

**Factors Influencing Efficiency  
in  
Namibia's Banking Sector**

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## **Abstract**

Central bankers recognise that efficiency in the banking sector is a key contributor to macroeconomic stability, which is a precondition for economic growth and is important for the effectiveness of monetary policy. While this report does not attempt to empirically assess the relationship between banking sector efficiency and economic growth in Namibia; empirical studies in other countries, such as Italy, have incorporated the banking sector efficiency into the growth model and find that efficiency of the banking sector in allocating credit to investment opportunities that offer the highest returns positively contributes to economic growth.

A banking sector's efficiency can be represented by microeconomic and macroeconomic measures. This research report adopted two microeconomic measures – alternative profit X-efficiency and profit before tax per employee (an accounting ratio) - to represent the efficiency of individual banks. These were then averaged to measure efficiency in Namibia's banking sector. In addition, a macroeconomic measure - the interest rate spread between deposit and lending rates - was also adopted to represent efficiency in Namibia's banking sector.

In this report, each of these efficiency measures was regressed, using Ordinary Least Squares, on an Analysis of Covariance model consisting of a random effects, panel dataset of various features of banks in Namibia to identify factors that influenced efficiency in Namibia's banking sector between 1998 and 2003.

The report found that the effect of concentration on efficiency in Namibia's banking sector was robust across all three measures between 1998 and 2003. This finding provides empirical evidence that the market power hypothesis for mergers is confirmed in Namibia (Berger & Hannan, 1997). Therefore, although M&A is positively associated with the measures of efficiency in Namibia' banking sector the effects of adverse pricing on the welfare of the society work in the opposite direction and should be considered by the regulator in any anti-trust assessment of potential M&A deals.

Although there is no overall consistent picture across all three measures of the robustness of the variable capturing a bank's risk, risk management in general and small business credit scoring in particular can contribute to reducing the costs of the banking sector in Namibia to the extent that it assists banks in automating the credit and risk management process. This should have an indirect impact on the Namibian banking sector's efficiency.

It is hoped that the findings of this study will inform the efforts of regulatory bodies to areas that they can intervene to improve the effectiveness of the banking sector in Namibia in allocating credit efficiently, which should have positive implications for economic growth.

## Table of Contents

Acknowledgements .....	iii
Disclaimer .....	iii
Abstract .....	iv
List of Tables .....	vii
List of Figures .....	vii
List of Boxes .....	viii
List of Equations.....	viii
List of Abbreviations.....	ix
1. INTRODUCTION .....	1
2. BACKGROUND .....	2
2.1. Internal Factors .....	3
2.1.1. Information Systems.....	3
2.1.2. Information and Communications Technology .....	4
2.1.3. Human Resource Management .....	5
2.1.4. Service Delivery Channels .....	6
2.1.5. Risk Management .....	11
2.2. External Factors .....	15
2.2.1. Bank Size .....	15
2.2.2. Organisational Form and Governance .....	16
2.2.3. Other Bank Characteristics .....	19
2.2.4. Market Characteristics.....	20
2.2.5. Regulation .....	21
2.3. Other Factors .....	23
3. IDENTIFYING INFLUENCING FACTORS .....	26
3.1. Sample .....	26
3.2. Data.....	27
3.3. Model.....	28
3.4. Procedure.....	30
4. RESULTS AND DISCUSSION .....	31
4.1.1. Efficiency .....	31
4.1.2. Bank Size .....	34
4.1.3. Organizational Form and Governance .....	36
4.1.4. Other Bank Characteristics .....	42
4.1.5. Market Characteristics.....	44
4.1.6. Regulator .....	46
5. CONCLUSION.....	48

6. REFERENCES.....	49
Appendix A: Description of Variables in ANCOVA Model.....	53
Appendix B: Technical Discussion.....	55

## List of Tables

Table 1: Web Presence and Provision of Internet Banking Facilities in Namibia's Banking Sector between 1998 and 2003.....	10
Table 2: M&A Participation in Namibia's Banking Sector between 1998 and 2003 .....	17
Table 3: Holding Company Features in Namibia's Banking Sector between 1998 and 2003 .....	18
Table 4: Dates of Establishment for Banks in Namibia .....	19
Table 5: Regulators of Banks in Namibia between 1998 and 2003 .....	22
Table 6: Correlation Analysis Results for Namibia.....	34

## List of Figures

Figure 1: Trend in Real ICT Expenditure for Namibia's Banking Sector between 1998 and 2003 ('1000s of NAD).....	4
Figure 2: Trend in Affirmative Action Employment for Namibia's Banking Sector between 1998 and 2003.....	6
Figure 3: Average Number of Branches in Namibia's Banking Sector between 1998 and 2003 .....	7
Figure 4: Average Number of ATMs and Agencies in Namibia between 1998 and 2003 .....	8
Figure 5: Relative Size of Banks in Namibia from 1998 to 2003.....	16
Figure 6: Relative Shares of Business Loans to Total Loans for Banks in Namibia from 1998 to 2003 (%) .....	20
Figure 7: Herfindahl-Hirschman Index Scores for the Loan Market in Namibia's Banking Sector from 1998 to 2003.....	21
Figure 8: Alternative Profit X-efficiency in Namibia's Banking Sector between 1998 and 2003 .....	31
Figure 9: Profit before Tax per Employee in Namibia's Banking Sector between 1998 and 2003 .....	32
Figure 10: Interest Spreads in Namibia's Banking Sector between 1998 and 2003 .....	33

**List of Boxes**

Box 1: Definition of Small and Micro enterprises in Namibia .....2

Box 2: Types of Risk..... 12

Box 3: Types of Credit-Scoring Systems ..... 14

**List of Equations**

Equation 1: ANCOVA Efficiency Model: General Function.....28

Equation 2: ANCOVA Model: Estimated Function.....55

Equation 3: Multicollinearity. ....56

## List of Abbreviations

<i>aπx</i>	Alternative Profit X-efficiency
ANCOVA	Analysis of Covariance
ATM	Automated Teller Machine
BoN	Bank of Namibia
CMA	Common Monetary Area
H-Index	Herfindahl-Hirschman Index
HRM	Human Resource Management
ICT	Information and Communication Technologies
LIMDEP	Limited Dependent Variables
M&A	Mergers and Acquisitions
NAD	Namibian Dollars
OLS	Ordinary Least Squares
PC	Personal Computer
SBSS	Small Business Scoring Service
SARB	South African Reserve Bank
SME	Small and Medium-Scale Enterprises
USD	United States Dollars



## **1. INTRODUCTION**

Efficiency in the banking sector is recognised by central bankers in the Southern African Development Community (SADC) as a precondition for macroeconomic stability (Ngalande, 2003) and important for effective monetary policy execution (Hartmann, 2004). In addition, a banking sector's ability to allocate credit efficiently is expected to have positive implications for economic growth (Galbis, 1977).<sup>1</sup>

The main goal of this report was to identify factors that influenced efficiency in Namibia's banking sector. This was done to inform the efforts of policy makers and regulators in their attempts to boost the effectiveness of the banking sector in allocating credit efficiently.

To achieve our goal the average of two microeconomic measures – alternative profit X-efficiency and profit before tax per employee (an accounting ratio) – for individual banks and a macroeconomic measure - the interest rate spread between deposit and lending rates were adopted to represent efficiency in Namibia's banking sector.

