authority to make decisions by the principal to the agent. With both parties to the contract being utility maximizers, there exists the potential that both parties do not share the same motivations for entering into a specific contract. This difference in motivation can result in a divergent view of performance in line with the terms of the contract entered into by the two parties. The principals' interest is in ensuring effective and efficient use of the funds provided to the agent.

DFIs experience the principal-agency problem in two scenarios: (1) as the agent with the donor or taxpayer as the principal; and (2) as the principal with the borrowing SME as the agent. The principal-agent problem is addressed by the principal through the introduction of various mechanisms and or instruments into a transaction and the contract in order to align the motivations and performance requirements of the principal and the agent. The principal-Agent problem results in agency costs which are directly dependent on the degree of information asymmetry and the cost implications of monitoring and accessing such relevant information (Ocran, 2010).

These agency costs can be high for the principal donor, taxpayer or DFI who provide the funds to the agent DFI or SME due to the need to ensure funds disbursed are used according to the agreed contracts. In high risk transactions such as startup funding where there is limited or no information on enterprise history, high agency costs can have a negative impact on the level of financial services provided by the DFIs to certain applicants or even resulting in the crowding out of more higher risk transactions due to the associated higher agency costs (Ocran, 2012).

2.2.4 Asymmetric Information

Asymmetric Information is the lack of equal available information between two parties who are engaged in a transaction (Rao, 2003). Banks or financial institutions that are focused on providing loans are concerned about the return and the repayment of a loan application which affects the risk profile of the loan application (Stiglitz and Weiss, 1981). The existence of asymmetric information results in adverse selection, creating a market for lemons (Akerlof, 1970) where applicants who are willing to pay high interest rates are on average higher risk applicants (Stiglitz and Weiss, 1981).

Transaction costs are negatively impacted by the level of asymmetric information where increasing search costs and monitoring costs negatively impact the loan applications risk profile (Huang et al., 2014). Due to credit rationing, asymmetric information is a concern as it crowds out SMEs with potential for growth and as a result limits the impact of increased SME activity in the economy (Huang et al., 2014). Financial institutions in developing economies have challenges identifying creditworthy applicants and this is largely due to asymmetric information challenges (Ocran, 2012).

2.2.5 Moral Hazard

Moral Hazard occurs when “a party which is responsible for the interest of the other party has incentive to put her own interest ahead of the other party” (Ocran, 2012: 18). This challenge occurs in financial institutions where a banker takes risks beyond certain levels knowingly because the banker can transfer those risks to another party. Moral hazard stems from asymmetric information, where approved loan applicants engage in opportunistic behaviour

resulting in a higher risk of default (Huang et al., 2014). Moral hazard exists in environments where accountability is a challenge. The existence of adverse selection and moral hazard results in credit rationing which negatively impacts any gains achieved in improving access to finance (Huang et al., 2014). Moral Hazard is inherent in development finance and thus the structure and the approval mechanisms to ensure achievement of development objectives are vital.

2.3 Types of funding products provided by DFIs

Unique characteristics of DFIs as compared to conventional financial institutions are based on an outlined provided by te Velde in 2011 where: DFI's focus on investing in sustainable private sector projects while ensuring a positive impact on development notwithstanding being viable over a long term period and mobilising private sector capital (te Velde, 2011). The DFI's ability to successfully achieve its goals is through its products which are influenced by the entities risk appetite.

DFIs have a myriad of financial and non-financial products designed and provided to SMEs. This study will focus on various types of funding products available to SMEs and startups from DFIs. The first type of funding product is a business term loan. This is offered by DFIs based on the following basic elements: Credit is extended to a business concern; a direct relationship between borrower and lender exists and the principal payment is repayable over a period longer than one year (Jacoby and Saulnier, 1942).

A term loan is a form of credit extended to a business enterprise by a DFI based on the business' ability to make repayments on the loan and profitability rather than based on security or collateral provided (Jacoby and Saulnier, 1942). The most important characteristic of a term loan is that it has a repayment period longer than 12 months thus categorising term loans under long-term funding. This type of funding is the most challenging for startup enterprises to secure.

The second product is an instalment sale agreement which is similar to term loans but has specific characteristics which separate it from term loans and these are as follows: most agreements are secured by income generating assets, buyers profile and sellers' profile; financing income generating assets/equipment can be based on a structured bulk transaction between buyer and single seller based on identical terms not based on borrowers' risk profile;

it relates specifically to commercial and industrial equipment and excludes working capital or financing of consumer goods and the relationship between lender and borrower is established through the seller intermediary (Jacoby and Saulnier, 1942). This type of funding has a repayment period that typically ranges from 24 months and beyond categorising this funding under long-term funding.

The third type of a product is bridging finance, which is categorised as a short-term loan, a type of loan provided to enterprises over a period of less than 12 months. Short term loans are provided to enterprises with the intention to meet, replace or complement existing financing already secured by the enterprises. Short term loans are utilised by businesses to finance short term or temporary cash flow and or working capital requirements of the enterprise (Isaacs, 2014).

Short term loans or bridging loans are used by companies that are experiencing rapid growth and thus require the financing to facilitate the fulfilment of sales orders alternatively. They are also used by enterprises in financial distress in order to meet their short-term financial obligations. Startup enterprises funding requirements fall predominantly in this category. Short term loans unlike term loans often require significantly less requirements and thus are more accessible to higher risk profile enterprises such as startups and depending on the reason the funding is required for, these loans can be secured against enterprise assets or can be offered on an unsecured basis (Isaacs, 2014).

Another type of product is structured finance which is “techniques employed whenever the requirements of the originator or owner of an asset, be they concerned with funding, liquidity, risk transfer, or other need, cannot be met by an existing, off-the-shelf product or instrument. Hence, to meet this need, existing products and techniques must be engineered into a tailor-made product or process. Thus, structured finance is a flexible financial engineering tool” (Fabozzi et al., 2006). This type of finance is applicable for loans that are approved for enterprises which do not fall within the standard term, instalment or short term loan product structure. This type of finance also applies to project, contract and order finance loans provided to enterprises. Structured finance refers to a “variety of debt and related securities whose promise to repay investors is backed by (1) the value of some form of financial asset or (2) the credit support from a third party to the transaction” (Fabozzi et al., 2006) such as an off-take agreement underpinned by the creditworthiness of the buyer.

The International Project Finance Association (IPFA) defines project financing as the financing of long-term infrastructure or industrial projects and public services based on a non-recourse or limited recourse financial structure, where debt and equity are used to fund the project and is paid back from the cash flows generated by the project. Project Finance also known as contract or order finance in terms of startups can be used to fund short-term projects and is not entirely limited to infrastructure or industrial projects. The most important aspect of this type of funding is the limited or non-recourse aspect where debt secured for the project/contract or order is repaid using the cash flows generated from the project/contract or order.

Key advantages of Structured Finance are: limited or non-recourse type of finance; collateral is secured using the projects or contracts assets or off-take agreement; first priority is given to the project financier in terms of repayments; can be off-balance sheet finance and the financing period is structured according to the duration of contract/order.

Key disadvantages of Structured Finance include the fact that it can take longer to structure and execute especially for larger projects; it can have higher transaction costs; it can be restrictive in terms of managerial decision making and requires disclosure of stakeholder strategy & intellectual property. These disadvantages make it a less attractive funding option for start-up enterprises.

2.4 Challenges and Risks of Access to Finance

Startup enterprises experience and face numerous challenges when attempting to secure funding. In South Africa, SME lending has been viewed as a significant problem by SMEs including startup enterprises (NCR, 2011). South Africa is seen to have a well-developed and highly concentrated financial sector dominated by banks (NCR, 2011). The availability of capital for startups and SMEs is impacted by borrower and lender factors such as interest rates charged; agency problems; asymmetric information; adverse selection and monitoring challenges (NCR, 2011).

These challenges affect SMEs alike with startups being more negatively impacted by the challenges when trying to secure finance (NCR, 2011). Enterprise specific factors which influence access to finance include managerial competencies; quality of business information; availability of collateral and networking; fluctuation of earnings; low survival rate of SMEs;

lack of accurate records and management of finances; size of enterprise; ownership structure and legal structure of enterprise (NCR, 2011) and the type and period of loans required by the enterprise.

The factors above contribute immensely to the success of startups and SMEs in terms of accessing finance. With South Africa's current low levels of entrepreneurial activity when compared to other countries, it becomes prudent to ascertain if enough support especially in terms of provision of funding, is provided to startup enterprises which have been shown to have the ability to positively impact job creation, economic growth and income distribution (Global Entrepreneurship Monitor, 2016).

The Global Entrepreneurship Monitor (2015/2016) reported that the weakest area of South Africa's entrepreneurship ecosystem is around: "government programmes and policies, school-level entrepreneurship education and training, research and development transfer, and cultural and social norms" (Global Entrepreneurship Monitor, 2016:6).

Key challenges highlighted in the Global Entrepreneurship Monitor (2015/2016) report relating to startup funding and funding initiatives include the lack of well administered funding programmes; investors and funders in South Africa are seen as too risk-averse; lack of field experience from those responsible for assessing funding applications; risk-averse banking sector which often doesn't lend to startups or SMEs; pressure of government funding programmes to be sustainable and profitable making them more risk-averse; public funding institutions tend to use same risk matrix as banks resulting in similar resistance to startups as banks; large banks are security-based lenders which make it more attractive to seek formal sector employment if one wants to access finance for assets or consumption; lack of security from entrepreneurs to enable them to access finance and lack of track record results in startups and SMEs being categorised as high risk and thus leading to lenders requiring high collateral.

With all of these funding concerns, challenges and risks faced by startups, researching their impact on South Africa's economic growth and unemployment is instrumental in enabling economic development. Startups and SMEs contribute tremendously to job creation and economic growth. The question is, do startups have sufficient funding support or is the South African funding environment which actively promotes entrepreneurship, in reality more risk averse towards startup related funding. It should be noted that the funding of startup enterprises is highly risky due to low survival rates of startups within the first five years of

operations, but this does not negate their positive impact. In order for startups and SMEs to have the desired employment and economic impact, the culture of conservatism and risk-averseness need to be addressed (GEM, 2016).

2.5 Risk Appetite

Risk Appetite is an integral guidance, evaluation and monitoring tool used by various financial organisations to provide, organisation-wide, the risk parameters for the fulfilment of the organisation's mandate. "Risk appetite is defined as the level of risk a bank is ready to accept (assuming the risk is measurable) to generate a particular rate of return" (Hassani, 2014: 2). A well-defined and articulated risk appetite framework is the cornerstone of effective Enterprise Risk Management. A well-defined risk appetite ensures internal consistency with regards to how decision makers in an organisation and employees pursue an organisation's objectives and strategy. Risk Appetite is an effective risk analysis tool which enables an organisation's key staff to distinguish between acceptable and undesirable risk when making project decisions (Burke et al., 2011).

The role of an organisations risk appetite can be broken down into four main roles: (i) Support strategy setting; (ii) Support risk management; (iii) Set boundaries for risk taking and (iv) Support stakeholder value optimisation (Burke et al., 2011). An organisations risk appetite is developed at the board of directors' level based on the risk environment faced by the organisation during that period. These environmental risks are then identified and articulated in relation to three areas including acceptable risks, considerable risks based on certain conditions and unacceptable risks.

Table 1: Components of Risk Appetite Concept

Risk Appetite	The Level of risk an organisation is willing to take
Risk Tolerance	Encompasses acceptable risk but also includes risk, even though undesirable, would be considered depending on certain conditions and scenarios
Risk Bearing Capacity	The maximum level of downside risk that a firm can accept
Risk Profile	Overall risk profile of enterprise

Source: (Burke et al., 2011)

The concepts above form part of the Risk Appetite Framework which articulates the organisation's risk strategy and risk limits to enable seamless operational performance. According to Green Climate Fund (2015), the development and establishment process of an organisation's risk appetite is based on the following core steps which are used as guidelines. Step 1: defining the various organisational risk types. Step 2: Defining the core risk centre's in an organisation and attributing risk appetite to them. Step 3: Ascertaining methodology to measure identified risk in terms of potential losses and gains. Step 4: Final development of a Risk Appetite statement at board level.

Knowledge of the steps above is integral to being able to determine and analyse an organisation's risk appetite statement as it masks the in-depth level of detail synthesised into a Risk Appetite Framework which underpins the Risk Appetite Statement. Risk Appetite, which should be seen as an indication of the amount of risk an organisation is prepared to accept is interpreted based on a scale defining levels of risk ranging from acceptable (low risk) to non-acceptable (high risk), described using quantitative and qualitative information sourced from the organisation. While very effective in guiding organisations in terms of risks when fulfilling organisational objectives and strategy, there are existing challenges and flaws which limit the efficiency and effectiveness of the Risk Appetite Statement and various risk models.

Challenges such as the emphasis placed on historical information as a basis for forecasting risk parameters fails to identify and provide sufficient weight to recent changes and new trends which could impact the organisation's ability to adhere to its risk appetite statement (McKinsey, 2011).

Another challenge experienced by organisations is the over-reliance on risk models to determine risk levels thus indirectly limiting their effectiveness as a result of the exclusion of key staff expertise and knowledge in identifying and interpreting risk levels (McKinsey, 2011). This challenge leads to managerial and key staff complacency resulting in a gradual deviation from the organisation's mandate and objectives. Risk models, such as Risk Appetite are exploratory decision-making tools which are developed to guide and support decisions made by key organisations staff based on the limited information provided (Pregler and Freeman, 2008). These models are based on various approaches with the probabilistic

modeling approach being the dominant approach based on input assumptions collated from the organisation's data, mandate and objectives.

2.6 Determinants of Risk Appetite Levels

Risk appetite is the level of risk an institution is prepared to accept in the course of achieving its organisational objectives. Institutions with higher risk appetite accept higher volatility in returns with focus being on value creation and then returns whereas institutions with a lower risk appetite that are considered to be more risk averse focus more on steady lower risk pursuits (Rims, 2012).

Risk appetite is determined by a number of factors in an organisation including existing risk profile; risk capacity; risk tolerance and attitudes towards risk (Rittenberg and Martens, 2012). The current risk profile of an organisation is based on the set of risks the organisation has defined as part of its strategy and risk management (ISO 73, 2009). The risk capacity of an organisation is the level of risk the organisation is able to sustain in the pursuit of its strategic plan (Rittenberg and Martens, 2012). In terms of funding institutions, the institution's loan book can represent the capacity to provide loans. The risk tolerance of an organisation is tactical and operational, based on the level of acceptable risk volatility the organisation is willing to accept with regards to pursuing its strategic objectives (Rittenberg and Martens, 2012). The risk tolerance is measured using the organisation's performance metrics, setting the boundaries of performance volatility. The organisation's attitude towards risk is the fourth critical determinant which relates to the organisation's approach towards achieving its growth, risk and investment return objectives (Rittenberg and Martens, 2012).

In order for an organisation's risk appetite to be effective, the organisation needs to adopt the risk appetite at the board level; translate and communicate the adopted risk appetite throughout the organisation and monitor the risk appetite on an ongoing basis (Rittenberg and Martens, 2012). Risk appetite forms the basis of the risk appetite framework which is a tool designed to assist executive management in aligning the organisation's willingness to take risks with the organisation's ability to take those risks (Wyman, 2012). Risk appetite must be measurable and is determined quantitatively and qualitatively through the use of key risk indicators.

The risk appetite of an organisation is determined based on three organisational levels comprising of a strategic level; a tactical level or an operational level (Gorzen-Mikta and

Wieczorek-Kosmala, 2013). At strategic level, risk appetite determines the organisation's strategic approach towards risk. At a tactical level, the risk appetite of an organisation dictates the implementation of the strategic level risk appetite and at the operational level the risk appetite informs how daily operational risks are to be addressed (Gorzen-Mikta and Wieczorek-Kosmala, 2013). At the strategic level, value creation is the key determinant. Key Risk Indicators (KRI) are tactical level determinants and Key Control Indicators (KCI) at the operational level are used to measure risk appetite (Gorzen-Mikta and Wieczorek-Kosmala, 2013).

Different organisations articulate their risk appetite differently ranging from a basic statement focusing on “low”, “medium” or “high” risk appetite levels to detailed statements precisely indicating percentage probability or growth level targets in line with the strategic objectives (Rittenberg and Martens, 2012). When determining risk appetite of financial services organisations such as DFIs, quantitative risk indicators and performance metrics form an integrate part of the organisation's risk appetite (Rittenberg and Martens, 2012). Financial institutions determine their risk appetite using performance modeling which may include metrics as maximum levels of loan impairments and specific portfolio allocation targets (Rittenberg and Martens, 2012).

The risk appetite framework outlines the key risks to articulating risk appetite which form the basis of the risk appetite statement as outlined below. Key risk indicators are developed based on the risk targets, risk tolerances and risk limits guiding the risk appetite of the organisation. The organisation's risk appetite can also be measured based on organisational strategy, preference, attractiveness, tolerances and limits which can be determined qualitatively or quantitatively from the organisations. These determinants combine to form the risk appetite framework which guides the enterprise risk management process and the development of the organisation's risk appetite. Table 2 below outlines the main components to developing an organisation's risk appetite using a RAF.

Table 2: Risk Appetite Framework (RAF)

Risk Appetite	
Risk Strategy	
Strategic expression of an overall philosophy towards risk trading is necessary to achieve the mission, so that from the board on down there is alignment	
What risks to take	How much risk to take
Risk preferences	Risk tolerances
Articulating risk as opportunity, identifying risks that need to be taken deliberately in the expectation of creating the value needed to achieve the mission	Quantitative expression of the amount of aggregate risk the organisation will tolerate over varying time horizons as a means to achieve its mission
Risk attractiveness	Risk limits
Tactical assessment of the risks within the preference set, reflecting current circumstances	Granular operational controls on specific risks, expressed in metrics that are locally relevant and practical to monitor

Source: Towers Watson, 2013

DFIs’ risk appetite statement or framework influences the institutions’ approach to the provision of services. This research paper aims to determine the DFIs’ risk appetite levels based on historical data analysis, categorising the risk appetite is either high or low and how the funding of existing and startup SMEs are affected by the risk appetite (RA). These levels (portfolio percentage exposure) can be categorised in a number of ways namely: Extremely high (RA) = 1.00+ (100% +); High (RA) = 0.5 – 1 (50% - 100%); medium (RA) = 0.25 – 0.5 (25% - 50%) or Low (RA) = 0 - .25 (0 – 25%) risk appetite but crucially, the risk appetite levels have to be interpreted in the context of the DFIs’ past performance, mandate and existing risk tolerance parameters.

Four key drivers impact how DFIs’ risk appetite or risk aversion influences their approach to investments: capital, earning, market size and risk confidence (Burke et al., 2011). Capital of a DFI in terms of the size of fund available for investments will impact the level of risk the DFIs board of directors is prepared to take. The market size in terms of the DFI’s operations will influence its risk appetite as an increase/decrease in the market will have a certain upside or downside risk. The earnings of the DFI will impact how the DFI’s board of directors

increase or decrease their future risk appetite as their fiduciary duty is the financial sustainability of the DFI. The final major driver is risk confidence in the context of past performance and portfolio success or loss. This driver is based on the confidence the DFI has in the type of investment decision it has to make (Burke et al., 2011). What this implies is that past performance of the market and the DFI's investments will impact the risk appetite level the DFI has for certain investments such as startup funding or various sector investments.

