The Determinants of Risk Exposure When Development Finance Institutions Consider Approval of Funding to Different Development Markets—Case Study Development Bank of Southern Africa

Paul Kibuuka
University of South Africa (UNISA), Pretoria, South Africa

Njabulo Shandu
University of Stellenbosch Business School, Bellville, South Africa

This paper evaluates the determinants of risk exposure when development finance institutions consider approval of funding to different development markets utilising multiple regression econometric models and the Development Bank of South Africa (DBSA) as a case study. The research presents the classical development finance institution (DFI) business model and market size estimation with the contemporary DFI risk classification and enterprise risk management framework. In addition to reviewing the profile of financial and non-financial products and services, the related project cycles and the DFI credit risk pricing and mitigation approaches for the different development markets. Our results suggest that there is a correlation between the funding of under-resourced municipalities by DBSA and its exposure to financial risk though the correlation is not overwhelmingly significant, but also evidence of a negative correlation between the funding of under-resourced municipalities and the minimization of the financial risk exposure of DBSA. Likewise, there is a negative correlation between funding to all three different sizes of a municipality and ability of the DFI to absorb future losses (non-performing loan coverage ratio). The negative correlation is highest for secondary cities followed by metros and least for under resourced municipalities. The research concludes with four major recommendations of what the role of the DFI should be in enhancing access of under-resourced municipalities to development funding.

Keywords: development finance institution (DFI), risk exposures, development markets, multiple regression and South Africa

Introduction

Development finance institutions (DFIs) operate at an international, regional, national, and provincial level. They are established by shareholders through multilateral and regional agreements, acts of national parliaments and provincial legislatures. The shareholders provide initial capitalisation and mandate the organisations to
deliver development impact while remaining financially sustainable. The initial capitalisation is provided mainly through amongst others the issue and sale of shares while callable capital\(^1\) is set aside for use during expansion of operations or bailout during difficult business conditions. In the course of funding projects, DFIs do not price for profit but for risk and the operating surplus realised is therefore a function of risks identified that are managed so effectively to the extent that they do not fully materialise. DFIs are worldwide known for developing and retaining reservoirs of skills and capacity in the areas of finance, policy research and analysis, project preparation, project management and implementation in addition to monitoring and evaluation. In this regard, it is also common practice for shareholders to make conditional transfers to DFIs in order to originate and implement special development programmes.

**Theoretical Model for Investment and Development Risk Management**

According to Principles for Responsible Investment (PRI) (2018), modern portfolio theory (MPT), developed by Harry Markowitz (1959), has set the framework for portfolio creation and investments. Although this approach was established about 60 years ago, it is still taught extensively around the world and is the most universally approved procedure used in portfolio management and financial planning today (Erickson, 2014).

Modern portfolio theory states that investors are risk antagonistic, meaning that in any given situation where the investor (DFI) needs to choose between portfolios that offer the same expected return, investors will prefer the less risky one. Thus, an investor will take on increased risk only if compensated by higher expected returns. Conversely, an investor who wants higher expected returns must accept more risk. The exact trade-off will be the same for all investors, but different investors will evaluate the trade-off differently based on individual risk aversion features (Grant, 2015).

MPT suggests that the most efficient portfolio that is the highest return for any given level of risk can be achieved by optimal diversification across a mix of risky assets and a risk-free security, depending on the investor’s risk profile (Bodie, Kane, & Marcus, 2018). Markowitz (1959) advanced that this method is most suited to institutional or large private investors, possibly due to their greater ability to assess risk and diversify across assets (including government securities), given their large pool of funds. The concept of reducing risk by diversification has revolutionised portfolio management and has allowed for increased global access to finance across all asset classes.

PRI (2018) asserts that the financial industry should prepare for millennials being more critical of where their money is invested. The financial industry should thus play a more active role in providing information on the real and long-term impacts of their investments in creating a sustainable economy. In terms of the proposed framework for industry in Figure 1:

- the green arrow represents the integration of tailored investment portfolios based on a client’s ethical/societal preferences, in addition to traditional risk preferences;
- ethical/societal preferences are linked more to science-based targets, illustrating the impact of investments on planetary boundaries and global economic risks; and lastly
- there is a need for more information and quantification of investment impacts on global risks to communicate to clients.

\(^1\) The difference between authorised and paid up capital.
Evolution of the South African DFI System

Prior to the onset of the 1994 democratic dispensation, the South African DFI system was highly fragmented with characteristic duplications and mandate creep within and between DFI sectors. In 1996, the democratic government reviewed the DFI system and segmented it into five development funding sectors namely infrastructure, housing, agriculture, industry, small micro and medium enterprises. For each sector one national DFI was identified and legislated through an act of parliament to support the funding and development of that sector. In 1997, the Development Bank of Southern Africa (DBSA) was reconstituted through Act 13 of 1997 and mandated to fund infrastructure, human and institutional capacity development in South Africa and the other member states of the Southern Africa Development Community (SADC). The South African local government elections held in the year 2000 revealed massive capacity constraints at local government level. In order to address these constraints, the DBSA established the DBSA Development Fund (DBSA DF) in 2001 with a view to support municipalities with human and institutional capacity building.

DBSA Business Model and Market Size Estimation

The DBSA funds infrastructural projects through intermediaries which are mainly municipalities that are the sphere of government at which government execution and delivery takes place in South Africa. The model differs slightly in the rest of SADC and the continent where the DFI funds through government parastatals/utilities targeting sectors that support economic growth. As indicated earlier, the DBSA mandate and strategy has gone through a number of revisions in order to align with the evolution of the national development priorities. During the 2002 corporate strategy review exercise, the board of directors approved the segmentation of the DFI markets into Markets 1, 2, and 3 as depicted in Figure 2. The main guiding principles emanating from Figure 2 are that Market 1 is composed of municipalities that have high capacity and resources such as metropoles; Market 2 municipalities with medium capacity and resources like secondary cities which while at the extreme end are the low capacity and low resourced local municipalities in Market 3. One of the main criticisms levied against this model was that due to the extensive rural to urban and regional migration experienced by South Africa in the last two decades, characteristics of Markets 2 and 3 are also increasingly
prevalent in Market 1 leading to duplication.