Each of these efficiency measures was then regressed, using Ordinary Least Squares (OLS), on an Analysis of Covariance (ANCOVA) model consisting of a random effect, panel dataset of various features of banks in Namibia. Following this, standard hypothesis testing was used to identify the factors that influenced efficiency in Namibia's banking sector.

The remainder of this report is organised as follows Section two provides a background to potential factors that influence a banking sector's efficiency in a Namibian context. Section three goes on to describe the methodology this report adopted to achieve its goal. This is followed by section four that presents the results of an application of the methodology and an associated discussion. Finally, section five presents the conclusions.

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<sup>1</sup> Lucchetti, Papi & Zazzaro (2000) empirically justified this in a on the Italian banking sector.

## 2. BACKGROUND

Between the first quarter of 1998 and the fourth quarter of 2003, the privately-owned banks in Namibia included Bank Windhoek, First National Bank Namibia, Nedbank Namibia and Standard Bank Namibia. The publicly-owned banks included the Agricultural Bank of Namibia (Agribank) and the Namibia Post Office Savings Bank (NamPost).

These banks typically lend to individuals, the public sector, small and medium-scale enterprises (SMEs) and large-scale enterprises.<sup>2</sup> Some of these enterprises are growing rapidly towards liquidity - they are successful and stable enough so that the risk to outside lenders is reduced but still need outside cash to sustain their growth. In some cases, banks also lend to enterprises that are profitable but cash poor - these are rapidly expanding with fast sales growth, positive profit margins but lack marketable fixed assets or accounts receivables that are needed to reduce the lending risk (Sahlman, 1990). This is done through the provision of trade finance, leasing and factoring solutions that finance the inventory and fixed asset needs of these enterprises.

### Box 1: Definition of Small and Micro enterprises in Namibia

The official definition of small and micro enterprises in Namibia is depicted in the table below. This is based on number of employees, annual turnover and capital employed, which conforms to the practice in developing and developed countries alike. In Namibia, a firm is categorised as a small or micro enterprise if it meets at least two of the three criteria. Dahl (2002) argues that the official definition may not be appropriate for Namibia where the average small and micro enterprise size is approximately 3 (2.2) employees and the annual turnover and capital employed, in this definition, appear to fit few Namibian enterprises with between 1 and 9 employees.

Sector	Number of Employees	Annual turnover	Capital employed
Manufacturing	Less than 10	NAD 1,000,000	NAD 500,000
All other businesses	Less than 5	NAD 250,000	NAD 100,000

Source: Ministry of Trade & Industry (2000)

A bank's operational and lending practices has an impact on the level of funds SMEs and large enterprises can raise and how these firms are managed (Stulz, 2001). These practices depend on internal factors, which a bank's management can control or external factors, beyond its control.

<sup>2</sup> Although the official definition of the acronym SME, in Namibia, refers to small and microenterprises, in this report the acronym will refer to small and medium-scale enterprises.

## 2.1. Internal Factors

This section describes potential internal factors under a bank's control that may influence efficiency.<sup>3</sup>

### 2.1.1. Information Systems

The way a bank structures its processes should have implications on its efficiency. In Namibia, banks have structured their processes according to their various lines of business such as banking, property, insurance services and even postal operations and logistics in the case of NamPost. This increases their ability to compete, satisfy their customers and complete transactions accurately and address other sets of business problems (Frei, Harker & Hunter, 1998 and KPMG, 2004c).

The efficiency of these processes should also have implications the bank's overall efficiency. In recognition of this, banks in Namibia implemented various stand-alone, enterprise-wide information systems between 1998 and 2003 to assist their efforts to attain process efficiency. These included performance management systems such as Performax, Balanced Scorecard, JobFit and other human resource information and payroll systems; banking systems such as Globus and Phoenix, cash and corporate access management systems, networking systems such as Bankmaster, counter automation software systems such as Riposte, courier logistic systems such as Winfreight, etc. Others implemented e-business systems such as SAP to integrate the various organisational functions into a coherent, automated structure.

In addition to structuring and efficiency, processes need to be aligned with the overall goals of the organization. This is the task of its management. In recognition of this, banks in Namibia invested in their managers through management development programs. These included accelerated career development, mentorship and leadership programs. In some cases, promising managers toured with the overseas branches of their bank's to acquire best practice experience first hand.

When designing and structuring process it is important to not focus on one process, but to improve a set of processes because they interact with each other i.e. there is no single best practice (no "magic bullet"). This is because no one set of management practices, capital investments and strategies lead to success. Rather, it has been found in some studies that the alignment of technology, capital investments and human resources with appropriate delivery processes appears to be a more appropriate strategy to increasing efficiency in the banking industry (Frei, Harker & Hunter, 1998). Due to the importance of designing and structuring interacting processes, it is not uncommon for banks to hire managers from

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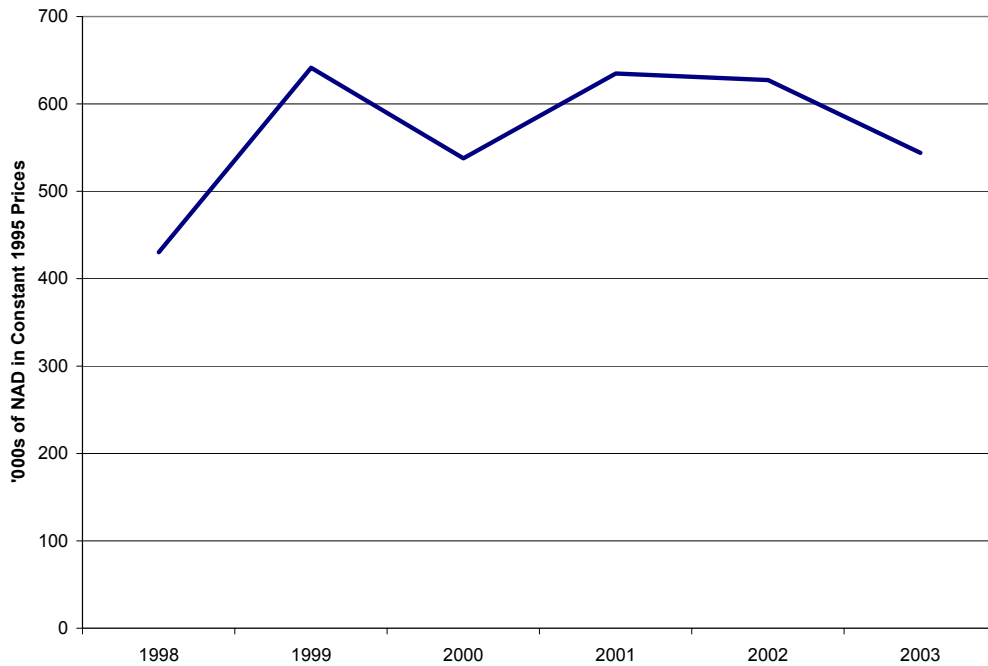
<sup>3</sup> Some of these factors can be empirically investigated in the context of a branch-level study.

manufacturing enterprises to drive the process alignment of technology, human resource management (HRM) and strategy.