The challenge of access to finance is fuelled by the types of funding products available to SMEs and specifically startup organisations. DFIs provide different financial products to high risk underserved economic sectors in order to improve the provision of financial services. Private financial markets located in emerging and developing economies tend to fail in the provision of sufficient long-term finance which is critical to economic investments and social development (WESS, 2005). The challenge in providing long-term financing is based on three reasons, imperfect market or existence of asymmetric information; borrower character and long-term macroeconomic factors resulting in lenders preferring a higher short-term concentration in their lending portfolio (WESS, 2005).

The existence of asymmetric information in the SME and startup sector, firm size and lack of collateral result in financial institutions preferring to provide short-term funding over long term funding (WESS, 2005). The under provision of long-term finance from the private sector is a market failure DFIs are tasked to address through increasing the provision of longer term finance products (WESS, 2005). UNESCAP (2015) indicates six categories of SME finance instruments: informal, internal, debt-based products and services, equity-based funding avenues, non-collateralised debt products and government grants or subsidies. Risk appetite in the context of this study is restricted to the direct lending portfolios of the DFIs combining collateralised and non-collateralised debt products.

2.7 Economic impact of Startups

Since the financial crisis of 2007-2008, a large number of central banks have loosened their monetary policies in order to bring down interest rates for all firms in order to stimulate economic demand (OECD, 2016). This resulted in lower interest rates which were

unfortunately only received by larger enterprises with SMEs and startups receiving relatively higher interest rates (OECD, 2016).

Startups and the impact they have on job creation and economic development can be “expressed as a combination of four different elements: the start-up rate; the average size of firms at entry; the survival rate; and the average growth rate of survivors” (Calvino et al., 2015). The four elements, even though not strongly positively correlated, contribute to the extent to which startups impact job creation (Calvino et al., 2015). A large percentage of startups do not have a high survival rate with a majority of startups falling under the subsistence entrepreneurs’ category. On average only 3% - 8% of startups create a disproportionate number of jobs ranging from 21% to as high as 52% in certain countries (Calvino et al., 2015).

It becomes very important when relating to policy matters, that policy is set taking into consideration that regardless of the low survival and growth rates, startup enterprises play a vital role as catalysts for economic growth and are drivers of job creation (Calvino et al., 2015). It is this very point that relates the need for this research paper to analyse the risk appetite of South African DFIs and their funding of startups to determine if these DFIs approach and funding allocation to startups is not negatively impacted by the high-risk nature of funding startups and their low survival rate. Allocative efficiency with regards to funding enterprises is key and thus this research paper focuses on an important factor of determining if these DFIs have embraced the risky nature of their funding space or are more likely to fund established less riskier enterprises which are less likely to experience higher percentage growth in terms of job creation.

Startup enterprises contribute to job creation or destructions through three main avenues: creation of jobs through enterprise establishment creating a positive employment effect in the economy; destruction of jobs in the event of the startup enterprise failing and thus having a negative employment effect on the economy and finally through the creation and destruction of jobs during the course of normal business operations such as the average operational enterprise in the economy (Calvino et al., 2015). It has been shown that these three avenues produce a positive net sum implying that startups and young enterprises should be regarded as net job creators (Calvino et al., 2015). This has also been confirmed by the intensive margin, which is the net job creation or destruction resulting from normal business operations, where startups are also regarded as net job creators. The study by OECD goes

further to note that taking into account all startups successful and failures over a five year period post entry, the surviving startups' net job creation is sufficiently large enough to compensate for all jobs destroyed by the startups that failed over the same period (Calvino et al., 2015).

Non-performing loans have a large impact on the potential for lending to startups as it directly impacts the DFIs' balance sheet which translates to a possible reduction in available credit, higher interest rates and more stringent conditions (OECD, 2015). Startups are considered to be very high-risk ventures and thus have a higher potential for default than existing enterprises.

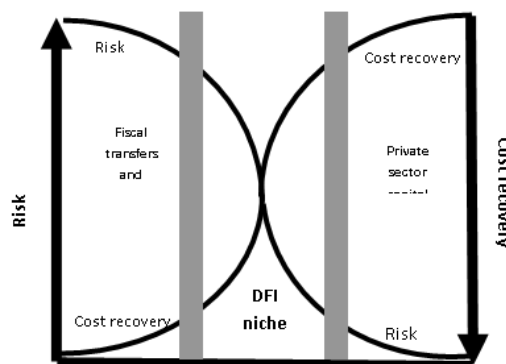
CHAPTER THREE
THE EFFECTIVENESS OF SELECTED DFIs IN IMPROVING ACCESS TO
FINANCE IN SOUTH AFRICA

3.1 Introduction

In South Africa, DFIs are regarded as the potential solution to economic growth stagnation and industrial development limitations. This solution is only possible if these institutions are able to realise their full development potential which is focused on improving access to finance through providing financial services to the underserved higher risk market. Development Finance is regarded as the provision of finance to under-served projects and economic development transactions. The United Nation sees DFIs as addressing five critical areas in terms of addressing market failures (Gumede et al., 2011): investing in development focused projects, long-term financial intermediation, providing technical support, capital raising and managing market failures.

With DFIs' role having developed and changed over the past couple of decades, DFIs are now expected to address broader development failures such as institutional failures which result from organisations failure to provide services of which they are mandated to, capacity failures resulting from insufficient skill base in the institution's management, origination failures arising from the lack of or inability to source or secure projects in line with the institution's mandate and informational failures which tend to be rooted in information asymmetry problems (Gumede et al., 2011).

Figure 1: Development Finance Institutions niche



Source: An adaptation from Scott, 2008 by Gumede et al., 2011

Successful DFIs provide their services in a very risky environment and thus their risk appetite level and framework is critical in ensuring sustainable developmental success. The ability for DFIs to focus and fund this niche is of the utmost concern as in the past and may still be in the present. DFIs have adopted orthodox banking logic and designed risk management strategies which effectively rule out servicing the poor (Murray, A.1999). The importance for DFIs to focus on this niche is imperative. Access to finance and underdevelopment challenges are compounded by systemic African challenges as highlighted by Aziakpono (2011:2), “Firstly, there is a lack of collateral due to poorly defined property rights...Therefore, a very small percentage of people have the ability to offer their property as collateral for a loan”.

The motivation for the study’s choice of DFIs specifically Business Partners (BP), the National Empowerment Fund (NEF) and the Small Enterprise Finance Agency (SEFA) is based on the development mandates adopted by each of the three DFIs. The three DFIs were selected based on the following parameters: the DFI must be located in South Africa, the DFI must provide direct lending products to the SME and startup market, the DFIs must have a national footprint and the DFI should be in existence for at least three years between the period 2011 to 2015. Additional criteria used to select the DFIs were based on their intention to improve access to enterprise finance, their ability to provide innovative financial products and having an objective to develop the South African economy.

3.2 Access to finance Financial Indicators

Improving financial access is the cornerstone of the services and products provided by DFIs. Financial access is a critical challenge experienced by startups and existing SMEs thus making it vital to analyse the past performance of the three DFIs selected in this study in order to determine if past portfolio performance is reflective of improved financial access and more importantly, whether their risk appetite is supportive of improving financial access.

Improvements in financial access and the impact thereof is determined by using key indicator variables which are called core financial impact indicators in this study. The key indicators are used by policy makers and key stakeholders to develop new policies and monitor whether SME finance challenges are being addressed. The key indicators provide information relating to key aspects in terms of SME access to information such as allocation of credit, structure of debt, demand for credit, SME and startup financing conditions, global, regional and local DFI

loan performance and SME and startup loan performance. These indicators are an amended version of the OECD core indicators in financing SMEs and entrepreneurs and have been developed as an enterprise risk management tool. In Table 3 indicators below, provide DFI specific information related to SME and startup loans. In Table 4 below, indicators show local, regional and global DFI loan performance comparison. Table 5 below, provides startup funding related information. Information gathered from these indicators provides policymakers and stakeholders a snap assessment of the SME and startup financing sectors in terms of DFI performance enabling a more targeted approach to SME and startup finance market failure.

Table 3: Core Financial Impact Indicators per DFI

Core Indicators	What they Show	Short name
1. Share of SME short-term loans in total SME loans	Debt structure of SMEs – % used for operations and working capital	SMEST
2. Share of SME Long-term loans in total SME loans	Debt structure of SMEs – % used for investments and % used for expansion	SMELT
3. Share of SME short-term loans/Long-term loans	Preference of DFI in terms of risk funding. The higher the %, the higher the risk appetite.	SMESL
4. SME loans disbursed/SME loans approved	Used in addition/instead of rejection rate to gauge credit conditions. A decrease indicates that conditions are loosening	SMELDLA
5. Total SME non-performing loans	Used as an indication of the SME performance and market conditions	SMETNPL
6. Number of approved loans	Used as an indication of level of market penetration	APPLNS
7. Number of disbursed loans/Number of approved loans	Used as an indication of investment committee risk appetite	DISLNS
8. Average approved loan amount	Used as an indication of DFI risk appetite	AVEAPPLAMT
9. Average disbursed loan amount	Used as an indication of investment committee risk appetite	AVEDISLAMT

Source: Adapted from OECD, 2015

Table 4: Core Financial Impact Indicators per DFI on a South African, Sub-Saharan Africa and Global level

Core Indicators	What they Show	Short name
1. DFI's non-performing loans/South Africa non-performing loans	Determines if DFI loan performance is riskier than countries' loan performance.	DFINPLSA
2. DFI's non-performing loans/Sub-Saharan Africa non-performing loans	Determines if DFI loan performance is riskier than regions' loan performance.	DFINPLSS
3. DFI's non-performing loans/World non-performing loans	Determines if DFI loan performance is riskier than world's loan performance.	DFINPLIN
4. Spread between DFI's non-performing loans % and South Africa non-performing loans %.	Tightness of credit conditions – indicates how closely DFIs risk sentiments correlate with South Africa.	DFINPLSASP
5. Spread between DFI's non-performing loans % and Sub-Saharan Africa non-performing loans %.	Tightness of credit conditions – indicates how closely DFIs risk sentiments correlate with Sub-Saharan Africa.	DFINPLSSSP
6. Spread between DFI's non-performing loans % and the world non-performing loans %.	Tightness of credit conditions – indicates how closely DFIs risk sentiments correlate with the world.	DFINPLINSP

Source: Adapted from OECD, 2015

Table 5: Core Financial Impact Indicators per DFI in terms of startup funding

Core Indicators	What they Show	Short name
1. Does the DFI report start-up funding performance metrics in annual report (Yes/No)	Determines if DFI has identified start-up funding as a vital enough sector to require monitoring	DFISU
2. Value of start-ups funded/Total value of loan approvals	Determines if DFI fund a sufficient % of start-up; this has a potential impact on economic growth.	SUFLA
3. Start-up non-performing loans/total SME non-performing loans	Determines if start-ups loan performance is riskier than total SME loan performance.	SUMPLTNPL

Source: Adapted from OECD, 2015

This research paper aims to outline the past performance of the DFIs based on the indicators outlined above. One of the biggest challenges when analysing DFIs for improved financial access is the availability of information in order to compile these indicators. These indicators

are used to develop descriptive analysis results in order to outline the changes in financial access but most importantly to provide an indication of the risk appetite of the DFIs based on the limited information available. From these indicators key independent explanatory variables were selected to develop the regression model outlined in the next chapter which formed the basis of the quantitative analysis of these DFIs. The results obtained from the qualitative and quantitative analysis conducted were then interpreted in the data analysis section in terms of how the results addressed the hypotheses outlined in this research paper.

It is important to note that the classification of a startup for the context of this research paper is regarded as an enterprise that has operated for less than one year at the time of funding approval or never operated at all. The set of core indicators based on available information are used to evaluate the performance of the DFIs based on financial access and risk appetite.

3.3 Business Partners (BP)

Business Partners is a South African specialist risk finance company with a national and African footprint. Business Partners provides customised financial solutions, mentorship and other added-value services focused on formal SMEs. Business Partners is inherently a private finance institution and in the context of this research paper, Business Partners is regarded as a Development Finance Institutions due to its focus on providing financial solutions to SMEs, its facilitation of wealth creation, job creation and economic development elements define it as a DFI. Business Partners' Vision is "To live our name, being the premier business partner for small and medium enterprises, facilitation wealth creation, job creation and shared economic development" (Business Partners Limited [BP], 2016). Business Partner's Mission is "To invest capital, skill and knowledge into viable entrepreneurial enterprises in South Africa, Africa and all markets where we have a presence" (BP, 2016).

Business Partners, like other DFIs in this study, provides various financial and non-financial products and services but for the scope of this study, the focus will only be placed on its direct lending services to SMEs. Business Partners' role as a DFI is to address certain market failures and challenges experienced by SMEs with the products and services to address Access to finance; Access to business expertise and resources; Access to non-financial support; Access to information, know-how, learning opportunities and Networking opportunities.

Business Partners was selected as one of the DFIs to be analysed due to it being a privately funded DFI but most importantly, due to the fact that Business Partners' risk model is regarded as one of the best SME financing models in South Africa and the rest of Africa. Business Partners finances enterprises with an amount ranging from R500, 000 up to R50 million. Business Partners has a network of more than 20 offices across South Africa, and has disbursed in excess of R16,5 billion in funding since it commenced operations in 1981 (BP, 2016). From the three DFIs selected for this research paper, Business Partners is the oldest and best-performing DFI based on the date of establishment and sustainability in terms of self-sustainability through self-generated returns.

3.3.1 Risk Appetite Framework of Business Partners

Based on the analysis of the 2015 and 2016 financial report from Business Partners, it is challenging to determine their Risk Appetite Framework without gaining access to the funding institution's internal credit policy records.

A formal risk assessment process is undertaken when investments are made and thus access to this process will provide insight into the institutions RAF.

- Currently, Business Partners limits their investment exposure to not more the 0.9% of their total investment portfolio in order to limit concentration risk from a single investment (BP, 2016).
- Business Partners mitigates credit risk through securing collateral for investments made.
- Interest rate risk is mitigated by property investments (BP, 2016).
- Maintain adequate cash reserves (BP, 2016).

3.4 National Empowerment Fund (NEF)

The National Empowerment Fund (NEF) is a state-owned South African DFI established as a result of the National Empowerment Fund Act No 105 of 1998. The NEF was established to be a key driver in promoting and facilitating black economic participation through the provision of financial and non-financial support to black empowered business. The NEF is governed by the Public Finance Management Act, National Treasury regulations and the

King III. The NEF is a government-owned DFI with a role to support Broad-Based Black Economic Empowerment (BB-BEE) (National Empowerment Fund, 2015).

The NEF implements its mandate through three main channels: asset management, fund management and strategic project funds. The NEF's mission is to address market failures through the provision of certain products and services: funding of between R250,000 and R75 million for startups, expansion and equity transformation purposes as well as use of concessionary facilities; online business planning solution and dedicated mentorship support; competitive cost of finance with a higher risk appetite as well as requirement for operational involvement (sweat-capital) reduces the need for collateral payment; online business planning solution, dedicated mentorship support and technical assistance; online business planning solution with a module for financial projections and mentorship support; linkages and emphasis on the implementation of the Codes of Good Practice (BB-BEE) and linkages with off-takers (NEF, 2015)

The NEF has a national footprint with offices located in every South African province. The NEF mandate just like other DFIs requires it to operate within a high-risk environment which can lead to assumptions that high-risk environments result in high interest rates. Based on these assumptions, NEF's risk appetite level should be reflective of its environment and target market and thus this research paper aims to determine if the risk appetite of NEF is reflective of its mandate and target market or whether its risk appetite is reflective of a low risk appetite institution which is contrary to what is required by its target market and mandate. NEF provides financial and non-financial products and services to its target market and for the purposes of this research paper, the focus will only be on the funding of SMEs and startups.

It is interesting to note that the NEF's risk appetite framework is subject to change based on the lack of clarity regarding next sources of funding in terms of fund recapitalisation. Therefore the interpretation of the NEF's risk appetite level should take into consideration the uncertainty regarding recapitalisation which has a direct impact on the NEF's sustainability (NEF, 2014).

3.4.1 Risk Appetite Framework of National Empowerment Fund

The NEF similar to Business Partners utilises an enterprise-wide risk management process to identify and mitigate against potential risks to the financial institution. The NEF's Enterprise Risk Management methodology is based on the following interrelating components: internal environment; objective setting; risk identification; risk assessment; risk control and response; risk monitoring, reporting and risk performance measurement (NEF, 2015). In terms of Risk Appetite and Tolerance, the NEF has not been able to determine its acceptable levels of risk due to lack of clarity regarding the NEF's future capitalisation (NEF, 2015). With this fact at hand, it becomes even more important to analyse data to be secured from the NEF in order to determine the NEF's risk appetite based on the past performance and whether their performance is in line with their mandate and objectives as well as comparability to other DFIs in the study.

The NEF highlights four key strategic objectives underpinned by key performance indicators (KPIs): advancing BBBEE; maximising the empowerment dividend; optimising non-financial support and financial efficiency and sustainability (NEF, 2015). These strategic objectives form the basis of the NEF's risk appetite statement. The NEF has key performance indicators linked to each strategic objective used by the institution for performance monitoring purposes. The strategic objectives and key performance indicators are taken from the NEF 2015 annual report. Advancing BBBEE KPI's provide information on finance provided to black managed enterprises funded by the NEF: Value of deals approved; Value of new Commitments and Value of deals disbursed.

Maximising the empowerment dividend KPIs provide information on the level of investments in high job creating black empowered enterprises, black women participation and facilitation of investment on a national scale. Specifically: Jobs created or maintained; Percentage of portfolio owned by black women and Maintain/Increase percentages of portfolio by value invested in Eastern Cape, Northern Cape, Western Cape, Kwa-Zulu Natal, North West, Mpumalanga, Free State and Limpopo province. Optimising non-financial support KPIs provide information on social economic development focusing on savings, investments, black economic participation, empowerment and the development of the NEF brand. KPIs: Number of Investor Education seminars held across the country; Number of Business Today Training sessions provided; Number of entrepreneurs referred for business incubation; Number of social facilitation sessions held with investees and Brand audit survey findings.

Financial efficiency and sustainability KPIs provide information on the NEFs sustainability specifically percentage of portfolio impaired, target ROI before impairments, collections ratios and management portfolio risk.

3.5 Small Enterprise Finance Agency (SEFA)

The Small Enterprise Finance Agency, a state-owned DFI known as SEFA, was established in 2012 as a result of a merger of three government institutions namely: The South African Microfinance Apex Fund, Khula Enterprise Finance Ltd and the small business activities of the Industrial Development Corporation (SEFA, 2015). SEFA has a national footprint of nine provincial regional centres with additional satellite offices in less urban environments.

SEFA's mandate is to be the leading catalyst for the development of SMEs and cooperatives through the provision of finance (SEFA, 2015). SEFA's Mission is to provide access to finance to SMEs and cooperatives by: Delivering wholesale and direct lending; Providing credit guarantees to Small, Medium and Micro businesses; Supporting the institutional strengthening of Financial Intermediaries so that they can be effective in assisting SMEs; Creating strategic partnerships with a range of institutions for sustainable SMEs development and support; Monitoring the effectiveness and impact of our financing, credit guarantee and capacity development activities; Developing (through partnerships) innovative finance products, tools and channels to catalyse increased market participation in the provision of affordable finance (SEFA, 2015).