Figure 2. DBSA business model and market size estimation 2002. Source: DBSA, 2002.

At the time Market 3 was estimated to constitute the largest part ranging between 50-60% of the total market followed by Market 2 at 20-30% and the least by Market 1 at plus minus 20%. The definition and sizes of these markets have since evolved in subsequent DBSA strategy documents but the principles have largely remained the same. Figure 3 portrays the trends in development funding disbursed by DBSA to municipalities by category during the last decade. Clearly metropolitan municipalities (Market 1) have consistently received the highest annual share of funding for infrastructure development followed by secondary cities (Market 2) and least the under resourced municipalities (Market 3). Proponents of the funding model argue that South Africa is rapidly urbanizing (Plecher, 2020), in 2019, over 66 percent of South Africa’s population lived in urban areas and cities. Therefore, it makes perfect sense for the development bank to provide infrastructure in areas of greatest need and backlog through amongst others co-funding with other development partners and crowding-in private sector into development. The opponents advance that metropoles are spheres of high capacity and resource with credit ratings and therefore should afford to draw on this endowment to source independently affordable funding from commercial banks, institutional investors, and other private providers, thereby enabling the development bank to focus on supporting the under-resourced municipalities faced with limited access and absorption capacity. Another school of thought exploits the tension between financial sustainability and development impact advancing that it is important for the DBSA to fund Market 1 significantly in order to realise the operating surplus that is required to subsidise its operations in Market 3. Above all these arguments and counter arguments are the consensus that it is firstly important for each DFI to be financially sustainable in order to be in a position to bring about the desired development impact.
Table 1 presents the desegregation of the DBSA funding patterns over the last decade 2010-2019 for the different development markets showing that Market 3 only accounted for 5% of the development funds disbursed, Market 2 21% while Market 1 took the largest chunk of 74% supporting some of the arguments in the different schools of thought discussed earlier-on.

Table 1
Summary of Funding Disbursed by DBSA per Development Market 2010-2019

| Year       | Development markets       | Total development funding | % funding |
|------------|---------------------------|---------------------------|-----------|
| 2010 to 2019 | Under-resourced municipalities | 1,806,700,000             | 5.2       |
| 2010 to 2019 | Secondary cities           | 7,479,200,000             | 21.4      |
| 2010 to 2019 | Metropolitan municipalities | 25,717,300,000            | 73.5      |
|            | Total funding              | 35,003,200,000            | 100       |

Source: DBSA, 2019.

DFI Risk Classification and Enterprise Wide Risk Management

The purpose of the DFI risk classification system reflected in Table 2 is to group risks with similar characteristics into categories for purposes of effective control and oversight. The system differentiates risks and their impact on the organisational objectives of development impact, financial sustainability, and institutional capability. Enterprise wide risk management enables DFIs to take a holistic view of strategic, operational, and business risks faced by the organisation in all of its business activities in order to embed the assessment and treatment of these risks into the main stream management processes and to entrench the accountability for reducing vulnerability to risks throughout all organisational levels.

The framework outlines the multi-dimensional nature of risk management performed throughout the organisation at various levels. It assists to identify and assess risks, decide on which and how much of these risks can be accepted, and impose limits and controls. The framework guides the development of plans to mitigate unacceptable exposure to risks and to measure and monitor the levels of risk exposures. It is the role of
enterprise risk management to review and where necessary enhance the effectiveness of internal risk controls, building capabilities to anticipate and respond to risks, collecting and analysing information on how well risk is managed in addition to improving areas of under performance and giving assurance as to the effectiveness of the risk management system.

Table 2

DFI Risk Classification System

| Corporate objectives       | Strategic risk            | Operational risk         | Business risk            |
|----------------------------|---------------------------|--------------------------|--------------------------|
| Development Impact         | Systemic risk             |                          | Development risk          |
|                            |                           |                          | New product risk          |
| Financial Sustainability   | Business model risk       | Fraud risk               | Credit risk              |
|                            | Asset portfolio risk      | Legal risk               | Market risk              |
|                            |                           |                          | Liquidity risk            |
|                            |                           |                          | Country risk              |
|                            |                           |                          | Sovereign risk            |
| Institutional Capability   | Reputational risk         | Process failure risk     | Project risk             |
|                            | Human resource risk       | Compliance risk          |                          |
|                            | Management risk           | Business continuity risk  |                          |
|                            |                           | IT system risk           |                          |
|                            |                           | Financial reporting risk  |                          |

Source: DBSA, 2007.

The DFIs project appraisal system likewise identifies and assesses risks that are inherent in the seven different modules of finance, technical, economic, social, institutional, legal, and the environment. The appraisal teams are responsible for determining the inherent risks, developing the mitigations, and presenting the residuals for consideration by the executive team and the board of directors. The strategic and operational objectives are aligned with the risk appetite and informed by how the DFI plans to reduce its vulnerability to unacceptable exposures to risk.