### 2.1.2. Information and Communications Technology

The level of adoption and application of ICT may also affect the efficiency of a bank. ICT is used by a bank's management and staff to transform "raw" inputs into useful inputs. It adds value by creating new sources of information in an organization, rather than simply automating existing processes (Zuboff, 1985). It is viewed within a bank at two main levels.

Firstly there is overall investment in ICT. The banking sector in Namibia is continuously undertaking technology infrastructure projects, platform automation and information and transaction process upgrading. These are aimed at integrating the traditional front-office and back office systems to reduce costs and enable the operation of smaller bank branches with fewer but more highly qualified staff. In some banks ICT is a stand alone business unit. Between 1998 and 2003 overall ICT expenditure (including depreciation) for the banking sector increased. This is illustrated in Figure 1 below.



**Figure 1: Trend in Real ICT Expenditure for Namibia's Banking Sector between 1998 and 2003 ('1000s of NAD)**

Note: Does not include Bank Windhoek ICT expenditure and 2003 figures for First National Bank of Namibia and Agribank

Source: Banks' Annual Reports

Secondly, there is the ICT functionality deployed in the production and service delivery processes, which focuses on its ability to perform certain functions within the organization. The purchase of a computer in itself adds nothing to the productive capability of an organization. It is only after this computer has been integrated into the production technology of the firm that it adds value - the same is true of labour and other capital inputs (Frei, Harker & Hunter, 1998). The selection of ICT projects and their management are crucial factors in transforming the investment in ICT into effective ICT aimed at generating higher profit, which has implications on bank efficiency.

### **2.1.3. Human Resource Management**

HRM processes provide a high-level framework and guiding principles, while HRM policies bring this framework down to an operational level. At increasingly specific levels below HRM processes and policies lies the implementation of particular HRM practices.

HRM practices create value by attracting and retaining employees, reinforcing employee behaviors and developing employee skills through compensation, hiring and selection, staffing, training, work organization and employee involvement. They affect both managerial and non-managerial employees and affect efficiency to the extent that both groups play important roles in engaging or supporting profit generating activities in banks (Frei, Harker & Hunter, 1998).

Solid empirical evidence shows that HRM contributes to organizational performance. This implies that bank efficiency may be increased by the effective management of human resources (Frei, Harker & Hunter, 1998).

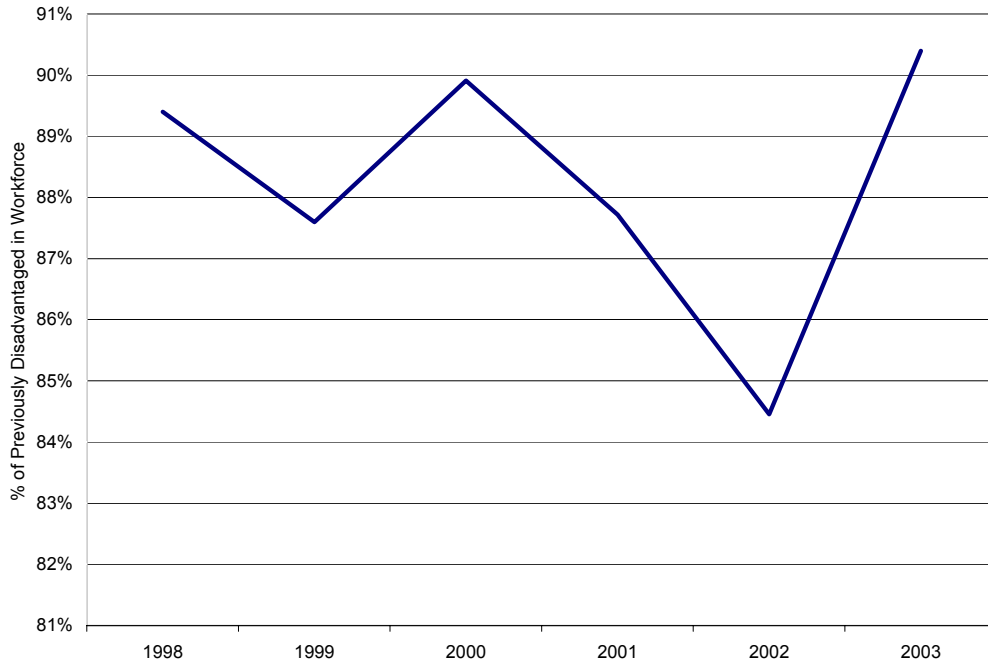
In Namibia, the Affirmative Action (Employment Act) 29 is a key factor influencing each bank's HRM policies and strategies. Its aim is to ensure that each organization in Namibia targets groups that were previously disadvantaged by its historical, socio-political practices, to create a balanced workforce. In some banks, these efforts are monitored by a committee appointed by their boards. Some banks even place advertisements in international newspapers to attract previously disadvantaged Namibians from outside the country.

To the extent that changes in the structure of the workforce in each bank affects employee's personal interactions, efforts to create a balanced workforce may affect the efficiency of a bank.<sup>4</sup> The level of progress in creating a balanced workforce in Namibia's banking industry is illustrated in Figure 2 below. This figure shows that even at its lowest level in 2002, 84% of the banking sector's workforce composed of employees designated as previously disadvantaged in Namibia.<sup>5</sup>

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<sup>4</sup> In microeconomic theory all labour is assumed to be homogeneous.

<sup>5</sup> In addition to the racially disadvantaged, this also includes women, youth and the disabled.



**Figure 2: Trend in Affirmative Action Employment for Namibia's Banking Sector between 1998 and 2003**

Source: Banks' Annual Reports

Another factor influencing HRM policy in Namibia is the existence and implementation of a formal HIV/AIDS policy. All banks in Namibia currently have such policies in place which ensures that the productive levels of their staff don't suffer unduly from manageable health issues.

#### **2.1.4. Service Delivery Channels**

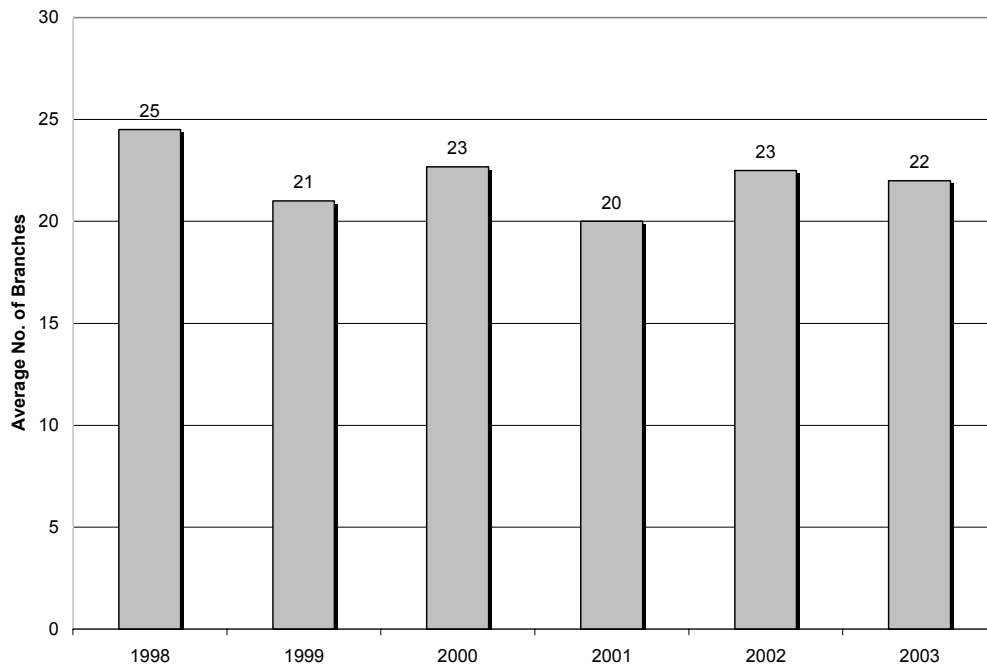
Another potential factor that may influence efficiency in the banking sector is the cost of and revenue generated by the channel used to provide financial services. Banks use branches, automated teller machines (ATMs), personal computers (PCs), fixed-line telephones and most recently cellular phones (cell phones) to provide financial services to their clients. The increase in service delivery channels are the result of pressures from a globalised financial services industry, opportunities provided by advances in ICT and innovations in financial engineering. The management of process consistency within and across these service channels is important because of the interactions between them.