In a survey commissioned by SEFA and conducted by an independent assessor, certain challenges and attributes experienced by SEFA were highlighted with some being reflective of the risk appetite of SEFA. Findings from the survey were disclosed on the 9th of March 2016 to the Portfolio Committee on Small Business Development highlighting the following challenges experienced by SEFA: Unrealistic requirements and time consuming documentation; Stringent application processes; Lack of clarity and knowledge about business sectors; No proper feedback and or no feedback at all on declination of applications; Poor turnaround times; High interest rates; High administration fees; Inadequate repayment period; Insufficient funds available to clients; Profit-driven and not customer-driven and too much red tape (SEFA, 2016)

The challenges above highlight and support an interesting trend regarding DFIs where SMEs sentiment is that the DFIs are seen to be profit driven and not development driven and thus interest rates are regarded to be higher than expected for DFIs even when taking into consideration the high-risk nature of the enterprises being funded. These sentiments highlight the need to analyse SEFA's risk appetite taking into consideration its mandate and target market in order to ascertain if indeed SEFA's performance in terms of startup approvals is reflective of a pro-development funding approach which is reflected in a higher risk appetite or if SEFA's performance is reflective of a low risk appetite institution which is risk averse to funding startups. SEFA provides a number of financial and non-financial services but for the purpose of this research study, the focus will be placed on the direct SME lending division with specific emphasis being placed on the funding of startups.

3.5.1 Risk Appetite Framework of Small Enterprise Finance Agency.

SEFA follows their Risk appetite which is set at board level. SEFA follows a process of credit risk grading which is used to determine the different client risk levels presented to the institutions. This grading classification process is based on a 17-grade scale and a default grade which is used to determine the risk level posed by clients and then integrated to determine the discounted credit risk charge. This is the basis of SEFA's pricing methodology. Similar to Business Partners and NEF, SEFA also considers collateral from its client in order to mitigate risk levels. This includes own contribution, covering bonds and personal suretyships from clients (SEFA, 2015). In SEFA's strategic plan, two strategic objectives and three strategic enablers are outlined which have KPIs aligned to them in order to monitor organisational performance.

Strategic objective 1 focuses on increasing access and providing finance to SMEs thus contributing to job creation (SEFA, 2016). The KPIs from SEFA (2016) are as follow: Expand direct lending through partnerships in all provinces; Introduce innovative programmes to expand access to cost-effective microenterprise credit; Establish stronger partnerships with institutions to increase access to finance for SMEs and co-operatives; and Increase the utilisation of the Credit Guarantee Scheme by both banks and other partners.

Strategic objective 2 focuses on building an effective and efficient sefa that is sustainable and performance driven (SEFA, 2016). The KPIs from SEFA (2016) are as follow: Create,

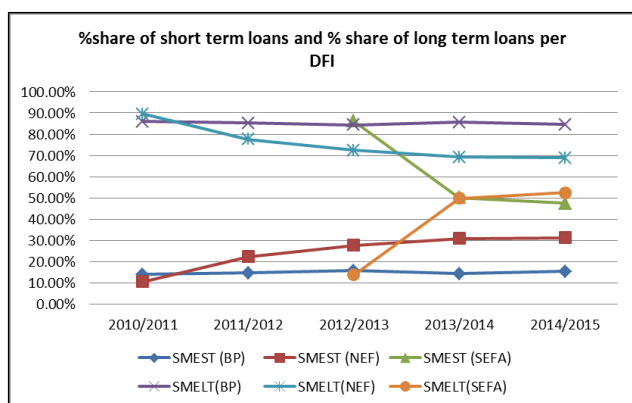
develop and retain dynamic human capital with values and culture aligned to SEFA’s mandate; Build an effective SEFA with robust and efficient business process, systems and infrastructure; and Build a financially sustainable and viable SEFA.

Strategic enabler 1 focuses on building a learning organisation (SEFA, 2016). The key performance enablers (KPE) from SEFA (2016) are as follow: Develop and implement dynamic research and development capacity; and Develop effective SEFA monitoring, evaluation and knowledge management system and practices. Strategic enabler 2 focuses on building a SEFA that meets all legislative, regulatory and good governance requirements (SEFA, 2016). The KPE from SEFA (2016) is: Ensure an effectively governed and compliant organisation. Strategic enabler 3 focuses on building a strong and effective SEFA brand (SEFA, 2016). The KPE from SEFA (2016) is: Develop and implement an effective marketing and promotion programme to communicate SEFA’s product offering to SMEs and co-operatives.

3.6 The effectiveness of the three selected DFIs in improving access to finance

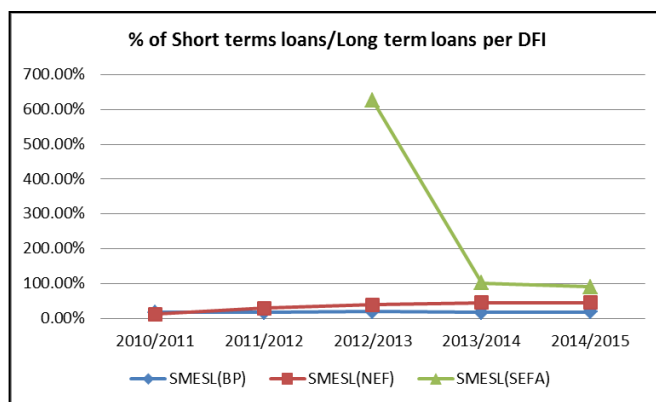
To assess the three DFIs in terms of improvements in access to finance, the core indicators outlined in the three indicator tables above are used. The core indicators were assessed over a 5 year period for this study and the performance of the three DFIs were outlined in the figures below.

Figure 2: Portfolio structure



Source: Author

Figure 3: Short-term loans over Long-term loans

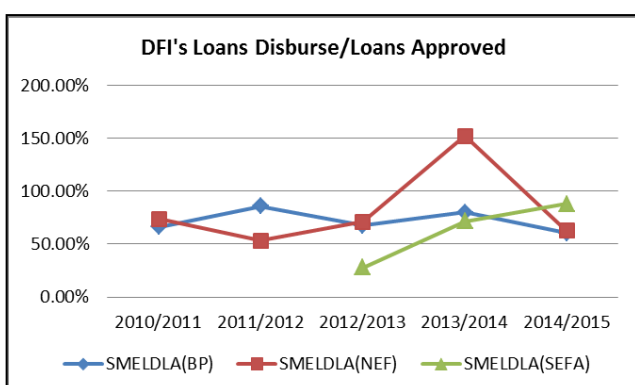


Source: Author

Between the three DFIs, Business Partners has the highest percentage of long-term loans in its portfolio at 84.54% in the 2014/2015 financial period. This is followed by NEF at 68.81% and SEFA at 52.47% in the 2014/2015 financial period. It is also interesting to note that out of the three DFIs, Business Partners is the only DFI that has consistently maintained this credit allocation over the 5 year period whereas NEF experienced a downward trend. SEFA, in contrast, experienced a significant growth in long-term loan allocation from 13.78% in the 2012/2013 financial period since its inception.

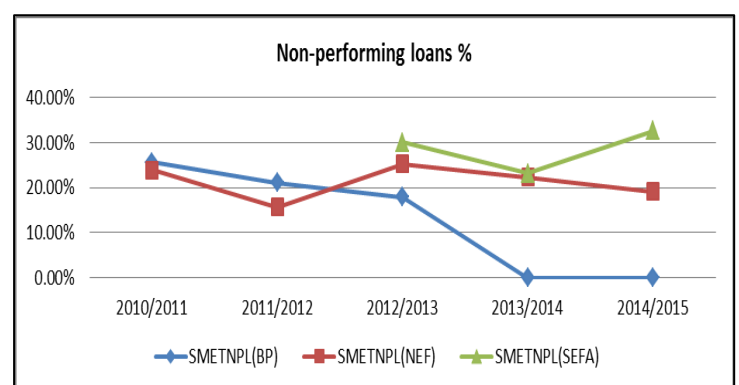
For short-term loans, Business Partners has maintained its percentage allocation with it reaching 15.46% in the 2014/2015 financial period from 13.94% in the 2010/2011 period whereas NEF experienced a growth from 10.51% in the 2010/2011 period to 31.19% in the 2014/2015 period. SEFA, in contrast, experienced a decline in the percentage of short-term loans from 86.22% in the 2012/2013 period to 47.53% in the 2014/2015 period. In terms of access to finance, findings show that SEFA has the highest percentage allocated to short-term loans compared to Business Partners and NEF. This indicates that SEFA in terms of improved financial access to the higher risk SME sector is the most progressive while Business Partners and NEF are more conservative and focused more on longer-term loans which are less likely to be secured by startup enterprises. This is supported by the percentage of short-terms loans over the long-term loans figure which shows that SEFA has a higher percentage portfolio allocation of loan products that are more securable by startup enterprises.

Figure 4: Loans disbursed/approved



Source: Author

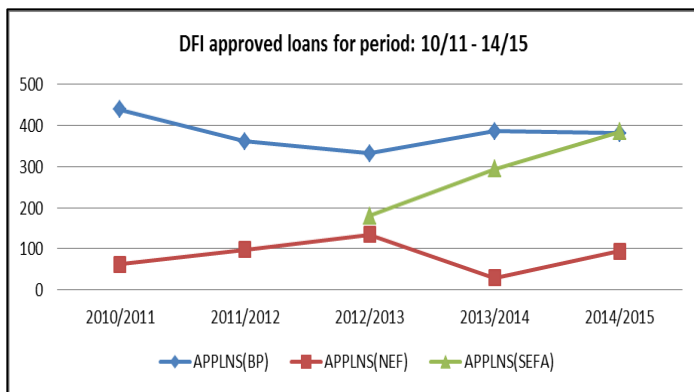
Figure 5: Non-performing loans %



Source: Author

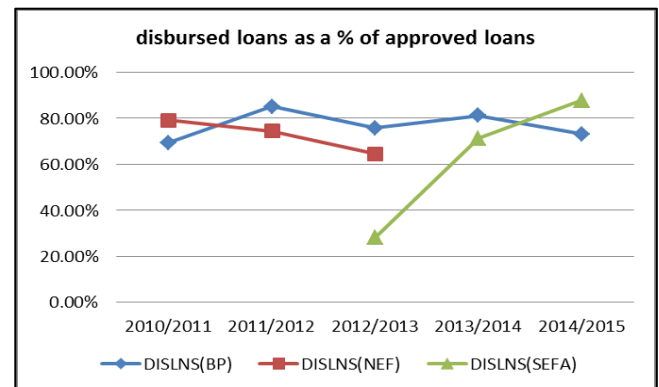
In terms of disbursements against loan approvals, 2014/2015 findings reveal that SEFA has the highest percentage of loans disbursed against loans approved which indicates that SEFA is the most aggressive DFI. This exposes the more conservative approach of the NEF and Business Partners who disburse a lower percentage of approved loans indicating a higher level of risk averseness post approval. This higher aggressive approach is reflected in the percentage of non-performing loans with SEFA over the entire assessment period experiencing the highest percentage.

Figure 6: Approved loans



Source: Author

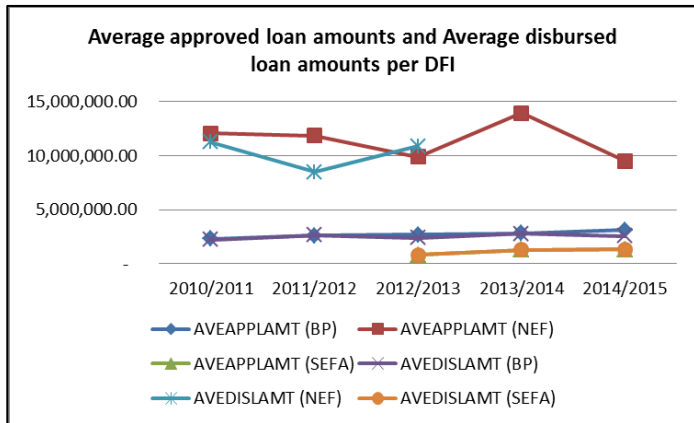
Figure 7: Disbursed/approved loans



Source: Author

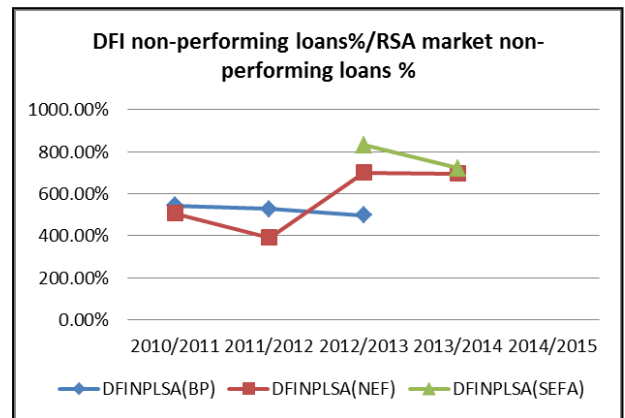
With regards to the number of loans approved as well as disbursed loans as a percentage of approved loans, Figure 6 and 7 shows that Business Partners is the most progressive out of the three DFIs with SEFA a close second. In terms of future trends, it is evident that SEFA will surpass Business Partners if it maintains its current trajectory. Of the three DFIs, Business Partners approved the most loans for SMEs followed by SEFA and then NEF. Unfortunately NEF had a moratorium on new loan applications post in 2013 but it is evident that in terms of financial access based on the number of loans Business Partners is the most effective of the three DFIs. It is however important to note the downward trend of Business Partners, where it does not approve as many loans as it used to, whereas SEFA has increased its number of loans aggressively.

Figure 8: Average loan amounts



Source: Author

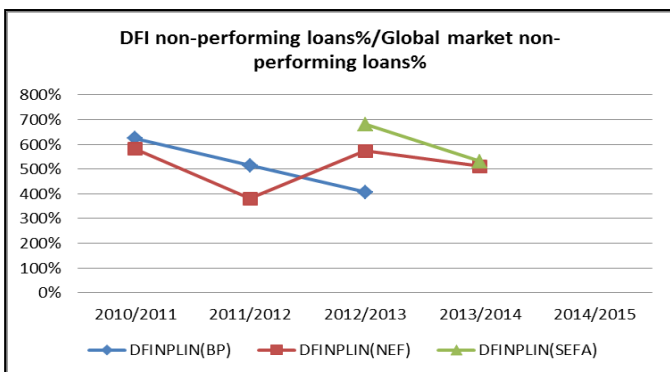
Figure 9: RSA Non performing loans



Source: Author

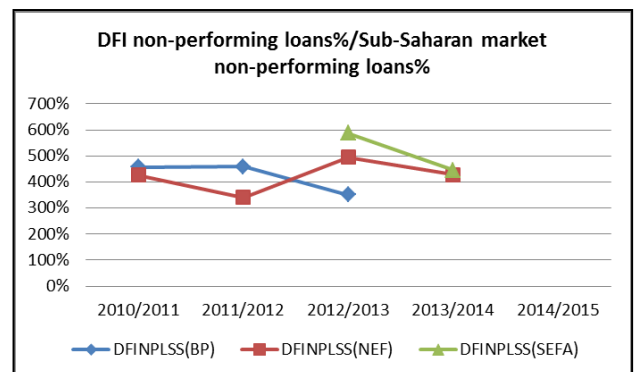
It is interesting to note that even though the NEF does not approve as many loans as Business Partners and SEFA, NEF has the highest average approved loan amount which is 100% more than Business Partners and SEFA which could provide insight into why the NEF does not approve as many loans as Business Partners and SEFA.

Figure 10: Global non-performing loans



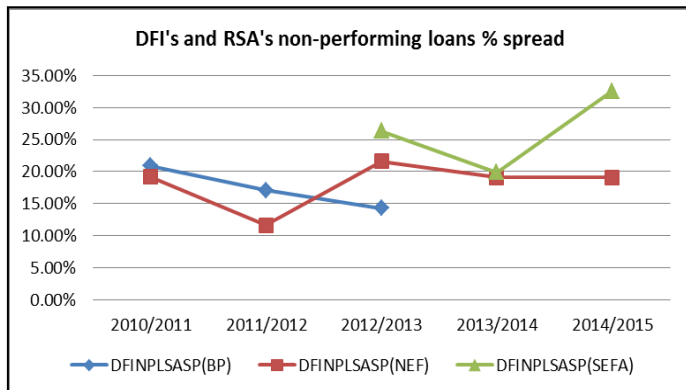
Source: Author

Figure 11: Sub-Saharan non-performing loans



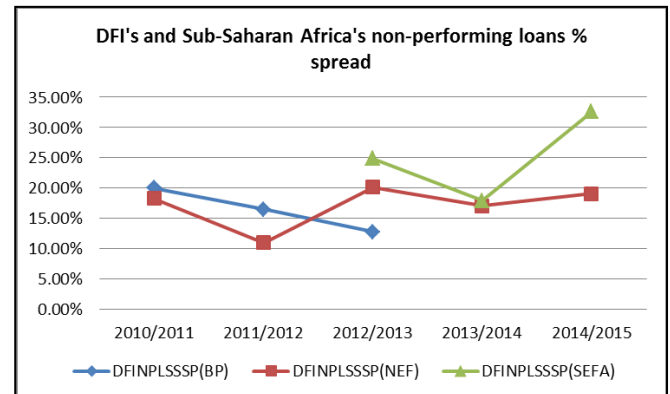
Source: Author

Figure 12: RSA non-performing loans spread



Source: Author

Figure 13: Sub-Sahara non-performing loans spread

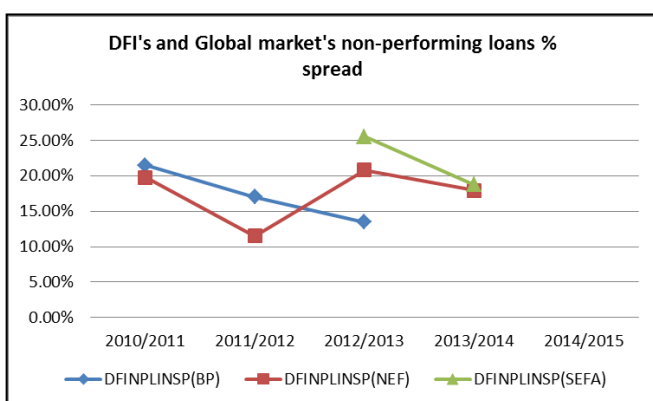


Source: Author

SEFA's aggressiveness in finance provision in this high-risk SME sector is reflected by its non-performing loan percentage with SEFA experiencing the highest percentage when compared to the South African bank sector, Sub-Saharan Africa and Global credit markets. Even though this is a concern from the SEFA's internal perspective, it is supportive of their objective of improved access to finance taking into consideration the high-risk sector they operate in.