DFI Financial and Non-financial Products and Services

The performance measures of a development finance institution must reflect its main roles of development impact, financial sustainability, and organisational capacity. Development impact is primarily a function of the value of disbursements by a DFI to identified intermediaries, customer, and partner satisfaction. Impact is often measured by indicators such as the number of jobs created, households connected to services and incomes accruing to low income households. Financial sustainability is determined through the level of sustainable earnings reflected as an outcome of the net interest income and cost to income ratio and in terms of the risk appetite in the form of the non-performing book debt as a percentage of the total book debt. Organisational capability affirms the level of staff engagement, the staff retention and turnover. DFIs utilise financial and non-financial products during the course of execution of their mandate. Funding instruments include equity, mezzanine, and debt finance in addition to partial and full credit guarantees. Development finance institutions experience intermediaries with poor human and institutional capacity resulting in low funding absorption capacity. In these situations the DFIs have administered non-financial products and services involving seed and technical assistance grant funding, advice, development information, and the deployment of skills. Figure 4
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presents the different types of products and services and an indication of the markets where they are most applicable. Given the high absorption capacity of metropolitan municipalities, DFIs utilise conventional business instruments to fund the metropoles ranging from high risk equity to medium risk mezzanine funding and low risk debt finance plus partial and full credit guarantees. These are coupled with technical assistance in the form of advice, development information, and project preparation grant funding where required.

![Figure 4. DFI products and services. Source: DBSA, 2002.](image)

Market 3 under resourced municipalities bears low capacity and low resources. Over the years of operating in this market, DFIs have been in a position to identify, understand, and quantify the risks inherent in the market and to develop specialised funding and non-funding instruments to respond to these risks effectively. On the finance side seed, fiscal and donor funding have been utilised. In this regard, the South African National Treasury (Republic of South Africa, 2010; 2013) proposed the use of frontloading of the municipal infrastructure grant—medium term expenditure framework (MTEF) fiscal funding to assist under-resourced municipalities to fast track funding for the implementation of infrastructure. The concept of frontloading would entail DFIs and private sector funders providing upfront funding for infrastructure development in under-resourced municipalities using the MTEF allocation as a guarantee. The market has also registered increased crowd funding in addition to viability gap finance designed to make projects that are economically viable over the long term, commercially viable for investors.

While funding is critical for infrastructure development, it has also been established that implementation capacity is equally if not most important for successful completion of the project implementation cycle. According to the DBSA Development Fund (2014), local government elections in 2000 revealed extensive capacity constraints in South African municipalities and led to a national debate on ways to address the gaps
sustainably. A few years before the elections, the National Treasury, DBSA, and the then Department of Provincial and Local Government had tried to introduce solutions, but the gaps persisted.

In 2001, the DBSA Development Fund was incorporated as a section 21 company to help alleviate human and institutional capacity weaknesses and so maximize the impact of development finance in municipalities. Accordingly, the Fund developed a model that evolved over the years in line with national priorities as well as the strategic objectives of the DBSA. The DBSA DF model was initially funded through the DBSA operating surplus and thereafter transfers from the national treasury. The achievements of the Fund were a function of the implementation of an effective governance system and stakeholder management framework which was integrated within the DBSA and was also aligned with those of the municipalities it supported. From the outset, the board and management established systems, processes, and internal controls that enabled effective detailed planning and scoping, appraisal, design, execution, monitoring, and evaluation. These systems were regularly reviewed and updated in consultation with the mandate authorities to match the requirements of the evolving business model.

The DBSA DF (2014) report shows that the Fund went through a number of phases in its lifetime, each posing its leaders with new challenges that required innovative thinking. The initial grant funding phase of implementing the model involved the appraisal, approval, and disbursement of grants to municipalities to address both human and institutional capacity building. The Fund also successfully piloted the concept of development credits which later was transferred to the then South African operations division to be implemented as the targeted infrastructure programme (TIP) within DBSA. It was during this phase that the Fund unfortunately built up a significant non-disbursing grant book. Management was only able to clear this book at the end of 2012 through the termination of grants that had not been disbursed for a number of reasons. This was completed after prolonged negotiations with the relevant municipalities. The report shows that the grant funding model as originally designed was the wrong prescription for the right diagnosis of municipal capacity constraints. This was because the model expected the same municipalities assessed as lacking capacity to plan and implement their own capacity turnaround projects.

As a result, the grant funding phase then made way for hands-on capacity building, a programme that was named Siyenza Manje “We are doing it now”. During this phase, the DF business model was reviewed to align grant funding with deployments for human and institutional capacity building in the areas of infrastructure project planning, finance and project management. However, the pool of individual experts available for deployment soon ran out and so the model was reviewed to incorporate professional service providers. The model assumed that experienced experts deployed to low capacity municipalities would transfer skills to existing municipal officials. However, the high vacancy rates in low capacity municipalities meant that there were an inadequate number of officials to whom the experts could transfer skills. The board then approved the implementation of the young professional programme to pair experts with qualified interns in the different skill areas in order to ensure the sustainability of the capacity building initiatives.

The infrastructure implementation phase benefited a number of municipalities and sectors. The programme deployed 826 engineers, finance experts, planners, young professionals, and apprentices to low-capacity municipalities, assisting 186 municipalities and 20 national and provincial departments. Over its lifetime, Siyenza Manje invested some R1.35 billion in grants and capacity building support and managed the implementation of projects of over R70billion.

The handover phase marked the start of the realization of a long-debated aspect of the Fund’s model: the
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The Fund had piloted concepts on behalf of mandate authorities and other parties and was now handing these fully functioning programmes back to the authorities. The report covered the unbundling of the Siyenza Manje programme, with its technical aspect handed to the Department of Co-operative Governance and Traditional Affairs to become the Municipal Infrastructure Support Agency (MISA) and the transfer of the finance function to the National Treasury. Non-core agency programmes were also handed back to their sponsors in a fully functional state.

The closure of the Fund was the result of the recommendations of the DBSA’s organisational review process. The progressive decline in the Bank’s operating surplus after the 2007/2008 global economic crisis reduced the funds available to resource the development activities of the Fund. Admittedly, the Fund’s financial sustainability model came a little too late to ensure the continuity of its operations.