##### **2.1.4.1. Branches**

Branches are the traditional delivery channel used by banks for financial service provision. However, due to their fixed location their outreach is limited to the local

clientele in their immediate surroundings. For most branch employees time spent with customers focuses on simple, transaction-oriented activities and basic servicing of accounts rather than on activities that are likely to lead to sales opportunities (Frei, Harker & Hunter, 1998)

The fee structure of banks is designed to encourage employees to shift away from using the branch to conduct their transactions towards the alternative channels discussed below. In addition, the pace of innovation in financial engineering and advances in ICT has brought the traditional role of branches into question. In Namibia, this is exhibited by the absence of any substantial increase in bank branches between 1998 and 2003 as illustrated in Figure 3 below.



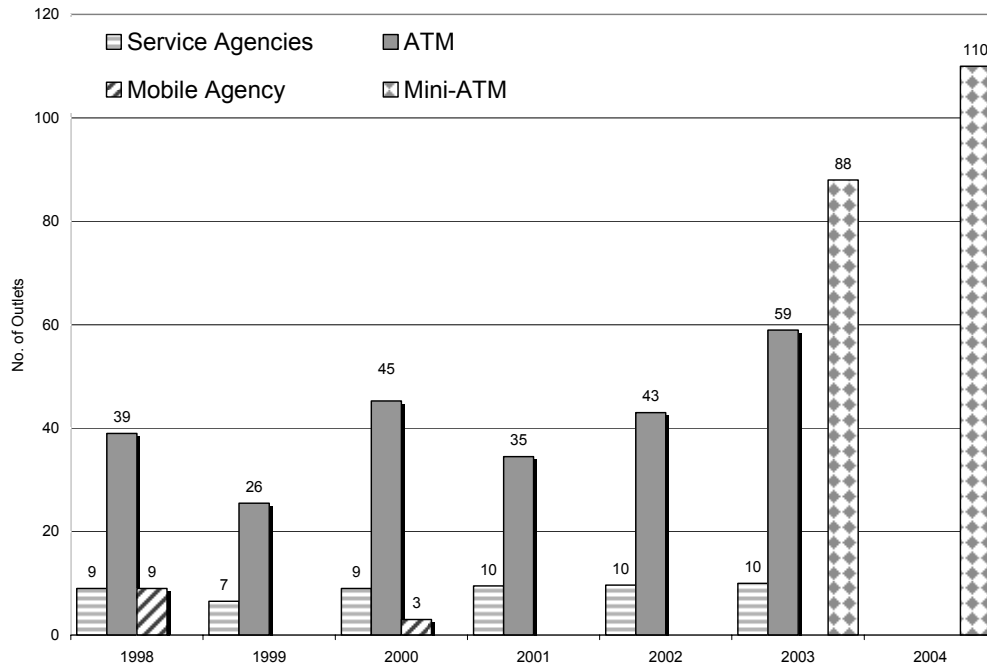
**Figure 3: Average Number of Branches in Namibia's Banking Sector between 1998 and 2003**

Source: Banks' Annual Reports

The future of branches does not lie in their elimination in favour of new service delivery channels but in transforming them into sales as opposed to service centres (Athanasopoulos, Soteriou & Zenios, 1997). This will involve designing processes to supplement or improve employee-customer interaction that will allow bank employees to increase their cross-selling efforts, in addition to assessing and meeting customers' needs.

### 2.1.4.2. Automated Teller Machines

Technological advances have assisted banks in reducing the cost of branch networks and allowed them to expand faster into new areas. This has mainly been through setting up ATMs instead of adding more costly physical branch offices (Berger & Mester, 1997). Mini-ATMs and mobile agencies have further reduced the cost incurred by setting up fixed ATM centers that are usually found outside bank branches. This is illustrated in Figure 4 below.



**Figure 4: Average Number of ATMs and Agencies in Namibia between 1998 and 2003**

Note:

- Service Agency Data excludes: Standard Bank (1998, 1999), Bank Windhoek (2001, 2003), and First National Bank Namibia (1999 and 2001 to 2003).
- ATM Data excludes: Standard Bank (1998, 1999), Bank Windhoek (2001, 2003), and First National Bank Namibia (1999, 2001, and 2002).
- Mini-ATM and Mobile Agency Data only includes First National Bank Namibia.

Source: Banks' Annual Reports and Bank of Namibia

The ATM channel provides an opportunity for banks to channel routine transactions towards this interface and introduce customers in new markets to different ways of interacting with banks. In addition, it can be a useful channel through which SMEs can use pre-paid debit cards to access approved financing or credit cards to access approved credit lines for their businesses.

### **2.1.4.3. Fixed-Line Telephones**

Banks also take advantage of the fixed-line telephone as a service delivery channel. This occurs mainly through the provision of call center services to handle routine questions and service transactions day and night. This strategy was developed to free up branch employees to pursue more sales opportunities.

In Namibia, banks have introduced toll free call centers for customer use. Others have set up internal call centers to boost functionality within their operations. Most recently call centers are being complemented with 24 hour helpdesk services to further satisfy customers. Shifting these call centres from pure service channels to sales and service channels should shift them from cost to profit centres.

Advances in ICT can be taken advantage of to enable call centre representatives to have a complete picture of each calling customer's financial portfolio, position and potential. This should enhance their sales efforts by enabling them to suggest an optimal fit between customers and services, and to refer the customers to areas in the bank with particular expertise in a product as it becomes necessary (Frei, Harker & Hunter, 1998). In addition, this channel can also be used to approve loans without actually meeting the loan applicant if complemented with credit scoring models discussed later on in this section.

Advances in ICT have also enabled banks to reduce the costs of the call center, by having more calls handled by automated voice response systems instead of by people. This decreases the call volume that reaches the call center representatives, which frees up their time to focus on sales functions. Where such automated voice response systems are implemented they need to be customer-oriented in design to allow efforts aimed at increasing their functionality to have the desired effect (Frei, Harker & Hunter, 1998).