Figure 14: RSA Global non-performing loans spread

Figure 15: Startup metrics disclosure



Source: Author

DATE	DFISU (BP)	DFISU (NEF)	DFISU (SEFA)
2010/2011	YES	NO	NO
2011/2012	NO	NO	NO
2012/2013	NO	NO	NO
2013/2014	NO	NO	NO
2014/2015	NO	NO	NO

Source: Author

In terms of improving financial access to the SME market and startup enterprises, findings show that SEFA is the most aggressive of the three DFIs with SEFA taking the most risks considering that it is the smallest of the three DFIs. With regards to the overall assessment of

the three DFIs, it is positive to note that all three DFIs have positively improved access to finance for the SME sector. However, based on limited information available, it cannot be determined how effective they have been in terms of startup enterprises. It is evident that out of the three DFIs, SEFA is the best performing DFI over the study period in terms of providing finance to the SME sector and most importantly the provision of financial products largely required by startup enterprises which are short-term loans. Taking into consideration the challenges experienced by the SME sector and specifically startup enterprises, SEFA ranks number 1 in terms of its effectiveness in improving financial access to SMEs and startup enterprises. Taking note of this, it becomes even more important to determine the different risk appetite levels of the DFIs taking into consideration their determinants as this will provide further insight into how to improve access to finance.

3.7 Startup, small and medium enterprises: Definition and Challenges

South African startups which can also be categorised as newly registered SMEs or enterprises which have been in operation for less than twelve months are reported to have a high failure rate which is underpinned by access to finance constraints or the lack thereof (Fanta et al., 2015). A 2016 study conducted by the Bureau for Economic Research on behalf of the Small Enterprise Development Agency found eight key challenges experienced by SMEs which hinder growth and development of these enterprises including:

Access to finance and credit

Access to finance and credit is a serious challenge for SMEs especially startups due to the high-risk profile associated to such applicants by banks. This high associated risk profile based on: inadequate collateral which can be provided by SMEs to lending institutions; lack of credit history which results in high levels of information asymmetry; lack of comprehensive business plans which included detailed market research based on a sustainable and viable business concept and the lack of access to markets (GEM, 2014). Therefore in order for access to finance and credit market failure to be addressed, DFIs with high-risk appetite are required to mitigate and support enterprises seeking improved access to finance. With innovative financial products, DFIs are able to address this challenge through financial intermediation such as the provision of guarantees or unsecured loans.

Poor infrastructure

Poor infrastructure is a key impediment to SMEs seeking improved access to finance as the lack of infrastructure such as satellite offices and qualified financing personnel located closer to or in more rural areas would reduce transaction costs for both enterprises and financing institutions. Improved infrastructure is highlighted as a key enabler for startups and SMEs by the Global Entrepreneurship Monitor South Africa Report of 2014. Infrastructure which includes the availability of municipal services, access to transportation, availability of cheaper or affordable business premises and business-related services is vital to the creation of a supportive environment for SMEs. The lack of sufficient infrastructure negatively impacts access to finance as a result of increased transaction costs for SMEs and financial institutions when considering provision and monitoring of finance and credit transactions. The existence of inadequate infrastructure creates an environment where only financial institutions with a high risk appetite such as DFIs can operate within.

Low levels of research and development

Research and development is a key driver of economic development where innovative ideas play a catalytic role in economic growth. With high levels of research and development, SMEs are able to reduce transaction costs which leads to improved access to finance resulting in increased probability of economic growth underpinned by SMEs. Technological advancements incorporate a multiplier effect which results in increased growth rates for startup enterprises. Thus low levels of research and development negatively impacts financial institutions' risk appetite levels as it creates an environment for high transaction costs resulting in lower access to finance.

Onerous labour laws

Laws of any country play a vital role in improving or hindering access to finance for economic development and South Africa is no exception. Labour laws particularly affect how SMEs and startups employ their workforce. Due to the instability of SMEs' performance during the early years of development, labour laws that make it difficult to lay off employees due to unproductivity and other matters make it challenging for SMEs to employ as many employees as it could. The GEM 2014 notes how labour laws do not provide for economic downturns and underperforming market conditions in South Africa, including minimum wage

implications, resulting in SMEs finding it difficult to navigate the employment market thus effecting SMEs potential growth which impact startup growth.

Inadequately educated workforce

Skills shortage is noted as one of the leading factors contributing to South Africa's unemployment rate with the National Development Plan highlighting how SMEs are negatively impacted by this shortage thus impeding economic development and growth. This shortage of skills directly impacts entrepreneurship potential thus having a negative knock-on effect on levels of access to finance and this is supported by the GEM 2015/2016 South Africa report which states the existence of a strong correlation between skills level and entrepreneurial activity.

Inefficient government bureaucracy

An enabling environment is critical for entrepreneurship to flourish. Policies of government form a vital part of this ecosystem as they provide the necessary platform for entrepreneurial activity. The GEM 2015/2016 South Africa report finds that South African government policies have been highlighted as one of the major hurdles for SME development. The lower than average entrepreneurship framework conditions score of South Africa supports the notion that even though much emphasis is placed by the government on the SME sector, government policies are inherently an impediment to SME development.

High levels of crime

Crime levels have a negative impact on SME development increasing costs being allocated to security by SMEs. This translates to increased transaction costs which result in overall increased costs of doing business. The increased transaction costs impacts on levels of investment which directly impacts development economy's objective of increasing access to finance as a result of reduced investment flows.

Lack of access to markets

Access to markets is a key pre-requisite for access to finance and credit for SMEs. This challenge is particularly high for SMEs located in the rural areas which are disadvantaged when compared to their more urban SME counterparts and as a result are not able to be as competitive due to limited opportunities for growth and the ability to reduce their transaction costs.

3.8 Conclusion

Access to finance and credit was found to be one of the main reasons behind business failure underpinned by a lack of adequate collateral, lack of credit history and lack of appropriate documentation and records which are key to improved access to finance (BER, 2016).

DFIs are managed by an operational executive team who are guided by the board of directors who are responsible for the development and outline of an effective Risk Appetite Statement which forms an essential part of the Risk Appetite Framework which is a core component of the institutions Enterprise Risk Management framework. In order for one to analyse an institutions loan portfolios' past performance in the context of its Risk Appetite, an analysis of the loan portfolios Key Risk Indicator is vital in order to ascertain the trend of the loan portfolio which will serve as an indication which will assist in the determination of the DFIs Risk appetite trend. The research methodology used in this paper will be outlined in the next chapter.

CHAPTER FOUR

METHODOLOGY

4.1 Introduction

This chapter focuses on the research methodology and data that was used for this research study. An unbalanced panel data methodology was selected due to the time-series and cross-sectional nature of the data and its ability to address the hypotheses and research questions relating to “microeconomic dynamic behaviour” (Honore, 2002). The data was stacked or clustered around the three DFIs: Business Partners, the National Empowerment Fund and the Small Enterprise Finance Agency. These institutions were selected based on the organisational type, loan fund size, national presence and funding mandate. The past performance of the three DFIs, the local South African credit market, the regional sub-Saharan credit market and the international credit markets were analysed using regression models. Section 4.2 outlines the collection, type and sources of data. In Section 4.3 the model specification is described and the selected variables defined followed by the analytical techniques in Section 4.4. This chapter is concluded by Section 4.5 in which the limitation of the research methodology is highlighted but discussed further in the final chapter.

4.2 Data collection, type and sources

The data from this study is drawn from the 2010/2011 to 2014/2015 (5 years) financial periods. Annual data was utilised and collected directly from the DFIs annual financial reports. The data was limited to publicly available information. The intention of the data analysis was to determine: Individual DFI Risk Appetite, how DFIs ownership affects risk appetite and how DFIs loan exposure terms affect risk appetite. Data for the local, regional and international credit markets was sourced from the Global Financial Development Database which “is an extensive dataset of financial system characteristics for 206 economies” developed by the World Bank. This database is in annual time series format with measures for size, efficiency, access and stability of financial institutions on an individual, regional and international basis.

4.3 Model Specification and definition of variables

The research methodology adopted for this research paper took into consideration the number of key indicators identified which dictated the descriptive analysis and panel data analysis methodology used in this research paper.

Baltagi (1998) refers to panel data as a data set that contains multiple variable observations from each sample or cluster unit. These data sets are generated through pooling or randomly sampling the observed time-series variables across three cross-sectional units, specifically the development finance institutions.

Panel data analysis used in this study follows a simple regression function:

$$y_{it} = \beta_0 + \alpha_i + \beta_1 x_{1,it} + \beta_2 x_{2,it} + \dots + \beta_k x_{k,it} + \varepsilon_{it} \quad i = 1, \dots, N; t = 1, \dots, T \quad (1)$$

Where α_i is individual specific. This model enabled the researcher to manage heterogeneity across individuals or clusters. This parameter was included in the model in order to address and explain the correlation between the observation in terms of time and can be fixed or treated like a random variable for each individual or cluster. The model above can be rewritten as follows:

$$y_{it} = X'_{it} \beta + \mu_i + \lambda_t + v_{it} \quad i = 1, \dots, N; t = 1, \dots, T \quad (2)$$

Where i denotes individuals/clusters/DFIs and t denotes time. X_{it} denotes a vector of variables or observations on k independent (explanatory) variables such as the observed variables identified later in this chapter. β in the simple regression represents a k vector of unknown coefficients which reflect the impact the observed variables have on the dependent variable which is risk appetite. μ_i in this regression is an unobserved cluster/DFI specific effect, λ_t represents an unobserved time specific effect. v_{it} represents a zero means random disturbance with variance σ^2_v . The error components residuals of this regression model follow a two-way analysis of variance (ANOVA) (Baltagi, 1998).

A major advantage about the use of panel data is that it does not require long time series information which makes it the ideal analytical technique to utilise in this research paper taking into consideration the limited data available. Another advantage supporting the use of panel data analysis is its ability to evaluate the impact the time-varying variables have on the dependent variable through cross section analysis.

The key variables for this research study and the data collected was analysed to determine the following core indicators which will be used in developing a regression function capable of addressing the hypotheses of this research paper through determining the risk appetite levels of the different DFIs.

Based on the key indicators above as a core component of this research study, observations were collected from the key independent variables, where the variables were analysed using regression analysis in order to determine a regression model that would be fit and provide analysis for our hypothesis in question using the Risk appetite proxy variable as the dependent variable assigned to represent risk appetite.

We let the dependent variable $y_{it} = RA_{it}$ be the Risk Appetite percentage of the loan portfolio where i denotes the DFI and t denotes the year. In this research study, the Risk Appetite percentage of the different DFIs is modelled as a regression function incorporating certain observable independent variables.

Two regression models were developed, the DFI specific Risk Appetite percentage function is:

$$RA_{it} = \beta_0 + \beta_1 LTLE_{it} + \beta_2 STLE_{it} + \beta_3 TALA_{it} + u_{it} \quad i = 1, \dots, N; t = 1, \dots, T \quad (3)$$

where LTLE denotes long term loan exposure, STLE denotes short term loan exposure and TALA denotes total approved loans amount. In order to address possible variable omission bias, other independent variables were added and later removed in order to arrive at the regression equation 3 the final regression model.

The pooled regression model for Risk Appetite is:

$$RA_{it} = \beta_0 + \beta_1 LTLE_{it} + \beta_2 STLE_{it} + \beta_3 TALA_{it} + \beta_4 TNPLLG_{i,t-1} + \beta_5 GDPGSALG_{i,t-1} + \beta_6 DFIID_{it} + \beta_7 DFIT_{it} + u_{it} \quad i = 1, \dots, N; t = 1, \dots, T \quad (4)$$

Where the TNPLLG variable denotes the Total Non-performing Loans Lagged variable which is a proxy of the past financial periods' portfolio performance and GDPGSALG is the lagged South African Gross Domestic Growth Rate variable which represents the macroeconomic performance of the local economy. The DFIID variable denotes the different DFIs. The DFIT variable denotes the DFIs ownership.

These key variables were identified through a theoretical and literature based method where indicator variables were observed and extrapolated in order to determine the DFIs risk appetite. From these indicator variables, an initial regression model was developed using four variables which resulted in a statistically significant regression model to be used as the basis for determining the DFIs risk appetite. Through this regression methodology, it was determined that insufficient data was available to determine the DFIs risk appetite, specifically towards funding startup enterprises. This lack of information or performance metrics from the resources available in itself provided ample insight into the various institution's appetite for risk when funding startups.

The key variables identified for the regression models were: Long-term loan exposure (LTLE) was included as an independent variable used to indicate the amount of the DFIs portfolio is allocated to long-term loans which are regarded as higher risk products. LTLE encompasses term loans, instalment loans and structured finance and project finance products – all with a maturity of more than twelve months. LTLE in this study is a capital risk appetite driver.

Short-term loan exposure (STLE) was included as an independent variable used to indicate the amount of the DFIs' portfolio is allocated to short term loans which are predominately perceived as a lower risk product due to its period of exposure for the development finance institution. STLE encompasses bridging loans, instalment loans, structured finance and project finance products—all with a maturity of less than 12 months. STLE in this study is a capital risk appetite driver.

Total Approved Loan Applications (TALA) was included as an independent variable used as a basis and to indicate the level of risk exposure the DFI is prepared to engage. TALA are all the loans approved in a given financial year and includes loan approvals of all four difference finance products. TALA, in this study, is an earnings risk appetite driver.

Total Non-performing Loans – one year lagged term (TNPLLG), was included as an independent variable which is a variable which indicates the individual DFIs non-performing loans percentage for the period financial year. This variable represents the performance of the individual DFIs portfolio over the previous financial period. TNPLLG in this study is a risk confidence risk appetite driver.

Gross Domestic Product Growth Rate for South Africa – 1 year lagged term (GDPGSALG), was included as an independent variable which is a variable which reflects the South African economics performance over the previous financial period. GDPGSALG in this study is a market size risk appetite driver.

Development Finance Institution Identity (DFIID), was introduced as a time-invariant fixed independent variable used to identify the different DFIs. DFIID is a cluster differentiating variable used to interpret differences in the three DFIs.

Development Finance Institution Type (DFIT) was introduced as a time-invariant fixed independent variable which denotes the ownership of the different DFIs. DFIID is a cluster differentiating variable used to interpret ownership influence on risk appetite.

Risk Appetite (RA), as the main focus of this research paper, was included as the dependent variable in the regression model.

$$RA = \frac{\text{Total Approved Loan Amount}}{\text{Total Long-term Exposure} + \text{Total Short-term exposure}}$$

This variable is an extrapolated variable calculated by taking the total loan exposure of the DFI which combines the long-term loan exposure and short-term loan exposure and divides the total by the total approved loans or loan advances for the same period. The ratio calculated is then used as a proxy for Risk Appetite and herein the dependent variable.

Variables which did not improve the regression model and thus were not included were: Number of approved loans (NAL); Average approved loans amount (AALA); Total disbursed loans amount (TDLA); Number of disbursed loans (NDL); Average disbursed loans amount (ADLA); Gross Domestic Product growth rate for Sub-Saharan Africa (GDPGSS); Gross Domestic Product Global growth rate (GDPGG); Non-performing loans percentage for South Africa (NPLSA); Non-performing loans percentage for Sub-Saharan Africa (NPLSS); and Global Non-performing loans (NPLG).

4.4 Analytical (estimation) techniques

The panel data analysis methodology used has two estimation techniques, Fixed effect and Random effects. If μ_i and λ_t represent or denote fixed parameters to be analysed, this regression model is called a fixed effect regression model. The fixed effect regression model assumes that the X_{it} variables are independent of the v_{it} for all i and t .

Fixed effect is used when the research is interested in analysing the impact of certain variables that change over time. Fixed effect methodology is consistent when the error term and the independent variable (explanatory variable) are correlated, which results in the random effects methodology being inconsistent in this case.

If the μ_i and λ_t represent random variables which have zero means and constant variances σ^2_μ and σ^2_λ , this regression model is known as the random effects model. This model assumes that μ_i , λ_t and v_{it} are conditionally independent (Baltagi, B. 1998). The random effects model is estimated using the generalised least squares (GLS) technique. The random effects model can estimate time-invariant and individual or cluster invariant variables.

The study utilises the random effects technique based on dependent and independent variables identified which are quantitative and qualitative which assumes that variation across entities is random and uncorrelated with the independent variable. The random effects model is also appropriate due to the expected existence of heteroscedasticity. This assumes the error term is not correlated with the independent variable allowing for time-invariant variables such as gender or DFI to play a role as explanatory variables (Torres-Reyna, O. 2007).

It must be noted that the use of the random effects technique when the appropriate technique to have been used is the fixed effects technique will result in inconsistent estimates. The fixed effect technique results in consistent estimates when used appropriately. The random effects technique is regarded as more efficient than the fixed effect technique if it is used appropriately and results in the best linear unbiased estimates (Sheytanov, 2014). In the case where the fixed effect technique is not the technique to be used and the random effects technique is not the appropriate technique either, the pooled model technique is to be used.

A generalised multilevel modelling function as the basis for this regression was assumed based on theory and literature with the following linear modelling framework which was selected:

$$[\text{Level} - 1 \text{ Equation}] Y_{ij} = \beta_{0j} + \beta_1 X_{1ij} + \beta_2 X_{2ij} + e_{ij} \quad (3a)$$

$$[\text{Level} - 2 \text{ Equation}] \beta_{0j} = y_{00} + y_{01} Z_{1j} + u_{0j} \quad (3b)$$

When rewriting equation 1a and 1b in a reduced-form by substituting equation 3b level-2 equation into the level-1 equation when have:

$$Y_{ij} = y_{00} + \beta_1 X_{1ij} + \beta_2 X_{2ij} + y_{01} Z_{1j} + u_{0j} + e_{ij} \quad (3c)$$

i : represents measurement occasions (indexes level-1 units).

j : represents individual or countries or development finance institutions (indexes level-2 units).

X_{1ij} and X_{2ij} : time-varying variable for panel and TSCS data and an individual-level variable in multilevel data.

Z_{ij} : represents a level-2 variable which is time-constant (or country/individual/DFI-specific) variable in panel data and time-series cross-sectional data and a contextual variable in multilevel data.

e_{ij} : represents a level-1 error term, random term assumed to be normally distributed with a mean of zero and an estimable variance.

u_{0j} : represents unobserved heterogeneity across clusters.

In panel data analysis and time-series cross-sectional data analysis, N represents the number of cross-sectional units and T represents time points, in multilevel representation above, N represents cross-sectional units are level-2 units and T represents the cluster sizes for each cluster (Bartels, BL. 2008).

The inclusion of the variables β_{0j} and u_{0j} in the equation above “allows the conditional means of the dependent variable to vary across level-2 units for unobserved reasons” (Bartels, BL. 2008). It is also important to note how the level-2 equation “allows for the varying intercept to be explained by observed Z_{ij} and unobserved heterogeneity u_{0j} .”

It is important that assumptions of the above equation are not violated as this will impact on parameters and result in biased estimates. Taking into consideration the dynamics concerned, the following regression function accounts for dynamics using lagged dependent variable.

$$Y_{ij} = y_{00} + \beta_1 X_{1ij} + \beta_2 X_{2ij} + \beta_3 Y_{ij(t-1)} + \gamma_{01} Z_{1j} + u_{0j} + e_{ij} \quad (4)$$

Cluster confounding is a critical issue that has to be addressed when selecting the appropriate model and approach to adopt the data. Cluster confounding “occurs when a level-1 variable exhibits distinct within-cluster and between-cluster effects, yet one only includes the original level-1 variable in the model without distinguishing these two types of variation in the variable” (Bartels, BL. 2008). This results in the within and between cluster effects being confounded into a single averages effect represented both within and between cluster effects

(Bartels, BL. 2008). Cluster confounding significantly affects the interpretation of the resulting effects of independent variables in the clustered data and it is thus critical to address cluster confounding in order to properly interpret the variable relationships and for hypothesis testing (Bartels, BL. 2008). It must be noted that cluster confounding is not an issue when within and between cluster effects of a level-1 variable are the same.