**DFI Credit Risk Pricing and Mitigation**

Unlike private commercial banks, development finance institutions are expected by shareholders to report both financial and development returns. Figure 5 presents the generic DFI funding credit risk pricing model indicating that DFIs price for the cost of capital, overheads, and risk premium. The diagram emphasises the point that DFIs do not price for profit margin and that operating surplus is a function of unallocated risk premium plus income from capital and the other income. The operating surplus is then deployed into the funding of financial and non-financial development facilitation interventions and the retained earnings for strengthening the capital base as discussed earlier.

![Figure 5. DFI credit risk pricing model. Source: DBSA, 2007.](image-url)
project teams, subsistence, and travel. There has been remarkable restructuring of the institutions in many cases offloading or reducing the non-core functions of pre-financing such as research, policy support/analysis, and development information but also post-finance in the areas of deployment for human, institutional capacity building, hands-on project planning and implementation.

The transposition of the credit risk pricing model variables is depicted in Figure 6 where the variations per development market in the levels of institutional capacity, human resource development/skills, infrastructure development, return on investment, and social impact are broken down in terms of the magnitude of associated risk and the resultant impact on the final pricing per market. These elements inform the integrated development planning, components of the feasibility studies, detailed project planning and scoping, business planning, procurement and appraisal of the different modules of the projects funded and or implemented by the DFIs.
DFI Project Cycles for Financial and Non-financial Products and Services

Development finance institutions such as DBSA have documented different project cycles based on the type of product and services provided. In the course of providing financial products typically in Markets 1 and 2 the conventional nine-phase DFI project cycle reflected in Figure 7 is applied starting with application if the DFI did not get involved in the project origination, followed by appraisal, approval, signing of agreement for the commitment, disbursement, implementation, monitoring and evaluation, completion and surveillance. On the contrary, when providing non-financial services such as the deployment of technical skills to under-resourced municipalities in Market 3 to assist in the release and implementation of the municipal infrastructure grant (MIG), the cycle entails integrated development planning, followed by conducting the project feasibility, approval of technical reports, project business planning, release of funding, procurement, implementation, operations and maintenance. The activities of the different phases take place within the DFI but also as a responsibility of the intermediaries supported by the DFI and government constitutional mandates.
Research Objective

According to Dimitriu, Oprea, and Scrieciu (2012) in classical theory, risk is limited to the mathematical expectation of losses that can occur when choosing one of the possible variants. For development banks, risk is represented as losses arising from the completion of one or another decision. Development bank risk is a phenomenon that occurs during the activity of banking and project operations and that causes negative effects for these activities resulting in deterioration of business or record bank losses affecting functionality. Risk can also be caused by internal or external causes generated by the unfavourable or competitive environment. In this regard the aim of this research is to explore the development finance institutions basis for determining the risk impacting development funding that is approved, committed, and disbursed for investment in the different development markets.

The research analyses and tests the risk exposure of the development bank of Southern Africa in funding under-resourced municipalities in South Africa for the period 2010 to 2019. The analysis explores the risk appetite of the bank in funding under-resourced municipalities in South Africa with several objectives. First, to determine if the apparent level of risk exposure is the cause of funding disparities by DBSA when funding municipalities in South Africa. Second, to determine if under-resourced municipalities have more risk compared to secondary cities. Third, to establish if DBSA risk exposure is the major determinant that results into under-funding of under-resourced municipalities. Fourth, to evaluate the determinants of risk exposure when DBSA is funding under-resourced municipalities as compared to high capacity municipalities in South Africa.
Research Methodology

Definition of the Multiple Regression Model

Dimitriu et al. (2012) assert that in studies of the economy or companies, using data and statistical methods for the analysis of information is inevitable; therefore perception objectively and effectively of economic reality recommends the use of quantitative analysis methods. Analytical methods exploiting the information collected via econometric models are based on specific concepts of logic and mathematics. Using the scoring, the lender can appreciate quickly, objectively, and consistently the previous loans and calculate the probability that a given loan will be repaid according to the contract.

Using multiple regression researchers can determine the impact of several independent variables on certain variables (called dependent variables). The general form of multiple regression equation is:

\[ Y_t = a_0 + a_1 * X_{1t} + a_2 * X_{2t} + a_3 * X_{3t} + \ldots \ldots + a_k * X_{kt} + \epsilon_t \]

where:

- \( t = 1, 2, \ldots, n \) — observations of the sample,
- \( Y_t \) — observations \( t \) of the dependent variable,
- \( X_j \) — independent variables, explanatory, \( j = 1, 2, 3, \ldots, k \),
- \( X_{jk} \) — observation \( t \) of independent variables \( X_j \),
- \( a_0 \) — constant, free term of equation,
- \( a_1 \ldots a_k \) — coefficients of independent variables,
- \( \epsilon_t \) — error term of equation.

The coefficient of an independent variable reflects how dependent variable \( X_j \) changes by one unit, while the other independent variables remain constant. If the dependent variable and independent variables are specified in natural logarithms, the coefficients of independent variables can be interpreted as elasticities. Thus, these coefficients will show the percent change of the dependent variable if the independent variable changes by 1 percent. Regression coefficients are estimates of the unknown population parameters and describe the relationship between a predictor variable and the response. In linear regression, coefficients are the values that multiply the predictor values. Suppose you have the following regression equation: \( y = 3x + 5 \). In this equation, +3 is the coefficient, \( X \) is the predictor, and +5 is the constant. The sign of each coefficient indicates the direction of the relationship between a predictor variable and the response variable. A positive sign indicates that as the predictor variable increases, the response variable also increases. A negative sign indicates that as the predictor variable increases, the response variable decreases. The coefficient value represents the mean change in the predictor. For example, if a coefficient is +3, the mean response value increases by 3 for every one change in the predictor. The level of significance is often expressed as a p-value between 0 and 1. The smaller the p-value, the greater the evidence that you should reject the null hypothesis. A p-value less than 0.05 (typically ≤0.05) is statistically significant. If your regression model contains independent variables that are statistically significant, a reasonably high R-squared value makes sense. The statistical significance indicates that changes in the independent variables correlate with shifts in the dependent variable (Frost, 2020).