### **2.1.4.4. Personal Computers**

Advances in ICT have also made it possible to take advantage of the PC as a service delivery channel. It allows customers to conduct their routine banking transactions such as electronic fund transfers and payments on-line, which provides the advantages of cost reductions and customer convenience.

Despite the large up-front costs associated with PC banking, banks in Namibia do not really have the option of not using this delivery channel at this point due to its competitive necessity. Almost all banks in Namibia offer internet banking facilities and some have even redesigned their processes to ensure optimal web and intranet delivery support. This is illustrated in Table 1 below.

**Table 1: Web Presence and Provision of Internet Banking Facilities in Namibia's Banking Sector between 1998 and 2003**

Bank	Standard Bank Namibia	Agricultural Bank of Namibia	Bank Windhoek	Nedbank Namibia	First National Bank Namibia	NamPost Savings Bank	Development Bank of Namibia
Web Presence	Yes	No	Yes	Yes	Yes	Yes	Yes
Internet Banking	Yes	No	Yes	Yes	Yes	Yes	No

Source: Banks' Annual Reports and Websites

The introduction of internet banking through the PC channel has resulted in banks facing a similar set of service issues that the software industry faces such as how to deal with hardware related questions about customers' PCs and modems as well as issues such as hacking and identity theft. This creates the need to train and retain technically skilled call center representatives and technical support staff.

Due to the unavoidability of the use of the PC channel in banking in Namibia, its planning and implementation has to be considered most carefully, down to the precise objectives and detailed descriptions of how the customer will interact with the channel (Frei, Harker & Hunter, 1998).

#### **2.1.4.5. Cellular Phones**

The cell phone is a delivery channel that combines the functionality of the PC and telephone in one device. Therefore, it combines the advantages offered and issues faced by these channels, as described above. The importance of this channel to the Namibian financial services industry cannot be overstated. Finscope (2004) estimates that 46% of the Namibian population has cell phones, as opposed to only 27% having fixed line telephone access. Of the latter, only 1 out of 20 have access to the internet. Therefore, the embracing of this channel represents a high-growth area if the objective of banks is to increase market share, profits and access to financial services in Namibia.

As is evident in Namibia, the introduction of a new service delivery channel does not replace previous channels. Therefore, banks need to integrate newly introduced channels into the existing methods of interacting with the customer. This requires the management of interactions within and across service delivery channels to ensure that they complement each other (KPMG, 2004c). A holistic approach to channel management will allow a bank to take advantage of the increasing volume of interaction with customers that a service delivery channel shift creates to promote the new product options and services that are offered by the new technology.

As part of this effort, banks need to understand how customers interact with the bank through each service delivery channel. This is useful so that when a set of customer transactions are migrated from one channel to another, appropriate processes can be designed to facilitate the switching of these customers from one delivery channel to another. This will allow existing customers, who may be channel-specific to use their preferred channel and allow newly acquired customers to use one or all channels, which should prevent a channel from suffering unduly when an additional one is introduced (Frei, Harker & Hunter, 1998).

### **2.1.5. Risk Management**

To ensure that banks maintain their customer protection objectives and control for systemic risk, which refers to the risk that the liquidity crunch problems of a few institutions spreads to many other institutions that are otherwise solvent and liquid (Berger & Humphrey, 1997), the Basel II Capital Accord will require banks to better align their regulatory capital to the underlying risks (Saidenburg & Schuermann, 2003).

Since a bank's own insolvency risk depends on the financial capital available to absorb portfolio losses, as well as on the portfolio credit risks themselves, the Basel Capital Accord places limitations on exposure to sources of vulnerability. If banks continuously exceed any of these limitations they are subjected to heavy costs in the form of increased regulatory oversight (remedial covenants) or may even have their charters revoked, in the most serious instances.

With Basel II, banks are required to adhere to a capital requirement that is more closely linked to each bank's actual credit risks. In response to this banks have implemented risk-based capital allocation systems that reward low risk. To the extent that banks can lend to less risky investment opportunities, the potential of loss is reduced, which leads to more stable profit levels and less variation in efficiency.

These risk-based capital allocation systems are designed based on the assumption that capital market frictions, such as limited public information, costly renegotiations due to defaults and agency problems between managers and outside investors, exist and drive a wedge between the cost of internal and external funds.<sup>6</sup> To the extent that these frictions lead to credit constraints, allocating capital from a central office to a diverse set of projects based on an ordinal measure of the value of the project, can increase investment efficiency (James, 1996).<sup>7</sup>

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<sup>6</sup> Frictionless capital markets are those with perfect information and without taxes, bankruptcy costs or conflicts between managers and shareholders.

<sup>7</sup> An example of such a system is described in detail in James (1996).

The move of the capital allocation decision to the bank's headquarters or holding company makes no difference to capital budgeting decisions and investment activity because the final effect of whether a bank varies leverage to business units on the basis of risk or varies the cost of capital with the risk of each individual project is similar. In addition, allocation from headquarters frees managers to focus their attention on risk that they can influence i.e. business risk (James, 1996).

### Box 2: Types of Risk

- Credit risk refers to the risk of loss due to borrower default or failure to pay on a contractual obligation in the full amount or on time. It is one source of reluctance in lending to marginal, small-scale enterprises.
- Business risk refers to the uncertainty of the revenues and expenses associated with activities such as loan origination, servicing and data processing. It depends on X-efficiency.
- Market risk refers to the risk of loss due to changes in the market price of a publicly traded bank's assets and obligations such as foreign exchange risk, interest-rate risk and options risk on mortgages and deposits. The bank's treasury unit is responsible for hedging against market risk.
- Country risk refers to the risk of loss on cross-border and sovereign exposures due to governmental actions such as the suspension of hard currency payments, radical devaluation of the currency and nationalization of assets held as investments.

Source: James (1996)

To the extent that riskier divisions face a higher capital charge from head office, business unit managers may be tempted to understate the risk of their division. This behaviour can be mitigated by evaluating the realized outcomes of a position (net of hedgable risk) relative to management forecasts, as part of the performance evaluation system of senior management (James, 1996).

#### 2.1.5.1. Credit Scoring

To the extent that risk-based capital allocation systems promote risk-averseness among banks they are a constraint to the effectiveness of the financial intermediation mechanism in lending to high-risk, high-return destinations. This is because these lending opportunities represent higher credit and business risk, which are associated with a lower-quality loan portfolio. Business units that seek out high-risk, high return opportunities contribute to a greater volatility of the bank's overall market value, resulting in higher costs of raising external funds and a reduction in its competitiveness in the wholesale market. Therefore, such business units will face a higher capital charge than those that lend to less risky, lower return destinations.

Despite this constraint, banks have begun to downstream their service offerings towards the marginal, small-enterprise sector by offering microfinance (Harper & Arora, 2005). This pool of clientele is typically informationally opaque, request for loans that are small in size and lack strong financial statements or marketable assets that are suitable for collateral. In Namibia, Bank Windhoek has a branch solely dedicated to lending to the emerging SME sector and other banks in Namibia may soon follow suit.<sup>8</sup> As banks move towards lending to the marginal, small-enterprise sector the risk of their overall portfolio is likely to increase.