The selected data observed due to its cluster nature had the potential of displaying heterogeneity and homogeneity trends among certain variables. In particular the expectation that systematic differences in the Risk Appetite percentage of the different DFIs would exist due to differences between the DFIs based on their donor/sponsor, mandates, their enterprise risk management framework and other cluster specific factors.

It was hypothesised that there would be differences in the risk appetite of the different DFIs enabling the ranking of the different DFIs in terms of their risk appetite. Additionally, based on the development nature of these DFIs and the high risk enterprise funding sector they operate within, it was expected that there would be differences in the Risk Appetite percentage of the DFIs over time due to changes in the enterprise risk management strategy of the DFIs as a result of local, regional and global economic performance. Taking into consideration the development mandate and key development indicators outlined by these DFIs it was reasonably assumed that the funding and monitoring metrics of approved SME and startup enterprise loans would be disclosed or publicly available enabling a statistical analysis of the different DFIs funding of startups taking into consideration their risk appetite levels.

These changes in independent variables were expected to affect the dependent variable by (1) the level of risk appetite and (2) the responsiveness of the risk appetite of the DFIs to changes in the explanatory variables. The explanatory variables used to develop the key core indicators are determined based on data collected which forms the basis of the regression analysis conducted on the data. The analysis results from the data will assist in determining the Risk Appetite level of the individual DFIs and provide insight into the research questions. The data collected will be used to calculate the core indicators which will be used to develop the Risk Appetite regression models which shall be used to address the key research questions and objectives.

4.5 Conclusion

Data analysis and interpretation of results for this research paper was challenging due to limited data availability but still insightful in terms of the risk appetite of the different DFIs and their funding of startups. In the next chapter, we analyse and interpret the descriptive analysis and the results from the regression model developed.

CHAPTER FIVE
DATA ANALYSIS AND INTERPRETATION OF RESULTS

5.1 Introduction

This section of this research study outlines the descriptive data analysis conducted and the regression data analysis conducted using the regression model outlined in the previous chapter. In order for the data selected and the results gathered from the variables and error terms analysis, the estimators of the regression coefficients and the error terms need to be independent and unbiased. In order for the results obtained and the interpretations resulting from this data to be of significance, the data and model need to be tested to ensure that it overcomes model biasness. These tests are focused on testing the validity of the model, testing the strength of the relationship that may exist between the variables and testing the strength of this relationship between two or more variables. These tests will address challenges resulting from the existence of heteroscedasticity and autocorrelation which if present can violate the regression model assumptions. These tests will be outlined in more detail in the following sections prior to the results and research study findings section.

5.2 Descriptive Data Analysis

5.2.1 Variable and portfolio summary statistics

Initial analysis of the dependent variable RA and the independent variables: LTLE, STLE, TALA, TNPLLG, GDPGSALG, DFIID and DFIT was conducted and the summary statistics resulted as follows:

Table 6: Summary statistics (Qualitative Data)

Summary statistics (Qualitative data):					
Variable	Categories	Counts	Frequencies	%	
DFIID	BP	4	4	40.000	
	NEF	4	4	40.000	
	SEFA	2	2	20.000	
DFIT	POC	4	4	40.000	
	SOE	6	6	60.000	

Table 7: Risk Appetite Descriptive Analysis Summary

<i>RA</i>	<i>RABP</i>	<i>RANEF</i>	<i>RASEFA</i>	<i>RA (Pooled)</i>
Mean	0.481999	0.749494	0.748117	0.646293359
Standard Error	0.018383	0.145635	0.082059	0.066538567
Median	0.474672	0.89484	0.726356	0.544442831
Mode	#N/A	#N/A	#N/A	#N/A
Standard Deviation	0.041105	0.32565	0.142131	0.239908215
Sample Variance	0.00169	0.106048	0.020201	0.057555952
Kurtosis	-0.63562	-1.18985	#DIV/0!	-0.992086531
Skewness	0.301997	-0.79853	0.672828	0.442088298
Range	0.106383	0.781332	0.281751	0.781331649
Minimum	0.431643	0.283342	0.618122	0.283341965
Maximum	0.538025	1.064674	0.899874	1.064673614
Sum	2.409994	3.747468	2.244352	8.401813667
Count	5	5	3	13
Largest(1)	0.538025	1.064674	0.899874	1.064673614
Smallest(1)	0.431643	0.283342	0.618122	0.283341965
Confidence Level(95.0%)	0.051039	0.404348	0.353072	0.144975083

A descriptive analysis of the risk appetite (RA) variable was conducted. Table 7 above tables the descriptive analysis of the risk appetite of all three DFIs. Analysis was conducted on the three variables including a pooled data analysis as an industry proxy. The mean of Business Partners' risk appetite reflected the lowest mean among the three institutions with NEF having the highest mean risk appetite over the 2011 to 2015 period. When interpreted against the pooled risk appetite, Business Partners has a lower mean risk appetite in relation to the pooled risk appetite mean and NEF and SEFA has a higher risk appetite than the industry (pooled data). It is positive to note that based on the descriptive analysis, that all DFIs in this research study maintained a positive risk appetite which positively impacted on the growth of all the DFI loan portfolios.

The standard error, Standard deviation, as well as the sample variance for Business Partners was the smallest amongst all of the DFIs even against the industry proxy. This indicates that Business Partners is the most consistent DFI in terms of the lower volatility of their risk appetite. This also provides insight into how less influenced by exogenous variables Business Partners' risk appetite is towards funding enterprises. This is also supported by the range in terms of the volatility parameters of their risk appetite but this can also mean that Business Partners is less likely to adapt its risk appetite based on exogenous industry challenges thus further emphasising how Business Partners is the more sustainable and consistent institution compared to the other two DFIs and against the industry proxy.

The kurtosis for all institutions except SEFA due to insufficient data exhibited a platykurtic distribution or light tails, all with a kurtosis less than 0. Skewness results indicate that the risk appetite of Business Partners is fairly symmetrical compared to NEF and SEFA which are moderately skewed. With such a small sample size, the interpretation of the kurtosis and skewness results for risk appetite have a level of bias.

Table 8: Total Approved Loan Amount Descriptive Analysis Summary

TALA	TALABP	TALANEF	TALASEFA	TALA (Pooled)
Mean	1,018,860,000.00	911,380,000.00	340,000,000.00	820,861,538.46
Standard Error	51,218,645.04	159,658,586.99	105,305,903.60	99,983,609.26
Median	1,009,300,000.00	895,000,000.00	366,000,000.00	895,000,000.00
Mode	#N/A	#N/A	#N/A	#N/A
Standard Deviation	114,528,372.03	357,007,453.70	182,395,175.37	360,496,029.89
Sample Variance	1.31167E+16	1.27454E+17	3.3268E+16	1.29957E+17
Kurtosis	-1.039530542	-0.678039178	#DIV/0!	-0.740380666
Skewness	0.423153282	-0.308324868	-0.628429891	-0.52997513
Range	286,000,000.00	914,100,000.00	362,000,000.00	1,186,500,000.00
Minimum	891,000,000.00	418,400,000.00	146,000,000.00	146,000,000.00
Maximum	1,177,000,000.00	1,332,500,000.00	508,000,000.00	1,332,500,000.00
Sum	5,094,300,000.00	4,556,900,000.00	1,020,000,000.00	10,671,200,000.00
Count	5	5	3	13
Largest(1)	1,177,000,000.00	1,332,500,000.00	508,000,000.00	1,332,500,000.00
Smallest(1)	891,000,000.00	418,400,000.00	146,000,000.00	146,000,000.00
Confidence Level(95.0%)	142,205,756.32	443,283,302.35	453,094,733.59	217,845,570.61

Table 8 above outlines the descriptive analysis results for the observed independent variable, Total Approved Loan Amounts, for the stated research period. Out of all three institutions, Business Partners has the highest mean total approval amount which indicates that Business Partners has the largest assets or funds available for funding compared to NEF and SEFA which has the lowest total approved loan amount. Compared to the pooled result, Business Partners and NEF can be regarded as the larger two institutions compared to SEFA. Business Partners' total approved loan amount variable exhibited the lowest standard deviation and sample variance support. Earlier indications showed that Business Partners is the most consistent institution in terms of maintaining high levels of total approved loan amounts. It is interesting to note that even though Business Partners has the largest total approved loan amounts over the period, its range is the smallest which indicates limited volatility in terms of total approved loan amount compared to NEF which has the highest range and standard deviation which can be explained in part due to the moratorium on funding experience by NEF during the 2013 to 2014 period.

Table 9: Long-term Loan Exposure Descriptive Analysis Summary

<i>LTLE</i>	<i>LTLEBP</i>	<i>LTLENEF</i>	<i>LTLESEFA</i>	<i>LTLE (Pooled)</i>
Mean	1,802,048,600.00	950,595,982.00	234,923,666.67	1,112,922,608.46
Standard Error	68,516,738.88	67,683,497.99	118,314,833.80	180,603,895.13
Median	1,740,888,000.00	1,004,124,287.00	251,174,000.00	1,020,961,208.00
Mode	#N/A	#N/A	#N/A	#N/A
Standard Deviation	153,208,085.73	151,344,902.45	204,927,303.43	651,176,604.45
Sample Variance	2.34727E+16	2.29053E+16	4.19952E+16	4.24031E+17
Kurtosis	-2.208236186	-1.193751479	#DIV/0!	-1.163051158
Skewness	0.100359285	-0.346786533	-0.354597295	-0.175259564
Range	353,986,000.00	382,068,025.00	408,887,000.00	1,946,085,000.00
Minimum	1,614,454,000.00	749,086,331.00	22,355,000.00	22,355,000.00
Maximum	1,968,440,000.00	1,131,154,356.00	431,242,000.00	1,968,440,000.00
Sum	9,010,243,000.00	4,752,979,910.00	704,771,000.00	14,467,993,910.00
Count	5	5	3	13
Largest(1)	1,968,440,000.00	1,131,154,356.00	431,242,000.00	1,968,440,000.00
Smallest(1)	1,614,454,000.00	749,086,331.00	22,355,000.00	22,355,000.00
Confidence Level(95.0%)	190,232,964.29	187,919,516.69	509,067,642.63	393,502,083.81

Long-term loan exposure, an observed independent variable, provides insight into the DFIs willingness to be exposure to long-term risk through provided long-term loans. Among all three DFIs, Business Partners is the only institution that has the highest mean long-term loan exposure and the only institution which has a long-term loan exposure higher than the pooled industry proxy. This indicates that either Business Partners has the most confidence in its long-term loan portfolio's performance which explain its willingness to incur such above industry exposure or that the indication is biased due portfolio size. Based on Business Partners consistency in terms of performance over this period, it was interesting to note that NEF had the lowest standard deviation and sample variance of the three institutions which may imply that of the three institutions, NEF may be the institution that has more intentions of maintaining a high long-term loan exposure other than Business Partners and in last rank SEFA which has the largest standard deviation and sample variance. Due to the small sample size, the significance of the variables above are detailed in the regression analysis section which takes into consideration their data assumptions and restrictions.

Table 10: Short-term Loan Exposure Descriptive Analysis Summary

<i>STLE</i>	<i>STLEBP</i>	<i>STLENEF</i>	<i>STLESEFA</i>	<i>STLE (Pooled)</i>
Mean	313,936,400.00	336,755,042.80	261,067,666.67	310,512,324.15
Standard Error	16,397,443.23	76,770,210.30	72,494,832.33	32,583,244.11
Median	323,320,000.00	383,652,347.00	252,711,000.00	323,320,000.00
Mode	#N/A	#N/A	#N/A	#N/A
Standard Deviation	36,665,797.72	171,663,408.87	125,564,732.88	117,480,557.36
Sample Variance	1.34438E+15	2.94683E+16	1.57665E+16	1.38017E+16
Kurtosis	0.397556708	-0.699411275	#DIV/0!	0.076111021
Skewness	-0.407017295	-0.739155235	0.298160454	-0.257706854
Range	98,435,000.00	424,793,521.00	250,712,000.00	424,793,521.00
Minimum	261,480,000.00	87,934,546.00	139,890,000.00	87,934,546.00
Maximum	359,915,000.00	512,728,067.00	390,602,000.00	512,728,067.00
Sum	1,569,682,000.00	1,683,775,214.00	783,203,000.00	4,036,660,214.00
Count		5	5	3
Largest(1)	359,915,000.00	512,728,067.00	390,602,000.00	512,728,067.00
Smallest(1)	261,480,000.00	87,934,546.00	139,890,000.00	87,934,546.00
Confidence Level(95.0%)	45,526,600.99	213,148,274.60	311,920,088.22	70,992,790.30

The descriptive analysis of the last observed independent variable, Short-term Loan Exposure, gives insight into the different institutions willingness to fund enterprises with little or no history as these are the enterprises which are more likely to qualify for short-term loans rather than long-term loans. It is interesting to note that even though all three DFIs have largely differing portfolio sizes, their short-term loan exposure mean is very close to the pooled industry proxy. SEFA has the lowest mean of the three institutions which was expected. Statistics indicated that SEFA is more inclined to fund short-term loans than the other two DFIs.

In terms of consistency, Business Partners is the least volatile of the three institutions with regards to short-term loan exposure with the lowest standard deviation and sample variance, followed by SEFA with NEF being the most volatile. With SEFA having the smallest loan portfolio, these analysis results indicate that SEFA is the most aggressive DFI in terms of growing its short-term loan portfolio which may lead to an interpretation that SEFA has the highest willingness to provide short-term loans which have a high startup allocation than long-term loans.

The descriptive analysis supports the hypothesis that the DFI have a higher risk appetite. The analysis also indicates that even though Business Partners is the most consistent of the three DFIs, SEFA has been the most aggressive DFI and this is reflective in its risk appetite which is higher over the period 2013 – 2015 when all DFIs were operational.

5.2.2 Total loan portfolio trend analysis

A trend analysis was conducted using graphical methods, plotting the observed variables on a line chart over the research period.

The figures outlined below highlight interesting trends that can be picked up from visual analysis of the variables.

Figure 16: DFI Portfolio Risk Appetite

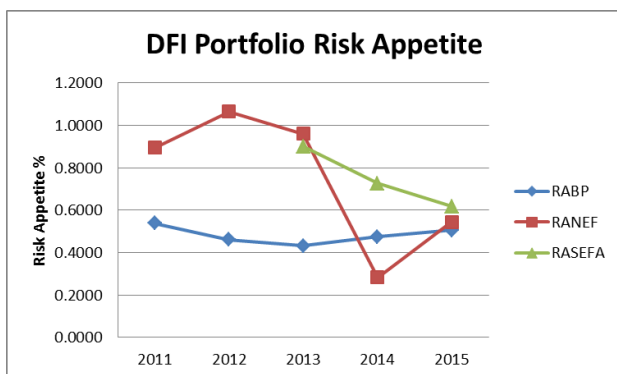
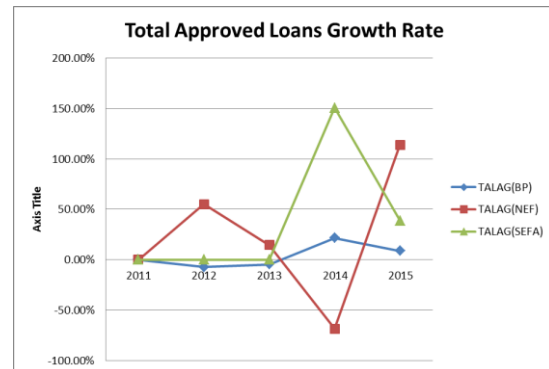


Figure 17: Total Approved Loans Growth Rate



In Figure 16, the risk appetite ratio extrapolated from collected data and indicates clear risk appetite trends for Business Partners, National Empowerment Fund and the Small Enterprise Finance Agency. The risk appetite level of Business Partners over the period 2011 – 2013 experienced a downward trend which indicates a reduction in the institution's risk appetite before changing into a positive trend from 2014 which indicates a positive change in the institution's risk appetite. It is also important to note that the downward trend and subsequent upward trend experience by Business Partners was gradual in slope when compared to the National Empowerment Fund and the Small Enterprise Finance agency (SEFA) during the same period.

The National Empowerment Fund (NEF) experienced an initial increase in risk appetite between 2011 and 2012 followed by a decrease in risk appetite between 2012 and 2013 before experiencing a drastic reduction in risk appetite between 2013 and 2014 which is explainable by the moratorium on funds experienced by the NEF at that stage before improving again on a positive path from 2014 onwards.

SEFA unlike the other two DFIs has only been operational since 2013 and the risk appetite of SEFA was thus only captured from 2013 onwards. SEFA has experienced a gradual decrease in risk appetite since 2013 till 2015. It is interesting to note that even though SEFA has been on a constant decrease risk appetite trend since 2013, SEFA has maintained a risk appetite

level which is higher than both Business Partners and NEF over the period it has been operational.

Figure 16 represents the Total Approved Loans Growth Rate which reflects the changes in the total approved loans over the study period. An important factor to note is that the most volatile DFIs in terms of changes in approved loans growth rate is NEF and SEFA. NEF experienced the most volatile changes due to the moratorium it self-imposed due to limited available funding resources whereas SEFA experienced a high growth rate from inception which later decreased drastically during the 2014/2015 financial period. All three institutions have maintained an overall positive growth in loan approvals with SEFA and NEF adopting the most aggressive position of the three DFIs. An interesting trend that is illustrated in Figure 16 is the downward growth trend experienced by both Business Partners and SEFA during the 2014/2015 financial period indicating a possible external factor influence to their growth rates.

Figure 18 and 19 below indicate a positively correlated relationship between all the DFIs with regards to the long-term loan exposure trends and the short-term loan exposure trends observable in the figures. Business Partners is evident to have the largest long-term loan exposure out of the three DFIs, NEF, the second largest which is followed by SEFA which has the lowest long-term loan exposure. The three DFIs have all maintained a positive growth rate in their long-term loan exposure with only SEFA standing out in terms of their high slope coefficient indicating a faster growth in the long-term loans exposure compared to the other two DFIs.