For the model determined by linear regression equation to be valid it must meet the following assumptions:

Assumption 1: Residual variables are random variables with average zero, namely \( E(\epsilon_t) = 0 \) for \( t = 1, 2, 3, \ldots, n \).
Assumption 2: Residual variables are not correlated: $\text{COV} (\varepsilon_i, \varepsilon_j) = 0$, for $i \neq j$.

Assumption 3: The residual variance is an unchanging variable, homoscedasticity property: $\text{Var} (\varepsilon_i) = \sigma^2$.

Assumption 4: Residual variables are not correlated with the explanatory variables: $\text{COV} (X, \varepsilon_i) = 0$.

Assumption 5: The regression model must be correctly specified: The explanatory variables are properly chosen, the regression formula is correctly specified, and not least, the residual term has the correct form.

Assumption 6: Explanatory variables are linearly independent.

Assumption 7: The residual variable is distributed as a normal distribution $\varepsilon \sim N (0, \sigma^2)$.

**Specifying the Variables for the Multiple Regression Model**

The main activity of a development finance institution is lending, so special importance is accorded to credit risk management in order to maximise interest income by minimising the level of non-performing loans. This study utilised 10 year (2010-2019) audited time series secondary data for an average of about 153 municipalities from the DBSA annual reports. Table 3 presents the variables used as the dependent variables to proxy for risk exposure and returns followed by the dependent variables utilised in the analysis. The econometric models proposed consider that the dependent variable for each model prescribed for the development bank is directly explained by the identified independent variables. A summary of the objectives and hypothesis for the models is presented in Table 4 followed by the econometric models.

| Dependent variable | Variable description                                      |
|--------------------|-----------------------------------------------------------|
| NPLGDL             | Non-Performing Development Loans to Gross Development Loan Book |
| SCLDV              | Secondary Cities Loans to Development Loans               |
| MMLDL              | Metropolitan Municipalities Loans to Development Loans    |
| URMDDL             | Under-Resourced Municipalities Loans to Development Loans |
| CTA                | Cash to Total Assets                                      |
| RAA                | Returns on Average Assets                                 |

| Independent variable | Variable description                                      |
|----------------------|-----------------------------------------------------------|
| NPLCR                | Non-Performing Loans Coverage Ratio                       |
| NPBDTBD              | Non-Performing Book Debt to Total Book Debt               |
| TA                   | Total Assets                                              |
| DE                   | Debt to Equity                                            |
| FMLIDA               | Financial/Market Liabilities to Investment in Development Activities |
| TCDL                 | Total Capital to Development Loans                        |
| TCTA                 | Total Capital to Total Assets                             |
| RAE                  | Returns on Average Equity                                 |
| NIIM                 | Net Interest Income Margin                                |
| CI                   | Cost to Income                                            |
| NIIAIA               | Net Interest Income over Average Interest-Bearing Assets |
| LEV                  | Returns on Average Assets to Returns on Equity            |

It is important to indicate that the research made a descriptive analysis of the data that helped to identify if data series are stationary. To check the stationarity of variables the research used the Philip Perron test and noticed that all independent variables are stationary hence their fluctuations around a trend occurring in parallel.
with the abscissa, and the probability shown by Phillip Perron test are close to 0. The Jarque-Bera test confirms that the variables are normally distributed as associated test probabilities are also close to 0.

Table 4

Summary of Objectives and Hypotheses to the Models

| No. | Objectives | H | Hypotheses | Models |
|-----|------------|---|------------|--------|
| 1   | The first objective is to interrogate if funding of under-resourced municipalities by DBSA exposes the DFI (DBSA) to financial risk. | H1 | There is correlation in the funding of under-resourced municipalities by DBSA and its exposure to financial risk. | 1 |
| 2   | The second objective is to examine whether the under-resourced municipalities minimise the financial risk exposure of DBSA. | H2 | There is a correlation (negative) between the funding of under-resourced municipalities and the minimization of the financial risk exposure of DBSA. | 2 |
| 3   | The third objective is to investigate if the size of the municipality impacts on the decision to fund municipalities by DBSA. | H3 | There is a relationship between the size of the municipalities and the funding decision by the DBSA of the municipalities. | 3 |

Model 1:

\[ NPLGDL = S_o + S_1FMLIDA + S_2URMLDL + S_3TCTA + S_4NIIAIA + S_5TCDL + \varepsilon \]

Model 2:

\[ URMLDL = S_o + S_1NPLGDL + S_2FMLIDA + S_3CTA + S_4TCDL + S_5DE + S_6LEV + \varepsilon \]

Model 3:

(a) (i)

\[ MMMLDL = S_o + S_1NPLCR + S_2FMLIDA + S_3CTA + S_4TCDL + S_5RAA + S_6LEV + \varepsilon \]

(a) (ii)

\[ SCLDV = S_o + S_1NPLCR + S_2FMLIDA + S_3CTA + S_4TCDL + S_5RAA + S_6LEV + \varepsilon \]

(a) (iii)

\[ URMLDL = S_o + S_1NPLCR + S_2FMLIDA + S_3CTA + S_4TCDL + S_5RAA + S_6LEV + \varepsilon \]

(b)

\[ CTA = S_o + S_1RAE + S_2MMLDL + S_3NPLCR + S_4FMLIDA + S_5TCDL + \varepsilon \]

(c)

\[ RAA = S_o + S_1MMLDL + S_2NPLCR + S_3FMLIDA + S_4CTA + S_5TCDL + \varepsilon \]

Study Research Results

Results

This study run and reported results of ordinary least square (OLS) regression models for the period (2010 to 2019) on the risk exposure of the Development Bank of Southern Africa in funding under-resourced municipalities in South Africa. This study reports the estimates of Models 1 to 3. The (OLS) regressions are
estimated using yearly indicator explanatory variables and report the results of the coefficient as well as the p-value of each explanatory variable.