To control for this risk, various approaches have been adopted to evaluate business loan applications, depending on a bank's stage of development and strategy. These include financial statement lending, which is based primarily on financial statements; asset-based lending, which is based primarily on collateral and relationship lending, which is based primarily on "soft" or non-quantitative information about the firm and its owner gained through contact over time (or a combination of these). In Namibia, credit processes involve a combination of these approaches (Angula, 2005).

Credit scoring is another way to evaluate business credit applications that can complement the techniques described above. It is defined as the process of assigning a single quantitative measure or score to a potential borrower representing an estimate of the borrower's future loan performance (Feldman, 1997). It uses a statistical approach to predict a borrower's willingness, rather than ability to pay in time based on previous loan applicants with similar characteristics.

Credit scoring was originally applied to consumer loans and mortgages because commercial loans were thought to be too heterogeneous and documentation was thought not to be sufficiently standardised either within or across institutions (Rutherford, 1995). Its application to commercial credits arose from the determination by credit analysts in the early 1990s that the loan repayment prospects of the individual were highly predictive of the loan repayment prospects of their business. This finding is expected to be the same in Namibia where in a non-representative sample of 337 businesses it was recognised that 70% of small and micro enterprise operators maintained private savings accounts for both personal and business purposes, suggesting little separation between business and personal finances (Grossman, Mwatotele, Stork & Tobias, 2005). This implies that a small businesses' future is closely tied to the owner's creditworthiness in Namibia.

The modification of the original credit scoring models to small business lending occurred when the Robert Morris Associates (an association of commercial loan officers and credit risk managers from over 3,000 member financial institutions in the United States of America) joined with Fair, Isaac & Co. (a computer software modeller based in San Francisco) to create the Small Business Scoring Service – SBSS (Latimer, 1995).

The developers of SBSS determined that key indicators of a business' health assessed by the original credit scoring models - including its age, net worth and

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<sup>8</sup> Bank Windhoek also defines SME as small and medium enterprise as opposed to small and micro enterprise.

profitability - hardly mattered in evaluating the probability of loan default for small businesses. Therefore, they augmented the original credit scoring models by including information about the character and reliability of the small business owner such as the owner's monthly income, outstanding debt, financial assets, employment tenure, home ownership, and previous loan defaults or delinquencies (Akhavein, Frame & White, 2001).

SBSS can be used for differential handling of late payments and delinquencies, differential handling of collections based on outcome predictions, estimation of the amount of profit an account is likely to generate, identification of applicants who may be candidates for other services and targeting of prospective customers (Akhavein, Frame & White, 2001).

### Box 3: Types of Credit-Scoring Systems

- A generic model that predicts the likelihood of a business loan applicant paying in a severely delinquent manner based upon a sample of businesses from across all industry segments, utilizing a wide range of commercial information.
- An industry-specific model that predicts the probability of delinquent payment based upon a sample of firms within a given industry.
- A model that predicts the likelihood of business owner payment performance based on the owner's payment behaviour.
- A scoring model developed from a sample of businesses that most resemble the bank's actual borrowers

Source: Rowland (1995)

The implication of the adoption of SBSS by banks in Namibia is that it could reduce the credit and business risk of emerging SME branches. This would make them less of a liability when assessed using the risk-based capital allocation system advocated by the Basel II Capital Accord. In addition, SBSS should greatly reduce the per unit costs of lending to the marginal, small enterprise sector by reducing the time spent on evaluating each loan application in the emerging SME branches.

Another implication of SBSS is that small business owners who have been scrupulous about paying off personal debts are more likely to get a new loan than those with a troubled credit history, even if their enterprises have impressive balance sheets. This could magnify existing socio-economic differences and be unfairly criticised as the source of these differences (COSATU, 2005).

The adoption of SBSS requires banks that are down streaming into the marginal, small-scale enterprise sector to view the issue of collateral from a different

perspective.<sup>9</sup> By not relying so much on financial statements for small enterprise lending, which tend to be unsophisticated or may understate income for tax reasons, SBSS is more effective than the original credit scoring models for small business lending. By enabling banks to evaluate business loan applications based on the owner's personal and business finances, which is important where entrepreneurs keep debt in the business and cash in their personal account, SBSS allows a bank that is willing to make large personal loans to self-employed people not to give the same clients a hard time when they apply for business loans by taking the owner and the business as the same entity.

The ability of SBSS models to improve collection activity depends on the information base on which they rely. The personal information used is usually obtained from one or more consumer credit bureaus and may be combined with data from business credit bureaus and basic business-specific data collected by the bank. Currently the existence of domestic, independent credit bureaus that could provide this information in Namibia is limited. However, Compuscan has an off-the-shelf product called Credit Check that is used by micro lenders in South Africa, Namibia and Botswana that could be used as a starting point to develop an industry-wide model.<sup>10</sup>

In the meantime, to create a database from which a SBSS can be developed, banks can start storing information on all previous (approved and rejected) and current loan applicants and existing customers. This pool of data will allow the creation of a SBSS that will automate the loan assessment process and should reduce the time loan officers spend evaluating referrals, which are not a revenue generating activity and do not contribute to improvements in efficiency or effective credit allocation.

## **2.2. External Factors**

This section describes potential external factors that may affect efficiency in a banking sector that are beyond the control of bank managers.

### **2.2.1. Bank Size**

According to microeconomic theory on scale economies, bank size (beyond a certain point) is negatively related to efficiency because bigger banks, after crossing a certain threshold, may suffer from scale diseconomies due to the difficulties of managing a larger entity. However, no consistent picture emerges from empirical studies that have investigated the relationship between bank size and profit

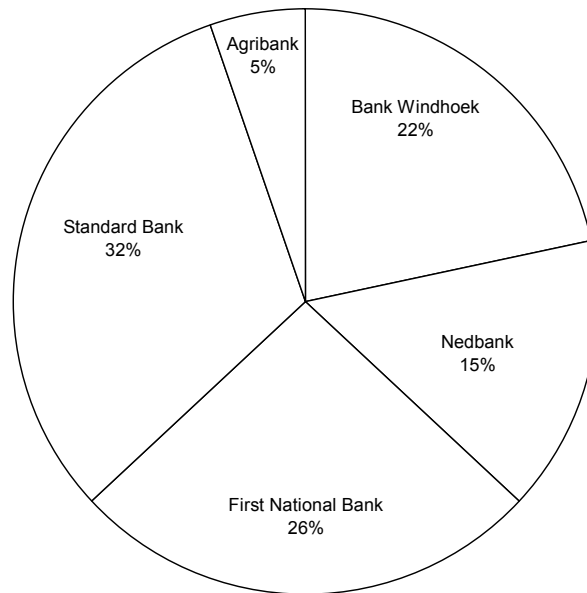
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<sup>9</sup> The use of SBSS to assess the owner and the business as a single entity conflicts with the limited liability rule. If the applicant enterprise is a corporation or a proprietary limited and default occurs it is not clear how this is handled.

<sup>10</sup> See [www.compuscan.co.za](http://www.compuscan.co.za) for more information.

efficiency because larger banks in a concentrated market may be able to influence prices such that they appear to be more efficient (Mester, 1996).

In Namibia, the largest bank in terms of size, measured by average total assets from 1998 to 2003 was Standard Bank Namibia, while the smallest was Agribank. This is illustrated in Figure 5 below.