Figure 18: Long-term exposure to total loan approvals

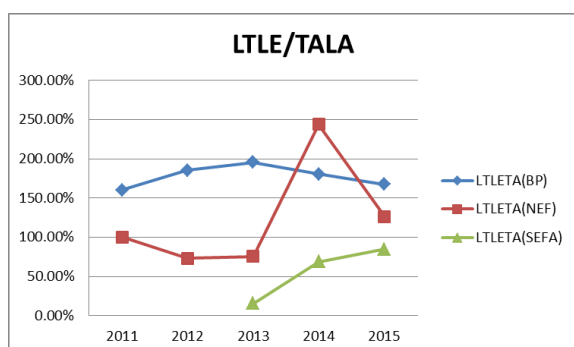
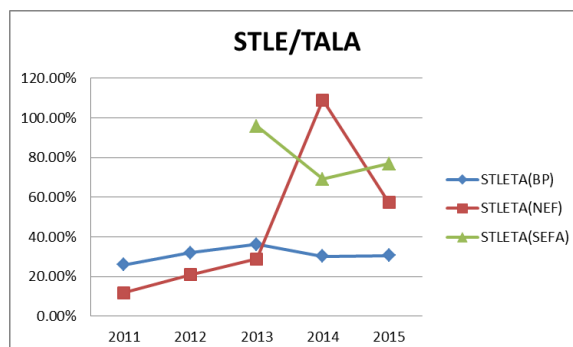


Figure 19: Short-term exposure to total loan approvals



When analysing Figure 19, the most important aspect that is highlighted is the change in short-term loan exposure experienced by all three DFIs. There is a positive trend experienced

by all of the DFIs which indicates that the short-term loan exposure has been growing over the period 2011 to 2015. The NEF has experienced the largest change in terms of short-term loan exposure. It has maintained a steady steep growth trend which has seen the NEF change from having the lowest short-term loan exposure in 2011 out of all of the DFIs to surpassing Business Partners in 2012 which has the largest short-term loan exposure of the three institutions. An important aspect to note is that SEFA out of the three DFIs has the highest short-term loan exposure to total loans approved.

Figure 20: Total Portfolio Growth Rate

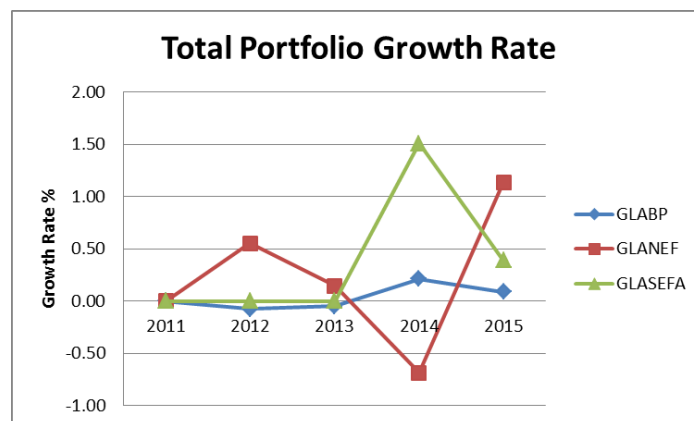


Figure 20 indicates the level of aggressive growth or decline that was experienced by the DFIs during the 2011 to 2015 period. This figure shows that Business Partners portfolio experienced a negative growth between 2011 and 2013 then an increasing positive rate post 2013 before slowing slightly in 2015. This trend is quite different for NEF which experienced aggressive portfolio size growth from 2011 to 2012, slowing down from 2012 to 2013 before experiencing negative growth rates from between 2013 and mid-2014 during the moratorium period which was finally followed by an aggressive portfolio growth from mid-2014 to 2015 reflecting renewed intention to fund.

SEFA experienced similar aggressive portfolio growth rates since its inception. It experienced the highest growth rate in 2014 and slower growth from 2014 resulting in SEFA's growth rate being surpassed by NEF's in 2015. It is interesting to note that over the same period, Business Partners maintained the lowest portfolio growth rate, being surpassed by NEF and SEFA. In terms of ranking, in 2015 NEF had the highest portfolio growth rate followed by SEFA and lastly Business Partners.

5.3 Econometric Analysis

The previous section of this research paper focused on the descriptive analysis conducted on the different variables identified as affecting risk appetite. It is clear from the variables above that they all have an effect on the risk appetite of the DFIs, but what is not clear is to what extent these variables and factors actually influence risk appetite and to what level this influence is.

In the following regression analysis section, I will address this problem by statistically analysing all the independent variables against the dependent variable using a panel data methodology taking into consideration model assumptions and challenges in achieving the statistically significant model below that is used to analyse the risk appetite of the three DFIs.

5.3.1 Model diagnostic tests

In order for the results to be valid and reliable and before doing any time series analysis, certain statistical tests were conducted on the data to check for the existence of Stationarity using the standard unit root test, the Dickey-Fuller test; Cointegration using the Johansen test; Heteroscedasticity using the Wald or Breusch-Page and White test; Autocorrelation using the Wooldridge autocorrelation test and covariance based on the covariance and multicollinearity.

One of the biggest challenges when doing research or analysis of small samples such as this data set, is the ability to minimise Type I and Type II errors. Type I error occurs when we reject a true null hypothesis whereas Type II error occurs when we do not reject a false null hypothesis. Due to the sample size of this data set, a nonparametric test is best in lieu of the t-test as mentioned by Siegel (1957). Posten in his 1982 research identified the Wilcoxon test as the test which provided the highest statistical power in small sample sizes (Winter, J.C.F. 2013). Results from Janusonis (2009) were contrary to Siegel which recommended that the application of t-test on extremely small samples is feasible and thus this research paper has utilised the t-statistics to determine significance.

A Hausman test was conducted to determine which technique should be used when analysing the data. A Hausman test tests whether the cross-sectional between-effect is different from the cross-sectional within effect. This test is conducted in order to determine the appropriate panel data methodology between fixed effects and random effects through determining if there is any correlation between the explanatory variable and the constant or error term. The

Hausman test is based on testing “the difference between the random effects and fixed effects estimates” (Wooldridge, J. 2002). It evaluates the estimator consistency against a less efficient known estimator. The test compares the ordinary least squares estimator (OLS) against the two stage least squares (2SLS) estimator to determine the existence of endogeneity (Wooldridge, J. 2002). Based on data collected and on the sample space identified, the research paper has used unbalanced panel data due to limitations in available data and thus the parameters outlined for the data to be sourced. Therefore a random effects model with GLS estimators was used.

Multicollinearity is a challenge in regression modelling, a term used to indicate the existence of a correlation between independent variables resulting in estimates of the regression coefficient having large sampling errors (Keller, G. 2012). In larger samples, multicollinearity is not as much a problem as in small samples such as the sample for this research paper. The large sampling errors due to multicollinearity have two consequences: 1) sample coefficients may be quite different from the actual population; 2) The t-statistics of the coefficients will be small, leading to inference of there being no existence of a linear relationship between the independent variables and the dependent variable when there is (Keller, G. 2012). Multicollinearity was tested for and the variables selected in the developed regression model were selected based on a theoretical and literature based regression modelling method in order to identify and address the existence of multicollinearity. This processes resulted in the possible existence of omitted variable bias limiting the interpretation of the included independent variables due to the exclusion of certain explanatory correlated variables.

Stationarity test – Cluster level Time Series

The test for stationarity is conducted to ascertain if any time series’ variability or statistical distribution is dependent on time as this influences the interpretation of results and the reliability of results presented by the regression models.

Stationarity tests were conducted on the dependent and all the independent variables utilising three different testing methods to ensure accuracy of results. The Dick-Fuller test and Phillips-Perron test were conducted with the following null hypothesis H_0 : There is a unit root for the series. The KPPS test was also conducted with the following null hypothesis H_0 : The series is stationary.

Table 11: Risk Appetite (RA) – Time Series (Dependent Variable)

Dickey-Fuller test (ADF(stationary) / k: 1 / RA):				Phillips-Perron test (PP(no intercept) / Lag: Short / RA):				KPSS test (Level / Lag Short / RA):			
	BP	NEF	SEFA		BP	NEF	SEFA		BP	NEF	SEFA
Tau (Observed value)	0.000	0.000	0.000	Tau (Observed value)	-0.391	-0.809	-11.454	Eta (Observed value)	0.152	0.342	0.329
Tau (Critical value)	0.000	0.000	0.000	Tau (Critical value)	0.000	0.000	0.000	Eta (Critical value)	0.425	0.425	0.332
p-value (one-tailed)	< 0.0001	< 0.0001	< 0.0001	p-value (one-tailed)	< 0.0001	< 0.0001	< 0.0001	p-value (one-tailed)	0.553	0.136	0.084
alpha	0.05	0.05	0.05	alpha	0.05	0.05	0.05	alpha	0.05	0.05	0.05

For the dependent variable (RA), all the results of the Dickey-Fuller and Phillips-Perron tests conducted for the (BP), (NEF) and (SEFA) time series returned significant p-value statistics indicating that we reject the null hypothesis and infer that all the series are stationary at an alpha of 5%. The KPSS test p-value for (BP), (NEF) and (SEFA) variable returned statistically insignificant results at an alpha of 5% indicating that the null hypothesis cannot be rejected and therefore we can infer that all these (RA) times series are trend stationary which supports the ADF and PP test results.

Table 12: Long-term Loan Exposure (LTLE) – Times Series (Independent Variable)

Dickey-Fuller test (ADF(stationary) / k: 1 / LTLE):				Phillips-Perron test (PP(no intercept) / Lag: Short / LTLE):				KPSS test (Level / Lag Short / LTLE):			
	BP	NEF	SEFA		BP	NEF	SEFA		BP	NEF	SEFA
Tau (Observed value)	0.152	0.342	0.329	Tau (Observed value)	3.619	3.645	1.041	Eta (Observed value)	0.487	0.500	0.332
Tau (Critical value)	0.000	0.000	0.000	Tau (Critical value)	0.000	0.000	0.000	Eta (Critical value)	0.425	0.425	0.332
p-value (one-tailed)	1.000	1.000	1.000	p-value (one-tailed)	1.000	1.000	1.000	p-value (one-tailed)	0.011	0.006	0.043
alpha	0.05	0.05	0.05	alpha	0.05	0.05	0.05	alpha	0.05	0.05	0.05

For the independent variable (LTLE), all the results of the Dickey-Fuller and Phillips-Perron tests conducted for the (BP), (NEF) and (SEFA) time series returned insignificant p-value statistics which indicates that the null hypothesis cannot be rejected and therefore infer that in all of the (LTLE) series there exists a unit root. The KPSS test p-value for the (BP), (NEF) and (SEFA) variable returned statistically insignificant results which indicates that the null hypothesis cannot be rejected and therefore we can infer that all these (LTLE) time series are trend stationary. This difference in results provides insight into the possibility of heteroscedasticity in the times series.

Table 13: Short-term Loan Exposure (STLE) – Times Series (Independent Variable)

Dickey-Fuller test (ADF(stationary) / k: 1 / STLE):				Phillips-Perron test (PP(no intercept) / Lag: Short / STLE):				KPSS test (Level / Lag Short / STLE):			
	BP	NEF	SEFA		BP	NEF	SEFA		BP	NEF	SEFA
Tau (Observed value)	0.487	0.500	0.332	Tau (Observed value)	3.347	1.301	7.276	Eta (Observed value)	0.484	0.503	0.333
Tau (Critical value)	0.000	0.000	0.000	Tau (Critical value)	0.000	0.000	0.000	Eta (Critical value)	0.425	0.425	0.332
p-value (one-tailed)	1.000	1.000	1.000	p-value (one-tailed)	1.000	1.000	1.000	p-value (one-tailed)	0.012	0.005	0.037
alpha	0.05	0.05	0.05	alpha	0.05	0.05	0.05	alpha	0.05	0.05	0.05

For the independent variable (STLE), all the results of the Dickey-Fuller (ADF) and Phillips-Perron (PP) tests conducted for the (BP), (NEF) and (SEFA) time series returned insignificant p-value statistics at an alpha of 5% indicating that we cannot reject the null hypothesis and

therefore we infer that the different series have a unit root. The KPSS test p-value for (BP), (NEF) and (SEFA) variable returned statistically significant results at an alpha of 5% which indicates that we reject the null hypothesis and therefore we can infer that all of these (STLE) times series are not trend stationary. Taking into consideration the difference between the ADF, PP and KPSS test, the results imply the series STLE has a unit root.

Table 14: Total Approved Loans Amount (TALA) – Times Series (Independent Variable)

Dickey-Fuller test (ADF(stationary) / k: 1 / TALA):				Phillips-Perron test (PP(no intercept) / Lag: Short / TALA):				KPSS test (Level / Lag Short / TALA):			
	BP	NEF	SEFA		BP	NEF	SEFA		BP	NEF	SEFA
Tau (Observed value)	0.484	0.503	0.333	Tau (Observed value)	0.601	-0.250	1.852	Eta (Observed value)	0.316	0.115	0.330
Tau (Critical value)	0.000	0.000	0.000	Tau (Critical value)	0.000	0.000	0.000	Eta (Critical value)	0.425	0.425	0.332
p-value (one-tailed)	1.000	1.000	1.000	p-value (one-tailed)	1.000	1.000	1.000	p-value (one-tailed)	0.172	0.741	0.078
alpha	0.05	0.05	0.05	alpha	0.05	0.05	0.05	alpha	0.05	0.05	0.05

For the independent variable (TALA), all the results of the Dickey-Fuller and Phillips-Perron tests conducted for the (BP), (NEF) and (SEFA) time series returned insignificant p-value statistics at an alpha of 5% which indicates that we cannot reject the null hypothesis and therefore we infer that the different series have a unit root. The KPSS test p-value for the (BP), (NEF) and (SEFA) variable returned statistically insignificant results at an alpha of 5% which indicates that we cannot reject the null hypothesis and therefore we can infer that all of these (TALA) time series are stationary. Due to the fact that we cannot reject the SDF. PP and KPSS null hypothesis indicates that the level of observations for this time series may be insufficient. This is an acknowledged challenge of limited observation due to the limited information made available by the different development finance institutions.

Table 15: Total Non-performing Loans-lagged (TNPLL) – Times Series (Independent Variable)

Dickey-Fuller test (ADF(stationary) / k: 1 / TNPLL):				Phillips-Perron test (PP(no intercept) / Lag: Short / TNPLL):				KPSS test (Level / Lag Short / TNPLL):			
	BP	NEF	SEFA		BP	NEF	SEFA		BP	NEF	SEFA
Tau (Observed value)	0.316	0.115	0.330	Tau (Observed value)	-3.698	-0.346	65535.000	Eta (Observed value)	0.402	0.089	0.250
Tau (Critical value)	0.000	0.000	0.000	Tau (Critical value)	0.000	0.000	0.000	Eta (Critical value)	0.395	0.395	0.000
p-value (one-tailed)	1.000	1.000	1.000	p-value (one-tailed)	1.000	1.000	1.000	p-value (one-tailed)	0.039	0.938	< 0.0001
alpha	0.05	0.05	0.05	alpha	0.05	0.05	0.05	alpha	0.05	0.05	0.05

For the independent lagged variable (TNPLL), all of the results of the Dickey-Fuller and Phillips-Perron tests conducted for the (BP), (NEF) and (SEFA) time series returned insignificant p-value statistics at an alpha of 5% which indicates that we cannot reject the null hypothesis and therefore we infer that the different series have a unit root. The KPSS test p-value for the (BP) and (SEFA) variable returned statistically significant results at an alpha of 5% which indicate that we reject the null hypothesis and therefore we can infer that the

(TNPLLG) times series for (BP) and (SEFA) are not trend stationary. KPSS result for (NEF) (TNPLLG) time series was not statistically insignificant at an alpha of 5% and therefore we cannot reject the null hypothesis for the (NEF) (TNPLLG) time series and thus infer that the (NEF) (TNPLLG) time series is trend stationary. These results provide contradicting results with the TNPLLG times series for BP and SEFA indicating the existence of a unit root in the times series but for the NEF (TNPLLG) times series the results for ADF and KPSS indicate that the observations in the data set may not be sufficient.

Table 16: South African Gross Domestic Product Growth rate-lagged (GDPGSALG) – Time Series (Independent Variable)

Dickey-Fuller test (ADF(stationary) / k: 1 / GDPGSALG):				Phillips-Perron test (PP(no intercept) / Lag: Short / GDPGS)				KPSS test (Level / Lag Short / GDPGSALG):			
	BP	NEF	SEFA		BP	NEF	SEFA		BP	NEF	SEFA
Tau (Observed value)	0.402	0.089	0.250	Tau (Observed value)	-3.841	-3.841	-1.370	Eta (Observed value)	0.371	0.371	0.280
Tau (Critical value)	0.000	0.000	0.000	Tau (Critical value)	0.000	0.000	0.000	Eta (Critical value)	0.395	0.395	0.332
p-value (one-tailed)	1.000	1.000	1.000	p-value (one-tailed)	1.000	1.000	1.000	p-value (one-tailed)	0.089	0.089	0.327
alpha	0.05	0.05	0.05	alpha	0.05	0.05	0.05	alpha	0.05	0.05	0.05

For the independent lagged variable (GDPGSALG), all the results of the Dickey-Fuller and Phillips-Perron tests conducted for the (BP), (NEF) and (SEFA) time series returned insignificant p-value statistics at an alpha of 5% indicating that we cannot reject the null hypothesis and therefore we infer that the different series have a unit root. The KPSS test p-value for (BP), (NEF) and (SEFA) variable also returned statistically insignificant results at an alpha of 5% indicating that we cannot reject the null hypothesis and therefore we can infer that all these (GDPGSALG) times series are stationary. Based on the contradicting results from the ADF and KPSS, the implication is that there may be insufficient observations from this time series.

Based on the results obtained from the ADF, PP and KPSS unit root and stationarity tests, it was evident that a cointegration existed in these individual regression models and thus a cointegration test was required in order to ascertain how to address the cointegration problem resulting from the ADF, PP and KPSS test results. Prior to conducting the cointegration test for these variables, which were analysed and tested as three different cluster data time series, additional ADF, PP and KPSS tests were run on the pooled data to ascertain if the unit root and non-stationarity challenge existed in this pooled data set.

Stationarity test – Pooled level Time Series

Table 17: Risk Appetite (RA) – Time Series (Dependent Variable)

Dickey-Fuller test (ADF(stationary) / k: 2 / RA):		Phillips-Perron test (PP(no intercept) / Lag: Short / RA):		KPSS test (Level / Lag Short / RA):	
Tau (Observed value)	-2.518	Tau (Observed value)	-0.598	Eta (Observed value)	0.154
Tau (Critical value)	0.021	Tau (Critical value)	0.021	Eta (Critical value)	0.461
p-value (one-tailed)	0.263	p-value (one-tailed)	0.263	p-value (one-tailed)	0.438
alpha	0.05	alpha	0.05	alpha	0.05

For the dependent variable (RA) time series, all the results of the ADF, PP and KPSS tests conducted for the time series returned insignificant p-value statistics which indicates that we cannot reject the null hypothesis for all three tests. This implies that unit root existence is present and or trend-stationarity which is contradictive thus implying that cointegration may exist or that there are insufficient observations for this time series in the data set.

Table 18: Long-term Loan Exposure (LTLE) – Times Series (Independent Variable)

Dickey-Fuller test (ADF(stationary) / k: 2 / LTLE):		Phillips-Perron test (PP(no intercept) / Lag: Short / LTLE):		KPSS test (Level / Lag Short / LTLE):	
Tau (Observed value)	-1.829	Tau (Observed value)	-1.702	Eta (Observed value)	0.081
Tau (Critical value)	0.021	Tau (Critical value)	0.021	Eta (Critical value)	0.461
p-value (one-tailed)	0.511	p-value (one-tailed)	0.511	p-value (one-tailed)	0.777
alpha	0.05	alpha	0.05	alpha	0.05

For the independent variable (LTLE) time series, all the results of the ADF, PP and KPSS tests conducted for the time series returned insignificant p-value statistics indicating that we cannot reject the null hypothesis for all three tests. This implies that unit root existence is present and or trend-stationarity which is contradictive thus implying that cointegration may exist or that there are insufficient observations for this time series in the data set.