**Application of Model 1.** The testing hypotheses for the regression model are as follows:

- $H_{01}$: There is correlation in the funding of under-resourced municipalities by DBSA and its exposure to financial risk.
- $H_{a1}$: There is no correlation in the funding of under-resourced municipalities by DBSA and its exposure to financial risk.

The null hypothesis is the correlation in the funding of under-resourced municipalities by DBSA and its exposure to financial risk. The alternate hypothesis is the non-correlation in the funding of under-resourced municipalities by DBSA and its exposure to financial risk. The model for testing the Hypotheses 1 is stated below:

$$NPLGDL_t = S_0 + S_1FMLIDA_t + S_2URMLDL_t + S_3TCTA_t + S_4NIIAIA_t + S_5TCDL_t + \epsilon_t$$

The Stata OLS estimation presents the results for Model 1 in Table 5 for the period 2010 to 2019. The backbone of the proxy to test for risk exposure in Model 1 is NPLGDL (Non-Performing Development Loans to Gross Development Loan Book) ratio. For the period under review, FMLIDA (Financial/Market Liabilities to Investment in Development Activities ratio) is statistically not significant at the 5% level but has a positive impact on Non-Performing Development Loans to Gross Development Loan Book [0.029 95% CI: -0.912, 0.150]. On the other hand, the impact of the URMLDL (Under-Resourced Municipalities Loans to Development Loans) ratio which is also not significant at the 5% level is higher compared to the FMLIDA while the Cash to Total Assets ratio is having an inverse magnitude. However, NIIAIA (Net Interest Income over Average Interest-Bearing Assets) ratio is significant at the 5% level with a positive impact. The TCDL (Total Capital to Development Loans ratio) has a negative sign but is not statistically significant.

There is some evidence that there is correlation in the funding of under-resourced municipalities by DBSA and its exposure to financial risk though this is not overwhelming. Therefore, this study can reject the null hypotheses that funding of under-resourced municipalities by DBSA exposes it to financial risk.

Table 5

*Model 1 Outputs*

| Model 1 | Period: 2010 to 2019 |
|---------|---------------------|
| **Independent variables** | **Variable description** | **Estimate** | **SE** | **P-value** | **95% confidence interval** |
| FMLIDA  | Financial/Market Liabilities to Investment in Development Activities | 0.029 | 0.044 | 0.532 | (-0.912, 0.150) |
| URMLDL  | Under-Resourced Municipalities Loans to Development Loans | 3.207 | 2.985 | 0.343 | (-5.081, 11.496) |
| TCTA    | Cash to Total Assets | 0.023 | 0.082 | 0.787 | (-0.205, 0.253) |
| NIIAIA  | Net Interest Income over Average Interest-Bearing Assets | 0.039 | 0.119 | 0.031* | (0.005, 0.072) |
| TCDL    | Total Capital to Development Loans | -0.029 | 0.055 | 0.623 | (-0.182, 0.123) |

Constant | 1.586 | 4.076 | 0.717 | (-9.731, 12.902) |

$R^2 = 0.827$

No of observations: 10
Application of Model 2. The testing hypotheses for this model are:

\( H_{2a} \): There is a correlation (negative) between the funding of under-resourced municipalities and the minimization of the financial risk exposure of DBSA.

\( H_{2b} \): There is a correlation (positive) between the funding of under-resourced municipalities and the minimization of the financial risk exposure of DBSA.

The null hypothesis is the negative correlation between the funding of under-resourced municipalities and the minimization of the financial risk exposure of DBSA. The alternate hypothesis is the positive correlation between the funding of under-resourced municipalities and the minimization of the financial risk exposure of DBSA.

The model for testing hypotheses 2 is stated below:

\[
URMLDL = S_o + S_1\text{NPLGDL} \mu + S_2\text{FMLIDA} \mu + S_3\text{CTA} \mu + S_4\text{TCDL} \mu + S_5\text{DE} \mu + S_6\text{LEV} \mu + \epsilon_\mu
\]

The Stata OLS estimation returns the results for Model 2 in Table 6 for the period 2010 to 2019. The dependent variable in Model 2 is URMLDL (Under-Resourced Municipalities Loans to Development Loans ratio). For the period under review, all the covariates included are not statistically significant except Debt to Equity ratios. Conversely, DE (Debt to Equity ratios) is statistically significant at the 5% level with negative impact [-0.002, 95% CI: -0.004, -0.0001].

The results show evidence of a negative correlation between the funding of under-resourced municipalities and the minimization of the financial risk exposure of DBSA. This study accepts the null hypotheses that there is a correlation (negative) between the funding of under-resourced municipalities and the minimization of the financial risk exposure of DBSA.