**Figure 5: Relative Size of Banks in Namibia from 1998 to 2003**

Source: Banks Annual Reports

## 2.2.2. Organisational Form and Governance

Based on principal-agent theory, a bank's behavior is influenced by the pressure from various interest groups including employees, shareholders or even the managers' own interests (Myers & Majluf, 1984). Therefore, organisational form and governance should be influenced by bank merger and acquisition (M&A) activity, ownership form and structure as well as financial market influence.

### 2.2.2.1. Mergers and Acquisitions

Theory postulates a positive relationship between M&A and bank efficiency. There are three main competing hypotheses as to why this relationship exists.

First, the efficient structure hypothesis argues that the positive relationship exists because relatively more efficient banks with lower costs of production, superior management and production technologies, compete more aggressively for and gain

market share leading to higher profits, which is reflected in higher levels of efficiency.

Second, the relative market power hypothesis argues that the positive relationship exists because banks with well-differentiated products are able to exercise market power in pricing these products resulting in their capture of market share (Berger & Humphrey, 1997). Ikhide (2000) points out that since banks offer basically the same facilities, this competition is mainly non-price in form through advertising, quality improvement, product packaging and services, as opposed to under pricing.

Finally, the market power hypothesis (also known as the structure-conduct-performance hypothesis) argues that the positive relationship may be due to banks in concentrated markets, where there are limited alternative sources of financial services, exercising market power to charge prices that deviate widely from their equilibrium levels and are unfavourable to consumers (lower deposit rates, higher loan rates), which results in high profits and is reflected in higher levels of efficiency.

On the contrary, an opposing negative influence of M&A activity on bank efficiency can arise because M&A is correlated with bank size which is postulated to be negatively related to bank efficiency, beyond a certain point.

The M&A experience in Namibia between 1998 and 2003 is illustrated in the Table 2 below.

**Table 2: M&A Participation in Namibia's Banking Sector between 1998 and 2003**

Bank	Nedbank Namibia	First National Bank Namibia	Standard Bank Namibia	Agricultural Bank of Namibia	Bank Windhoek	NamPost Savings Bank	Development Bank of Namibia
Merger or Acquisition Participation	Yes	Yes	No	No	No	No	No

Source: Bank Annual Reports

### 2.2.2.2. Holding Company Features

Theory postulates that ownership by a holding company is positively associated with bank efficiency due to the discipline it imposes on banks. Weak evidence exists that banks in holding companies are more efficient than independent banks (Mester, 1996). This finding is based on the efficient structure hypothesis that postulates that more efficient banks may tend to acquire other banks and the holding company is the vehicle that allows them to do that (Berger & Mester, 1997).

However, a multi-layered, holding company should be negatively associated with bank efficiency because banks with complicated organisational forms or internal management structures could be less efficient. The negative relationship between bank efficiency and multi-layered holding companies should be more pronounced if the holding company is located outside of a country because banks in another market would be more difficult to control and the ultimate bank owners suffer from information asymmetry disadvantages compared to those whose holding companies are located in a country. Empirical studies show that the more complex structure of multi-layered holding companies does not seem to harm bank efficiency.

However, this report found that all banks that had multi-layered holding companies also had separated their functions into independent subsidiaries between 1998 and 2003. To the extent that such banks managed to separate their distinct processes, such a holding company structure should be positively related to efficiency. By splitting processes focus of inputs and production processes improves. This increases the effectiveness of production or risk management decisions.

Finally, theory postulates that a publicly traded holding company should be positively associated with bank efficiency because outside shareholders can exert pressure on bank management. The holding company features of Namibia's banking sector are illustrated in Table 3 below.

**Table 3: Holding Company Features in Namibia's Banking Sector between 1998 and 2003**

Bank	Bank Windhoek	First National Bank Namibia	NamPost Savings Bank	Nedbank Namibia	Standard Bank Namibia	Agricultural Bank of Namibia	Development Bank of Namibia
Holding Company Ownership	Yes	Yes	Yes	Yes	Yes	No	No
Holding Company Location	Namibia	Namibia	Namibia	South Africa	South Africa	-	-
Multi-Structure Holding Company	No	Yes	Yes	No	Yes	No	No
Publicly Traded Holding	No	Yes	No	Yes	Yes	No	No

Company							
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Source: Banks Annual Reports

### 2.2.3. Other Bank Characteristics

The age of a bank and the risks that it takes are also postulated to be related to its efficiency.

#### 2.2.3.1. Age

According to the 'learning by doing' hypothesis theory, age should be positively related to bank efficiency since bank production improves over time (Mester, 1996). The founding dates of banks in Namibia are illustrated in Table 4 below.

**Table 4: Dates of Establishment for Banks in Namibia**

Bank	Standard Bank Namibia	First National Bank Namibia	Agricultural Bank of Namibia	Bank Windhoek	Nedbank Namibia	NamPost Savings Bank	Development Bank of Namibia
Establishment date in Namibia	1915	1915	1922	1948	1973	1993	2002

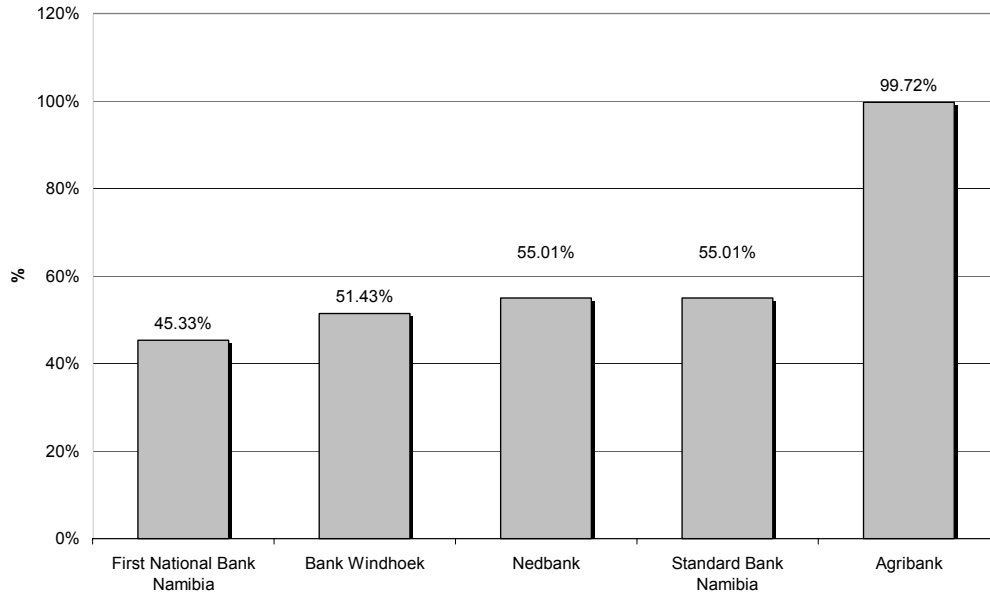
Source: Bank Annual Reports and Websites

#### 2.2.3.2. Risk

Theory postulates that risk is positively related to bank efficiency because a risk-loving bank will issue more loans, which are more highly valued than securities. Based on the market power hypothesis, the higher market power existing in loan markets compared to other product markets in which banks operate increases the potential for higher profits due to adverse pricing by more powerful banks. Therefore, a concentrated market may result in findings of efficiency even though this may not strictly be the case.