Table 19: Short-term Loan Exposure (STLE) – Times Series (Independent Variable)

Dickey-Fuller test (ADF(stationary) / k: 2 / STLE):		Phillips-Perron test (PP(no intercept) / Lag: Short / STLE):		KPSS test (Level / Lag Short / STLE):	
Tau (Observed value)	-2.001	Tau (Observed value)	-0.073	Eta (Observed value)	0.511
Tau (Critical value)	0.021	Tau (Critical value)	0.021	Eta (Critical value)	0.461
p-value (one-tailed)	0.442	p-value (one-tailed)	0.442	p-value (one-tailed)	0.034
alpha	0.05	alpha	0.05	alpha	0.05

For the independent variable (STLE), all the results of the Dickey-Fuller (ADF) and Phillips-Perron (PP) tests conducted for the time series returned insignificant p-value statistics at an alpha of 5% indicating that we cannot reject the null hypothesis and therefore we infer that the different pooled time series have a unit root existence. The KPSS test p-value for the pooled (STLE) time series returned statistically significant results at an alpha of 5% indicating that we reject the null hypothesis and therefore we can infer that all these (STLE)

time series are not trend stationary. Taking into consideration the difference between the ADF, PP and KPSS test, the results imply the pooled series STLE has a unit root.

Table 20: Total Approved Loans Amount (TALA) – Times Series (Independent Variable)

Dickey-Fuller test (ADF(stationary) / k: 2 / TALA):		Phillips-Perron test (PP(no intercept) / Lag: Short / TALA):		KPSS test (Level / Lag Short / TALA)	
Tau (Observed value)	-1.583	Tau (Observed value)	-1.194	Eta (Observed value)	0.159
Tau (Critical value)	0.021	Tau (Critical value)	0.021	Eta (Critical value)	0.461
p-value (one-tailed)	0.608	p-value (one-tailed)	0.608	p-value (one-tailed)	0.418
alpha	0.05	alpha	0.05	alpha	0.05

For the independent variable (TALA) time series, all the results of the ADF, PP and KPSS tests conducted for the pooled time series returned insignificant p-value statistics indicating that we cannot reject the null hypothesis for all three tests. This implies that unit root existence is present and or trend-stationarity which is contradictive thus implying that cointegration may exist or that there are insufficient observations for this time series in the data set.

Table 21: Total Non-performing Loans-lagged (TNPLLG) – Times Series (Independent Variable)

Dickey-Fuller test (ADF(stationary) / k: 2 / TNPLLG):		Phillips-Perron test (PP(no intercept) / Lag: Short / TNPLLG):		KPSS test (Level / Lag Short / TNPLLG):	
Tau (Observed value)	-1.350	Tau (Observed value)	-0.515	Eta (Observed value)	0.266
Tau (Critical value)	0.475	Tau (Critical value)	0.475	Eta (Critical value)	0.457
p-value (one-tailed)	0.594	p-value (one-tailed)	0.594	p-value (one-tailed)	0.202
alpha	0.05	alpha	0.05	alpha	0.05

For the independent variable (TNPLLG) Time series, all the results of the ADF, PP and KPSS tests conducted for the pooled time series returned insignificant p-value statistics indicating that we cannot reject the null hypothesis for all three tests. This implies that unit root existence is present and or trend-stationarity which is contradictive thus implying that cointegration may exist or that there are insufficient observations for this time series in the data set.

Table 22: South African Gross Domestic Product Growth rate-lagged (GDPGSALG) – Time Series (Independent Variable)

Dickey-Fuller test (ADF(stationary) / k: 2 / GDPGSALG):		Phillips-Perron test (PP(no intercept) / Lag: Short / GDPGSALG):		KPSS test (Level / Lag Short / GDPGSALG)	
Tau (Observed value)	-2.422	Tau (Observed value)	-2.836	Eta (Observed value)	0.907
Tau (Critical value)	0.243	Tau (Critical value)	0.243	Eta (Critical value)	0.459
p-value (one-tailed)	0.283	p-value (one-tailed)	0.283	p-value (one-tailed)	0.000
alpha	0.05	alpha	0.05	alpha	0.05

For the independent variable (GDPGSALG), all the results of the Dickey-Fuller (ADF) and Phillips-Perron (PP) tests conducted for the time series returned insignificant p-value statistics at an alpha of 5% indicating that we cannot reject the null hypothesis and therefore we infer that the different pooled time series have a unit root existence. The KPSS test p-value for the pooled (GDPGSALG) time series returned statistically significant results at an alpha of 5% indicating that we reject the null hypothesis and therefore we can infer that the (GDPGSALG) time series is not trend stationary. Taking into consideration the difference between the ADF, PP and KPSS test, the results imply the pooled series (GDPGSALG) has a unit root.

Johansen cointegration test

A cointegration Johansen test was conducted on all the time series on a cluster basis and a pooled basis in order to determine the level of differencing required in order to address the cointegration problem. Unfortunately, due to the limitation in variable observations for the different time series, it restricted a significant cointegration test. Based on theory and literature, the times series TNPLLG and GDPGSALG were both observed variables which were then transformed into 1 period lagged variables and this transformation impacted the coefficient of determination for the pooled regression model. Unfortunately, these transformed lagged variables did not influence the explanatory capability of the development finance cluster time series' and thus was not included in the cluster regression models.

Heteroscedasticity test

Heteroscedasticity is tested for in this research paper based on the regression model assumptions where which the error term e_i is assumed to be normally distributed; a mean of zero and have constant variance. If these assumptions are not met and the variance is not constant, the error term is said to be heteroscedastic. The existence of heteroscedasticity informs the researcher that the regression coefficients are not best linear unbiased estimates or minimum variance estimates (Watsham and Parramore, 1997). The solution to the existence of heteroscedasticity is the transformation of the regression model so that the regression model is reflective of the error term relationship with the regression model or the

use of a superior technique, Generalized Least Squares, used in this study yielding BLUE estimators in the presence of heteroscedasticity.

Autocorrelation test

The test for autocorrelation was conducted on the dataset to test whether the error terms (residuals) exhibit a level of autocorrelation. This level of autocorrelation occurs when the error terms are found not to be independent. If autocorrelation exists, the regression coefficients are unbiased but with underestimated standard errors making the regression coefficient tests unreliable (Watsham, J and Parramore, K. 1997). It is important to note that autocorrelation which is based on the autoregressive scheme is caused by omitted variables or wrong functional form of the regression estimating equation. In this research paper, the Durbin-Watson test statistic was used to determine the existence of autocorrelation which is discussed in the following regression models and results.

Multicollinearity

Test for multicollinearity is important for the regression model as the test indicates if the independent variables are uncorrelated. Multicollinearity occurs when a number or all of the independent variables in the regression model are highly correlated, which results in the regression model having difficulty separating the explanatory effects of the difference independent variables. This causes instability with the regression coefficients resulting in unreliable coefficients. This may result in high R^2 , high standard errors but small t-statistics indicating lack of significance (Watsham, J and Parramore, K. 1997). In this research paper, multicollinearity was detected using the variance inflation factor and addressed and reduced through omitting certain highly correlated variables and the pooling of the cross-section and time-series data. Due to the nature of the regression model and the independent variables included due to theory, the existence of multicollinearity was expected.

The first step when conducting panel data analysis is to determine which technique to utilise between the fixed or random effects model or to utilise a pooled regression technique.

5.3.2 Regression models

This section will present the regression results for the two different regression models equation (6) and (7) and the interpretation of their regression results.

5.3.2.1 Business Partners Regression Model

Correlation matrix:				
	LTLE	STLE	TALA	RA
LTLE	1	0.888	0.729	-0.124
STLE	0.888	1	0.520	-0.345
TALA	0.729	0.520	1	0.584
RA	-0.124	-0.345	0.584	1

The correlation matrix indicates that the RA variable is negatively correlated with the LTLE and STLE whereas the TALA variable indicates a very strong positive relationship. The LTLE and STLE variables are positively correlated as can be expected from literature and theory. The interesting dynamic is the small negative relationship between the TALA variable and the LTLE and STLE variables which indicates an increase in the TALA variable results in an inverse effect on the LTLE and STLE variable.

SUMMARY OUTPUT (Business Partners)								
<i>Regression Statistics</i>								
Multiple R	0.999622259							
R Square	0.99924466							
Adjusted R Square	0.996978639							
Standard Error	0.002259425							
Observations	5							
<i>ANOVA</i>								
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>			
Regression	3	0.006753439	0.002251146	440.9689	0.034988613			
Residual	1	5.105E-06	5.105E-06					
Total	4	0.006758544						
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	0.501420928	0.014188929	35.33888496	0.01801	0.321133492	0.681708364	0.321133492	0.681708364
LTLE	-2.29842E-10	2.19136E-11	-10.48856686	0.060514	-5.08281E-10	4.85965E-11	-5.08281E-10	4.85965E-11
STLE	-3.24828E-10	7.34202E-11	-4.42423969	0.141516	-1.25772E-09	6.08063E-10	-1.25772E-09	6.08063E-10
TALA	4.87546E-10	1.57523E-11	30.95070545	0.020562	2.87393E-10	6.87698E-10	2.87393E-10	6.87698E-10

The regression model fitted very well when used to analyse the independent variables influencing Risk Appetite of the institution. Intercept, LTLE and TALA coefficients were found to be statistically significant with p-values of 0.018, 0.0605 and 0.0205 respectively. The regression model with a statistically significant F-statistics indicates that the problem of omission variables is limited in this regression model.

The regression coefficients supported the assumptions that Risk Appetite is influenced by the independent variables. The LTLE variable negatively influences the Risk Appetite of Business Partners with every one unit increase in LTLE all other variables fixed, will result in a small negative change in the Risk Appetite variable. This was also the case for the STLE variable with the negative coefficient indicating that a positive change in the STLE variable will result in a small negative change in the Risk Appetite of Business Partners. The TALA variable has a positive coefficient indicating that the TALA variable has a direct and positive influence on the Risk Appetite variable. A positive change in the TALA variable will result in a small positive change in the Risk Appetite variable.

Standardized coefficients (RA):						
Source	Value	Standard error	t	Pr > t	Lower bound (95%)	Upper bound (95%)
LTLE	-0.857	0.082	-10.489	0.061	-1.894	0.181
STLE	-0.290	0.065	-4.424	0.142	-1.122	0.542
TALA	1.358	0.044	30.951	0.021	0.801	1.916

The above standardize coefficients confirm the negative relationship between RA and the LTLE and STLE variables with the LTLE variable being the variable with the stronger negative relationship with RA. The TALA variable indicates a very strong positive relationship with the RA variable with the TALA variable being the only significant variable at an alpha of 5%.

5.3.2.2 National Empowerment Fund Regression Model

Correlation matrix:				
	LTLE	STLE	TALA	RA
LTLE	1	0.985	-0.038	-0.610
STLE	0.985	1	-0.101	-0.658
TALA	-0.038	-0.101	1	0.811
RA	-0.610	-0.658	0.811	1

The correlation matrix indicates that the RA variable is negatively correlated with the LTLE and STLE whereas the TALA variable indicates a very strong positive relationship. The LTLE and STLE variables are positively correlated as can be expected from literature and theory. The interesting dynamic is the small negative relationship between the TALA variable and the LTLE and STLE variables which indicates an increase in the TALA variable results in an inverse effect on the LTLE and STLE variable.

SUMMARY OUTPUT (NEF)								
<i>Regression Statistics</i>								
Multiple R	0.998118528							
R Square	0.996240595							
Adjusted R Square	0.98496238							
Standard Error	0.039933784							
Observations	5							
<i>ANOVA</i>								
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>			
Regression	3	0.422596651	0.14086555	88.33318023	0.078018451			
Residual	1	0.001594707	0.001594707					
Total	4	0.424191358						
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	0.923260596	0.522940817	1.765516415	0.328083315	-5.721332488	7.56785368	-5.721332488	7.56785368
LTLE	-6.76111E-10	8.19506E-10	-0.825022909	0.560850975	-1.10889E-08	9.7367E-09	-1.10889E-08	9.7367E-09
STLE	-5.13572E-10	7.25674E-10	-0.707717119	0.607914487	-9.73414E-09	8.70699E-09	-9.73414E-09	8.70699E-09
TALA	7.04305E-10	6.0188E-11	11.70174589	0.054271969	-6.04564E-11	1.46907E-09	-6.04564E-11	1.46907E-09

The regression model was then applied to NEF data set with the regression result indicating that the regression model's F-statistic is statistically significant with an adjusted R² of 98.496% indicating that the selected independent variables explain very well any possible changes in the Risk Appetite variable for the NEF. The LTLE and STLE variable coefficients indicated a negative relationship with the institutions Risk Appetite but the coefficients were found not to be statistically significant with a p-value of 0.56 and 0.61 respectively. The only statistically significant variable is the TALA variable which indicated a positive relationship with the Risk Appetite variable with its coefficient being statistically significant at a p-value of 0.0543.

Standardized coefficients (RA):							
Source	Value	Standard error	t	Pr > t	Lower bound (95%)	Upper bound (95%)	
LTLE	-0.314	0.381	-0.825	0.561	-5.154	4.525	
STLE	-0.271	0.383	-0.708	0.608	-5.131	4.590	
TALA	0.772	0.066	11.702	0.054	-0.066	1.611	

The above standardize coefficients confirm the negative relationship between RA and the LTLE and STLE variables with the LTLE variable being the variable with the stronger negative relationship with RA. The TALA variable indicates a positive relationship with the RA variable with the TALA variable being the only significant variable at an alpha of 5%.

5.3.2.3 Small Enterprise Finance Agency Regression Model

Correlation matrix (Pearson):				
Variables	RA	LTLE	STLE	TALA
RA	1	-0.998	-0.982	-1.000
LTLE	-0.998	1	0.992	0.998
STLE	-0.982	0.992	1	0.984
TALA	-1.000	0.998	0.984	1

Values in bold are different from 0 with a significance level alpha=0.05

The correlation matrix indicates that the RA variable is negatively correlated with the LTLE, STLE and TALA variable indicating a very strong inverse relationship. The LTLE and STLE variables are positively correlated and the TALA and STLE variable are positively correlated which is expected from literature and theory. There is sample bias due to the small number of observations.

p-values:				
Variables	RA	LTLE	STLE	TALA
RA	0	0.041	0.121	0.006
LTLE	0.041	0	0.080	0.035
STLE	0.121	0.080	0	0.116
TALA	0.006	0.035	0.116	0

Values in bold are different from 0 with a significance level alpha=0.05

Coefficients of determination (R ²):				
Variables	RA	LTLE	STLE	TALA
RA	1	0.996	0.964	1.000
LTLE	0.996	1	0.984	0.997
STLE	0.964	0.984	1	0.967
TALA	1.000	0.997	0.967	1

The p-values and the coefficients of determination results for the inclusion of the three variables in the regression model for SEFA is confirmed by their statistically significant p-value and high R² at an alpha of 5% for LTLE and TALA with STLE being significant at an alpha of 10%.

SUMMARY OUTPUT		(SEFA)							
<i>Regression Statistics</i>									
Multiple R		1							
R Square		1							
Adjusted R Square		1							
Standard Error		1.94289E-16							
Observations		5							
<i>ANOVA</i>									
		<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>			
Regression		3	0.712017741	0.237339247	6.28743E+30	2.93166E-16			
Residual		1	3.77482E-32	3.77482E-32					
Total		4	0.712017741						
		<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept		-1.11022E-16	1.37383E-16	-0.808122036	0.567306208	-1.85664E-15	1.6346E-15	-1.85664E-15	1.6346E-15
LTLE		-6.24827E-09	2.24503E-24	-2.78315E+15	2.2874E-16	-6.24827E-09	-6.24827E-09	-6.24827E-09	-6.24827E-09
STLE		3.16667E-09	5.57155E-24	5.68365E+14	1.12009E-15	3.16667E-09	3.16667E-09	3.16667E-09	3.16667E-09
TALA		4.08608E-09	5.10962E-24	7.99684E+14	7.9609E-16	4.08608E-09	4.08608E-09	4.08608E-09	4.08608E-09

The sample size for SEFA was over a three year period with variables observed on an annual basis, thus only providing three observable variables per independent variable for this regression model. The most important result to recognise in the linear regression model for SEFA is the R² = 1. This implies that this model is a perfect fit which in statistical terms is a

very rear occurrence and in this case it is not. This regression result was attributed to the limited observed variables in the sample but the independent variables are still statistically significant indicating that the Risk Appetite of SEFA is indeed also influenced by the above-observed variables.

5.3.2.4 Pooled Development Finance Institutions Regression Model 1

SUMMARY OUTPUT (Pooled - Regression 1)								
<i>Regression Statistics</i>								
Multiple R	0.793214678							
R Square	0.629189525							
Adjusted R Square	0.528059395							
Standard Error	0.21837765							
Observations	15							
<i>ANOVA</i>								
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>			
Regression	3	0.890099489	0.29669983	6.221583294	0.009974162			
Residual	11	0.524576779	0.047688798					
Total	14	1.414676269						
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	0.29807387	0.124233836	2.399296999	0.03527642	0.02463704	0.5715107	0.024637	0.571511
LTLE	-4.62888E-10	1.40219E-10	-3.301173756	0.007063264	-7.71509E-10	-1.54268E-10	-7.7E-10	-1.5E-10
STLE	1.42749E-10	4.78288E-10	0.298457977	0.770916001	-9.09957E-10	1.19545E-09	-9.1E-10	1.2E-09
TALA	9.41932E-10	2.30311E-10	4.08982593	0.001790058	4.35021E-10	1.44884E-09	4.35E-10	1.45E-09

A pooled regression model was then developed based on equation (6) with the intention of further potential of analysis relating to the Risk Appetite dependent variable. Regression model equation (6) constitutes the same three independent variables and the pooled results presented three statistically significant coefficients being the intercept with a p-value of 0.035, the LTLE variable coefficient with a p-value of 0.007 and the TALA variable coefficient p-value of 0.002. Only the STLE variable coefficient presented results which were not statistically significant with a p-value of 0.771. The pooled regression model as a whole had an F-statistic that was statistically significant with an adjusted R² of 52.81% indicating that even though the pooled regression model is not a great fit, the independent variable included in the model explain 52.81% of the variation in the Risk Appetite variable.

This lower coefficient of determination result indicated that this pooled regression model may have variable omission bias and thus additional variables were included into the regression model in order to match the regression equation (7) outlined in the theory. Below is the results for equation (7) regression model using pooled data.