Table 1

Model 2 Outputs

| Model 2 | Dependent variable: URMLDL | Period: 2010 to 2019 |
|---------|---------------------------|----------------------|
| Independent variables | Variable description | Estimate | SE | P-value | 95% confidence interval |
| NPLGDL | Non-Performing Development Loans to Gross Development Loan Book Financial/Market Liabilities to | 0.002 | 0.025 | 0.945 | (-0.069, 0.076) |
| FMLIDA | Investment in Development Activities | 0.011 | 0.004 | 0.079 | (-0.0012, 0.022) |
| CTA | Cash to Total Assets | 0.017 | 0.009 | 0.151 | (-0.009, 0.436) |
| TCDL | Total Capital to Development Loans | -0.013 | 0.005 | 0.056 | (-0.027, 0.001) |
| DE | Debt to Equity | -0.002 | 0.001 | 0.043 | (-0.004, -0.0001) |
| Constant | | 0.173 | 0.379 | 0.673 | (-0.881, 1.226) |
| R^2 = 0.853 | | |
| No of observations: 10 | | | |

Application of Model 3. The testing hypotheses for this model are:

\( H_{3a} \): There is a relationship between the size of the municipalities and the funding decision by the DBSA of the municipalities.

\( H_{3b} \): There is no relationship between the size of the municipalities and the funding decision by the DBSA of the municipalities.
The null hypothesis is the relationship between the size of the municipalities and the funding decision by the DBSA of the municipalities. The alternate hypothesis is that there is no relationship between the size of the municipalities and the funding decision by the DBSA of the municipalities.

The Stata OLS estimation surfaces the results for Models 3a to 3b in Tables 7-11 for the period 2010 to 2019. The dependent variable in Model 3a (i) is the Metropolitan Municipalities Loans to Development Loans (MMLDL). For the period under review, the FMLIDA, TCDL, and RAA are not statistically significant but has a positive impact magnitude on MMLDL (Table 7). Although the variables (NPLCR, CTA, and LEV) are not statistically significant, they also impact negatively on MMLDL.

Table 7

Model 3a (i) Outputs

| Independent variables | Variable description                                      | Estimate | SE   | P-value | 95% confidence interval |
|-----------------------|-----------------------------------------------------------|----------|------|---------|-------------------------|
| NPLCR                 | Non-Performing Loans Coverage Ratio                       | -0.056   | 0.230| 0.823   | (-0.789, 0.677)         |
| FMLIDA                | Financial/Market Liabilities to Investment in Development Activities | 0.049   | 0.098| 0.652   | (-0.263, 0.361)         |
| CTA                   | Cash to Total Assets                                      | -0.095   | 0.247| 0.726   | (-0.882, 0.692)         |
| TCDL                  | Total Capital to Development Loans                       | 0.025    | 0.052| 0.654   | (-0.140, 0.192)         |
| RAA                   | Returns on Average Assets to Returns on Equity            | 1.81     | 0.415| 0.044   | (-12.994, 8.978)        |
| LEV                   | Returns on Average Assets to Returns on Equity            | -2.008   | 3.452| 0.602   | (-12.994, 8.978)        |
| Constant              | Intercept                                                 | 0.887    | 12.128| 0.946   | (-37.709, 39.484)       |

R² = 0.550

No of observations: 10

As a robustness check, in view of the results in Model 3a (i), this study rerun it in 3a (ii) using Secondary Cities Loans to Development Loans (SCLDV) as the dependent variable and found that none of the explanatory variables included are statistically significant (Table 8). The results from the new regression show that NPLCR and RAA are still not statistically significant with both still possessing a negative magnitude on the outcome of interest. Interestingly, FMLIDA though still not significant retains estimate similar to the estimate obtained in the previous model (model: Table 8).

Table 8

Model 3a (ii) Outputs

| Independent variables | Variable description                                      | Estimate | SE   | P-value | 95% confidence interval |
|-----------------------|-----------------------------------------------------------|----------|------|---------|-------------------------|
| NPLCR                 | Non-Performing Loans Coverage Ratio                       | -0.106   | 0.109| 0.389   | (-0.411, 0.199)         |
| FMLIDA                | Financial/Market Liabilities to Investment in Development Activities | 0.021   | 0.043| 0.641   | (-0.098, 0.142)         |
| CTA                   | Cash to Total Assets                                      | 0.037    | 0.091| 0.697   | (-0.214, 0.289)         |
| TCDL                  | Total Capital to Development Loans                       | 0.041    | 0.016| 0.062   | (-0.003, 0.087)         |
| RAA                   | Returns on Average Assets to Returns on Equity            | -0.045   | 0.083| 0.620   | (-0.276, 0.186)         |
| Constant              | Intercept                                                 | 4.545    | 6.235| 0.506   | (-12.766, 21.857)       |

R² = 0.884

No of observations: 10
This study proceeded to run Model 3a (iii) considering the results in Models 3a (i) and 3a (ii) using Under-Resourced Municipalities Loans to Development Loans (URMLDL) as the outcome of interest (dependent variable). Although, the findings from this model indicated that none of the explanatory variables are statistically significant but some interesting results are observed. The FMLIDA variable though still insignificant has a much-reduced positive impact on URMLDL with a very small magnitude estimate [0.005, 95% CI: (-0.025, 0.036), compared to their behaviour in Models 3a (i) and (ii) (Table 9). Likewise, CTA and RAA variables retain their insignificance but now with a positive impact on URMLDL.