5.3.2.5 Pooled Development Finance Institutions Regression Model 2

Correlation matrix:											
	LTLE	STLE	TALA	TNPLLG	GDPGSALG	DFIID-BP	DFIID-NEF	DFIID-SEFA	DFIT-POC	DFIT-SOE	RA
LTLE	1	0.020	0.576	-0.576	0.068	0.894	-0.289	-0.741	0.894	-0.894	-0.472
STLE	0.020	1	-0.119	-0.291	-0.645	-0.280	0.448	-0.205	-0.280	0.280	-0.417
TALA	0.576	-0.119	1	-0.767	0.206	0.367	0.191	-0.684	0.367	-0.367	0.409
TNPLLG	-0.576	-0.291	-0.767	1	0.342	-0.345	-0.086	0.528	-0.345	0.345	-0.058
GDPGSALG	0.068	-0.645	0.206	0.342	1	0.118	0.118	-0.290	0.118	-0.118	0.310
DFIID-BP	0.894	-0.280	0.367	-0.345	0.118	1	-0.667	-0.408	1.000	-1.000	-0.489
DFIID-NEF	-0.289	0.448	0.191	-0.086	0.118	-0.667	1	-0.408	-0.667	0.667	0.374
DFIID-SEFA	-0.741	-0.205	-0.684	0.528	-0.290	-0.408	-0.408	1	-0.408	0.408	0.141
DFIT-POC	0.894	-0.280	0.367	-0.345	0.118	1.000	-0.667	-0.408	1	-1.000	-0.489
DFIT-SOE	-0.894	0.280	-0.367	0.345	-0.118	-1.000	0.667	0.408	-1.000	1	0.489
RA	-0.472	-0.417	0.409	-0.058	0.310	-0.489	0.374	0.141	-0.489	0.489	1

The correlation matrix above indicates that the problem of correlation is less drastic as the individual regression models with the initial independent variables indicating lower correlation values. The between variable relationships have also stated the same with LTLE and STLE having a negative relationship with the RA variable and the TALA variable having a positive relationship with the RA variable. The lagged TNPLLG variable introduced has a negative relationship with the RA variable whereas the lagged GDPGSALG has a positive relationship with the RA variable.

The DFIID fixed variable used to identify the different DFIs was also incorporated and a negative relationship with RA was detected for Business Partners and a positive relationship with RA for NEF and SEFA.

A DFIT fixed variable was also introduced into the regression model to detect if the ownership of the development finance institution can influence RA and the results indicated that state-owned development finance institutions have a positive influence of RA whereas privately owned development finance institutions have a negative relationship with RA.

Multicollinearity statistics:										
	LTLE	STLE	TALA	TNPLLG	GDPGSALG	DFIID-BP	DFIID-NEF	DFIID-SEFA	DFIT-POC	DFIT-SOE
Tolerance	0.006	0.129	0.123	0.126	0.145	0.000	0.019	0.029	0.000	0.000
VIF	174.943	7.745	8.102	7.916	6.875		51.513	34.342		

Based on literature and theory, multicollinearity is expected from the selected regression model variables and the VIF confirms it with all variables indicating a VIF higher than 5.

Type I Sum of Squares analysis (RA):					
Source	DF	Sum of squares	Mean squares	F	Pr > F
LTLE	1	0.120	0.120	390.661	0.003
STLE	1	0.089	0.089	290.712	0.003
TALA	1	0.326	0.326	1061.600	0.001
TNPLLG	1	0.000	0.000	0.963	0.430
GDPGSALG	1	0.000	0.000	0.948	0.433
DFIID	2	0.001	0.001	1.862	0.349
DFIT	0	0.000			

Type II Sum of Squares analysis (RA):					
Source	DF	Sum of squares	Mean squares	F	Pr > F
LTLE	1	0.002	0.002	7.019	0.118
STLE	1	0.010	0.010	33.051	0.029
TALA	1	0.063	0.063	205.522	0.005
TNPLLG	1	0.001	0.001	1.891	0.303
GDPGSALG	1	0.001	0.001	2.707	0.242
DFIID	2	0.001	0.001	1.862	0.349
DFIT	0	0.000			

Type III Sum of Squares analysis (RA):					
Source	DF	Sum of squares	Mean squares	F	Pr > F
LTLE	1	0.002	0.002	7.019	0.118
STLE	1	0.010	0.010	33.051	0.029
TALA	1	0.063	0.063	205.522	0.005
TNPLLG	1	0.001	0.001	1.891	0.303
GDPGSALG	1	0.001	0.001	2.707	0.242
DFIID	2	0.001	0.001	1.862	0.349
DFIT	0	0.000			

Type I and II sum of squares analysis results indicate that the initial regression variables are significant with the additional regression variables being insignificant. Type III sums of squares of variances the only analysis which provides insignificant results for the LTLE variable and the additional variables indicating that the STLE and TALA variable have the most positive impact on RA.

Goodness of fit statistics (R

Observations	10.000
Sum of weights	10.000
DF	2.000
R ²	0.999
Adjusted R ²	0.999
MSE	0.000
RMSE	0.010
MAPE	1.419
DW	2.863
Cp	8.000
AIC	-80.987
SBC	-78.567
PC	0.010

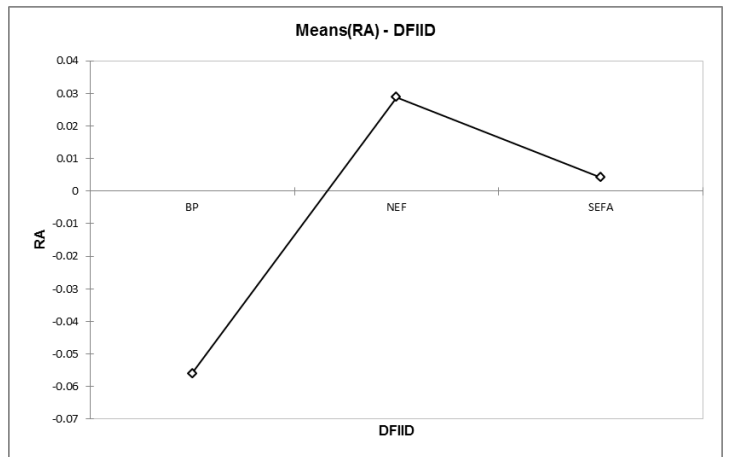
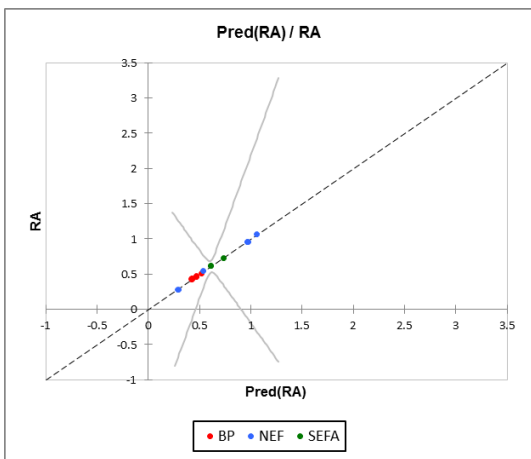
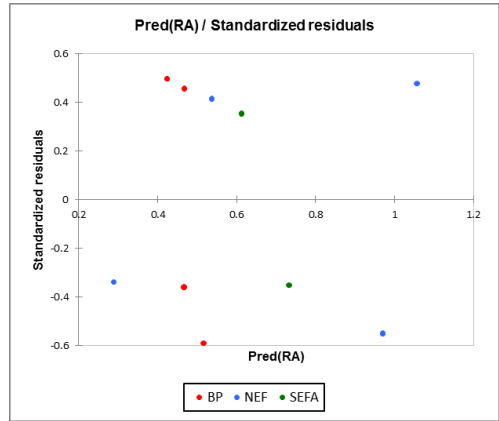
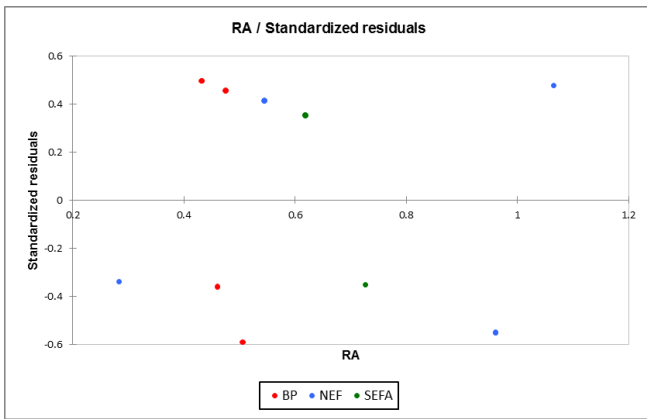
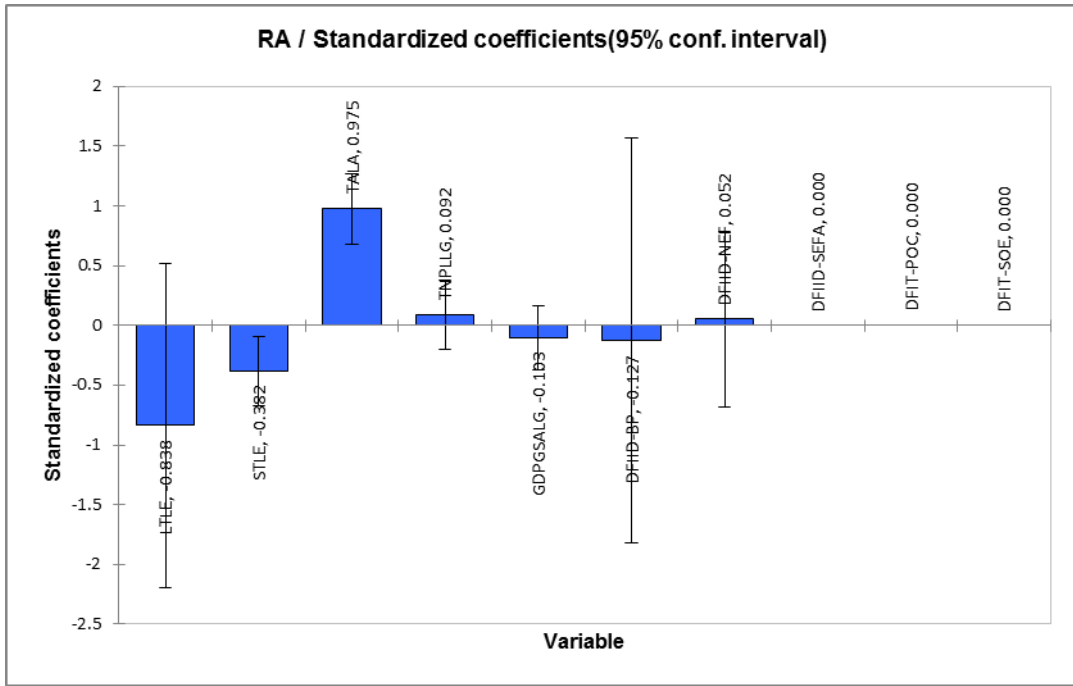
Model parameters (RA):							
Source	Value	Standard error	t	Pr > t	Lower bound (95%)	Upper bound (95%)	
Intercept	0.771	0.149	5.178	0.035	0.130	1.411	
LTLE	0.000	0.000	-2.649	0.118	0.000	0.000	
STLE	0.000	0.000	-5.749	0.029	0.000	0.000	
TALA	0.000	0.000	14.336	0.005	0.000	0.000	
TNPLLG	0.524	0.381	1.375	0.303	-1.116	2.164	
GDPGSALG	-4.149	2.522	-1.645	0.242	-14.999	6.701	
DFIID-BP	-0.060	0.186	-0.323	0.777	-0.862	0.742	
DFIID-NEF	0.025	0.081	0.304	0.790	-0.325	0.374	
DFIID-SEFA	0.000	0.000					
DFIT-POC	0.000	0.000					
DFIT-SOE	0.000	0.000					

The pooled regression model result presented a very high Adjusted R² indicating and confirming that this regression model is a good fit in explaining the dependent variable RA. Amongst all of the coefficients, the intercept STLE and TALA coefficients are the only ones which are statistically significant and both have a positive but small influence on the pooled RA. A Durbin-Watson of 2.863 is not statistically significant therefore the null hypothesis that the residuals are not autocorrelated cannot be rejected. This is supported by literature and theory that a level of correlation exists between the independent variables and the dependent variable.

Standardized coefficients (RA):							
Source	Value	Standard error	t	Pr > t	Lower bound (95%)	Upper bound (95%)	
LTLE	-0.838	0.316	-2.649	0.118	-2.198	0.523	
STLE	-0.382	0.067	-5.749	0.029	-0.669	-0.096	
TALA	0.975	0.068	14.336	0.005	0.683	1.268	
TNPLLG	0.092	0.067	1.375	0.303	-0.197	0.382	
GDPGSALG	-0.103	0.063	-1.645	0.242	-0.373	0.167	
DFIID-BP	-0.127	0.394	-0.323	0.777	-1.822	1.568	
DFIID-NEF	0.052	0.172	0.304	0.790	-0.686	0.790	
DFIID-SEFA	0.000	0.000					
DFIT-POC	0.000	0.000					
DFIT-SOE	0.000	0.000					

Standardised coefficients were calculated to provide clearer results. Only the two STLE and TALA coefficients are statistically significant. The negative relationship between RA and LTLE, STLE, GDPGSALG and DFIID-BP coefficients is clear with LTLE having the highest potential negative influence. The TALA, TNPLLG and DFIID-NEF have positive relationships with RA.

The residual graphs below support the assumption that the autocorrelation is present in the data.



LS Means for factor DFIIID:				
Category	LS mean	Standard error	Lower bound (95%)	Upper bound (95%)
BP	-0.056	0.087	-0.432	0.320
NEF	0.029	0.061	-0.234	0.292
SEFA	0.004	0.115	-0.492	0.501

The LS Means for the different development finance institutions indicate that BP has the lowest risk appetite followed by SEFA, whereas NEF is the development finance institution with the highest risk appetite. The results for the LS mean are statistically significant for Business Partners and NEF whereas they are not for SEFA and this could be due to the limited observation from SEFA.

The second pooled regression model based on regression equation (7) resulted in a statistically significant F-statistics and the regression model fit improved dramatically to an adjusted R² of 99.5% indicating that the additional variables included in the regression model made a large impact. This is also supported by the slight change in the coefficients of the other independent variables and the standard errors indicating that now a portion of the previous independent variables errors terms are now better explained by the additional variables.

5.4 Conclusion

Based on the regression results and descriptive statistics, the model that provided the best fit and also the best minimum variance coefficients is the pooled regression model two.

The regression models provided statistically significant results indicating that the regression models were developed appropriately and that the selected independent variables influence the dependent variable appropriately.

From the regression results, the total approved loans amount and the short-term loans exposure variables have the most influence on a DFIs risk appetite and that past economic and institutions performance has an effect on the risk appetite of the institution.

From the three DFIs, Business Partners was regarded as the institution with the lowest risk appetite even though it has such a large portfolio. SEFA had the second highest risk appetite with the NEF having the highest risk appetite of the three DFIs which is reflected by between

cluster effects. It was interesting to note that state ownership positively influenced the risk appetite level of the DFI.

Based on the regression results:

Hypothesis 1

H₀: South African State Owned DFIs have a higher risk appetite

H₁: South African State Owned DFIs do not have a higher risk appetite

We cannot reject the null hypothesis and thus infer that South African DFIs have a higher risk appetite. A larger sample size may have produced different results.

Hypothesis 2

H₀: South African DFIs have a lower risk appetite for funding startup related funding products than other products.

H₁: South African DFIs have a higher risk appetite for funding startup related funding products.

We reject the null hypothesis and thus infer that South African DFIs do have a risk appetite for funding startup related funding products. This is based on the variable STLE being statistically significant and having a lower negative relationship with risk appetite than the LTLE variable. With many startups lacking security and collateral, they are more likely to secure short-term funding over long-term funding which is the basis of this interpretation.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

At the beginning of this research paper, it was my intention to analyse three South African DFIs with the aim and objective of addressing the hypothesis developed relating to Risk Appetite and startup funding. Based on research of the application process and interactions with the different DFIs, the data required for the successful completion of this research paper was anticipated not to be a problem. Unfortunately, detailed primary and secondary research exposed the discrepancy between marketing and advertising messages being promoted by these institutions and the level of information they made available for public scrutiny. Due to all the information that exists but is not made available, this research paper was restricted in terms of the type of analysis and interpretation it could conduct regarding the DFIs risk appetite.

6.2 Conclusion and Summary of research findings

The data available enabled a regression analysis of the three DFIs. The strength of this study will improve based on an increased sample size. The results of this analysis indicated that an increase in the total approved loan amount by any of the DFIs will positively influence their risk appetite. An increase in short-term loan exposure would result in a slight decrease in the DFIs' risk appetite of which that decrease is less than the potential decrease if the long-term loans exposure was increased. What this implies is that the DFIs would most likely prefer to increase their short-term loans exposure rather than their long-term loans exposure which implies that even though the increase in any type of exposure negatively influences the institutions risk appetite, the preference for short-term loan exposure supports the notion that DFIs have a higher risk appetite for funding SME and specifically startup related finance products. This also implies based on this study that DFIs would prefer a higher risk exposure to startups or startup related products provided their mandate is addressed. With NEF and SEFA reflecting a higher risk appetite exposure than Business Partners, it is evident that government DFIs have a higher risk appetite than Privately owned DFIs.

6.3 Recommendations

My first and main recommendation is for these institutions with the help and insistence from the government, to make available additional performance metrics data on a quarterly or monthly basis especially information relating to these institutions mandate. This will ensure that objective assessment and analysis of these DFIs operations can be conducted. Currently, due to limited and not disclosed data, objective analysis of these institutions' performance, especially relating to the funding of startups is rather challenging as no startup metrics are disclosed at all by all of the three DFIs. This implies that there is no concerted effort based on metrics by these DFIs to ensure that the level of startup enterprises funded increases in order to positively impact South Africa economic growth which may not be the case.

Another recommendation would be the development and monitoring of a standardised DFI performance metric table which is inclusive of startup performance metrics outlined in this paper to assist policy makers in achieving development goals.

6.4 Constraints

Potential constraints for this research paper may exist if there is no standardisation and clear definitions of the core indicators in terms of data to be collected from the different institutions which may not apply across all DFIs.

Constraints with regards to the research to be conducted is the limited body of knowledge regarding Risk Appetite in DFIs that specifically looks at the development financing of startup enterprises. Combined with non-standardised performance metrics and varying Risk Management Frameworks among institutions, developing the body of knowledge in this sphere is important and will also identify areas of future research to be conducted.

6.5 Limitations of the Study

The largest limitation of this research study was the limited information disclosure from the three DFIs resulting in this research study focusing on secondary information based on observations and data from publicly available information. As a result of this limitation, this research paper's ability to effectively influence policy and credit methodology applied by these DFIs is limited. This limitation affected the analysis of startup funding in particular due to limited or no data available relating to startup funding performance metrics from the DFIs.

As a result of this data limitation, certain statistical tests were not conducted sufficiently or could not be conducted such as certain cointegration tests also impacting other statistical tests such as the unit root and stationarity test.

The methodology employed, specifically panel data analysis, has a number of limitations specifically relating to challenges with design, data collection and the management of the data collected (Baltagi, B. 1998). The challenges which existed in this research paper were the non-response and missing observations from DFIs. These distortions impacted on the regression models ability to improve.

6.6 Future areas for Research Study

This research paper provided insight into the DFIs risk appetite and their determinants and how the DFIs risk appetite is influenced by these. Accessing required information will provide a unique opportunity for further research focused on the risk appetite of funding startups.

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