Table 9
Model 3a (iii) Outputs

| Independent variables | Variable description | Estimate | SE  | P-value | 95% confidence interval |
|-----------------------|----------------------|----------|-----|---------|------------------------|
| NPLCR                 | Non-Performing Loans Coverage Ratio | -0.025 | 0.028 | 0.432 | (-0.104, 0.054)        |
| FMLIDA                | Financial/Market Liabilities to Investment in Development Activities | 0.005 | 0.011 | 0.670 | (-0.025, 0.036)        |
| CTA                   | Cash to Total Assets | 0.003 | 0.024 | 0.878 | (-0.061, 0.069)        |
| TCDL                  | Total Capital to Development Loans | -0.003 | 0.004 | 0.471 | (-0.015, 0.008)        |
| RAA                   | Returns on Average Assets | 0.001 | 0.021 | 0.980 | (-0.059, 0.061)        |
| Constant              | Intercept            | 1.641 | 1.617 | 0.368 | (-2.851, 6.132)        |

R² = 0.719
No of observations: 10

The next discussion of results is for Model 3(b). Using the Cash to Total Assets (CTA) variable as the outcome of interest, this study finds the RAE, NPLCR, and FMLIDA explanatory variables statistically significant at the 5% level with a magnitude of 0.326, -0.778, and 0.465 respectively (Table 10). The R-square (R²) measures the % of variation explained by the model. In the case of Model 3b, 91.7 % of the variation in the Cash to Total Assets was explained by the model.

Table 10
Model 3(b) Outputs

| Independent variables | Variable description | Estimate | SE  | P-value | 95% confidence interval |
|-----------------------|----------------------|----------|-----|---------|------------------------|
| RAE                   | Returns on Average Equity | 0.326 | 0.091 | 0.023* | (0.073, 0.579)        |
| MMLDL                 | Metropolitan Municipalities Loans to Development Loans | -0.478 | 1.179 | 0.706 | (-3.754, 2.798)        |
| NPLCR                 | Non-Performing Loans Coverage Ratio | -0.778 | 0.220 | 0.024* | (-1.389, -1.166)      |
| FMLIDA                | Financial/Market Liabilities to Investment in Development Activities | 0.465 | 0.088 | 0.006* | (0.218, 0.711)        |
| TCDL                  | Total Capital to Development Loans | 0.079 | 0.062 | 0.273 | (-0.094, 0.251)        |
| Constant              | Intercept            | 21.874  | 18.424 | 0.301 | (-29.281, 73.029)      |

R² = 0.917
No of observations: 10

Using the profitability proxy (RAA) as a dependent variable, this study examines the results in Model 3(c). The MMLDL, NPLCR, CTA, and TCDL explanatory variables impact positively on RAA but yet, still not statistically significant. On the other hand, FMLIDA is the only explanatory variable that is statistically significant at the 5% level in this model but has a negative impact on RAA (Table 11). The Cash to Total Assets...
variable (CTA) is not significant with a positive coefficient of 0.733.

Table 11

Model 3(c) Outputs

| Independent variables | Variable description                                      | Estimate | SE   | P-value | 95% confidence interval |
|-----------------------|-----------------------------------------------------------|----------|------|---------|-------------------------|
| MMLDL                 | Metropolitan Municipalities Loans to Development Loans   | 1.233    | 1.518| 0.462   | (-2.982, 5.449)         |
| NPLCR                 | Non-Performing Loans Coverage Ratio                      | 0.965    | 0.376| 0.062   | (-0.078, 2.009)         |
| FMLIDA                | Financial/Market Liabilities to Investment in Development Activities | -0.411 | 0.127| 0.032*  | (-0.764, -0.056)        |
| CTA                   | Cash to Total Assets                                     | 0.733    | 0.347| 0.032*  | (-0.764, -0.056)        |
| TCDL                  | Total Capital to Development Loans                       | 0.0003   | 0.091| 1.00    | (-0.252, 0.252)         |
| Constant              | Intercept                                                | -41.971  | 27.730| 0.205   | (-118.963, 35.021)      |

R² = 0.898
No of observations: 10

Conclusions and Implications for South Africa

The results of the analysis show evidence that there is a correlation between the funding of under-resourced municipalities by DBSA and its exposure to financial risk though the correlation is not overwhelmingly significant, but also evidence of a negative correlation between the funding of under-resourced municipalities and the minimization of the financial risk exposure of DBSA. In addition, there is a negative correlation between funding to all three sizes of the municipality and ability of the DFI to absorb future losses (Non-Performing Loan Coverage Ratio). The negative correlation is highest for secondary cities followed by metros and least for under resourced municipalities. The variable Non-Performing Loans Coverage Ratio (NPLCR) has a negative but significant impact on Cash to Total Assets (CTA).

The Metropolitan Municipalities Loans to Development Loans (MMLDL) and Total Capital to Development Loans (TCDL) variables impact positively on Returns on Average Assets (RAA) an indicator of profitability of a firm’s assets as a gauge of financial performance though insignificant. FMLIDA, the Financial/Market Liabilities to Investments in Development Activities has a negative but significant correlation with RAA. A substantial percentage of the funds utilized for development funding by the DBSA are sourced from the financial markets. Therefore, disbursement is largely based on the absorptive capacity of the geographical regions/development markets. The result provides positive news to the markets via encouraging returns on average equity and returns on assets, enabling continuous access to cheap funds to fulfil its mandate.

Recommendations

The mandate of DBSA as a development finance institution is to support infrastructure development, human and institutional capacity building through intermediaries including municipalities and other development partners. A sizeable unmet development funding need abides in Market 3 under resourced municipalities characterised by low capacity, low resources, and significant exposure to financial risk. The role of the DFI should be to enhance access of under-resourced municipalities to funding by:

- Credit enhancing their risk profile through addressing governance and institutional capacity constraints,
- Sourcing and warehousing cheaper and affordable long term finance in addition to utilising a mix of
innovative funding instruments,
• Improving financial viability and sustainability by supporting compliance with the requirements of the municipal finance management act (MFMA),
• Improving their implementation capacity by skills gap analysis and the deployment of expertise, and last but not least,
• Enabling the under-resourced municipalities to migrate from Market 3 to Market 2 and thereafter Market 1 respectively,
• Thereby leveraging and crowding-in increased private sector investment and funding into development.

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