An alternative theory is that risk, should have a negative influence on efficiency because more lending in a environment dominated by small and micro enterprises is associated with a higher credit and business risk.

The different banks in Namibia are exposed to differing levels of risk depending on the portion of their overall loan portfolio allocated to the business sector. This is illustrated in Figure 6 below.



**Figure 6: Relative Shares of Business Loans to Total Loans for Banks in Namibia from 1998 to 2003 (%)**

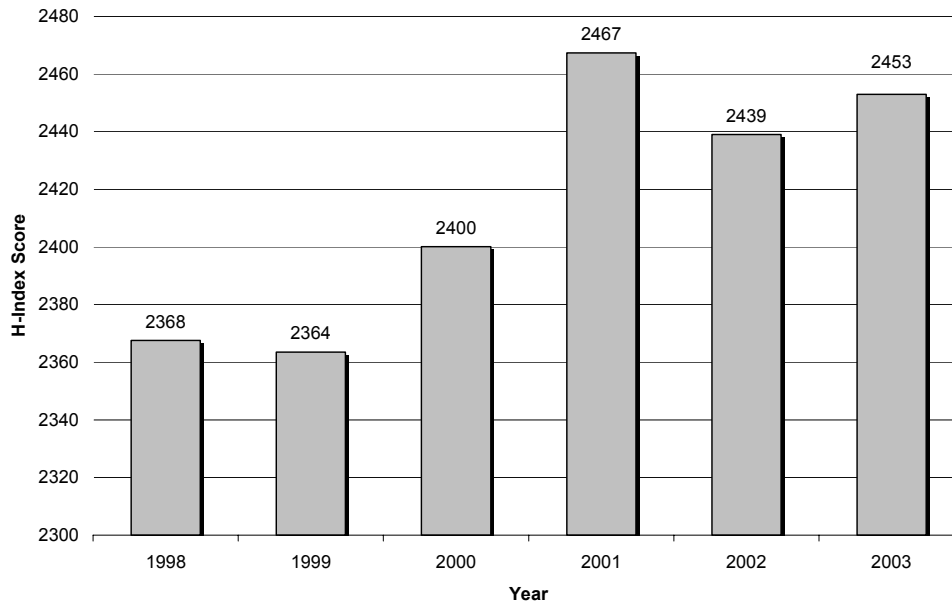
Source: Banks' Annual Reports

#### 2.2.4. Market Characteristics

The characteristics of the market in which a bank operates influences bank efficiency. Based on the quiet life hypothesis, lower competition is expected to be positively related to profit efficiency because banks in less competitive markets can charge higher prices for their services but might feel less pressure to keep costs down. There is limited evidence that banks operating in more concentrated markets are less efficient, supporting the quiet life theory that inefficiency has been sustainable in banking because competition has not been robust (Berger & Hannan, 1997).

Evidence exists that indicates that the banking sectors in the CMA are highly concentrated (Okeahalam, 2002). In Namibia, the level of concentration is empirically assessed using the Herfindahl-Hirschman index (H-Index), which is a microeconomic measure of the concentration of market power in an industry. The H-Index scores range from zero, for a perfectly competitive industry, to 10,000 ( $100^2$ ), for a pure monopoly. Therefore, the higher the index's score the less competitive the market. According to the interpretation of the United States Department of Justice and Federal Trade Commission, who developed the index, any score above 1,800 represents a highly concentrated industry that indicates the presence of oligopoly. The results of its application to the Namibian banking sector are illustrated in the Figure 7 below.

This figure shows that the output market structure of the Namibian banking sector was oligopolistic over the entire period. What is important to observe is that the level of concentration increased in tandem with the M&A activity in the Namibian banking sector beginning in 2001. This involved a merger between City Savings and Investment Bank and South West Africa Building Society (SWABOU) in 2001, which resulted in a new banking institution known as SWABOU Bank Ltd., which merged with the First National Bank of Namibia in 2003.



**Figure 7: Herfindahl-Hirschman Index Scores for the Loan Market in Namibia's Banking Sector from 1998 to 2003**

Source: Banks' Annual Reports

### 2.2.5. Regulation

Regulation determines a bank's choice of investment portfolios, which has implications on its efficiency. This regulation depends on different goals and objective functions of different interest groups. In addition, the trade-off between customer protection and increased access to credit; the desire for both simplicity - emphasis on rules, and flexibility - emphasis on supervision; and the need to allow for market forces to provide a powerful monitoring and correction mechanism also impact bank regulation (Saidenburg & Schuermann, 2003).

The identity of a bank's primary regulator accounts for the regulatory regime that bank's face. Publicly owned banks are regulated by independent statutes enacted by Parliament. In Namibia, Agribank is regulated by Agribank Act No. 5 of 2003, while NamPost is regulated under the Post and Telecomm Act 19 of 1992.

Commercial banks are regulated by the Bank of Namibia (BoN), which is Namibia's Central Bank.

The identity of banks' regulators in Namibia is illustrated in Table 5 below. The differences in the nature of regulation may influence bank efficiency. However, empirical studies show that only weak relationships exist between regulator identity and bank efficiency.

**Table 5: Regulators of Banks in Namibia between 1998 and 2003**

Bank	Bank Windhoek	First National Bank Namibia	Nedbank Namibia	Standard Bank Namibia	Agricultural Bank of Namibia	Development Bank of Namibia	NamPost Savings Bank
Regulator	Bank of Namibia	Bank of Namibia	Bank of Namibia	Bank of Namibia	Government	Government	Government

Source: Bank Annual Reports

Bank regulation is aimed at protecting consumers and stabilising the payments system in the macro economy. In Namibia, commercial banks also fall under the overall jurisdiction of the Common Monetary Area (CMA). Under this framework monetary policy in Namibia is determined by the South African Reserve Bank (SARB), which is South Africa's Central Bank.

To mitigate potentially adverse effects of shocks due to loss of monetary policy control, governors from each Central Bank in the CMA, including the BoN, meet on a quarterly basis at a Governors Forum to exchange views about recent economic developments in their respective countries. This forum takes place shortly before the meeting of the quarterly, Monetary Policy Committee at the SARB, which incorporates the views expressed by the Governors in the formulation of monetary policy for the CMA.

In addition, under the CMA, Namibia does not have the freedom to alter its exchange rate at will but has ceded this responsibility to South Africa through a pegged exchange rate. This arrangement implies a loss in autonomy of exchange rate and exchange control policies, which could expose Namibia to asymmetric macroeconomic shocks (Jenkins & Thomas, 1996).

Besides explicit regulation by the BoN, SARB and CMA, commercial bank depositors also impose implicit regulation on a bank. The information asymmetry that exists between banks and their depositors concerning the risk of a bank's assets arising from fixed payments to depositors, as opposed to equity payments, which vary with financial success, creates an incentive for banks to substitute riskier assets to seek a greater payoff. However, the higher expected payoff is unlikely to increase the value of equity more than it decreases the value of debt, resulting in a fall in the market value of the bank to the detriment of depositors. Whenever, such

asset substitution, which transfers value from debt holders and improves the value of bank assets, is suspected depositors have an incentive to withdraw their savings.

Since banks are highly leveraged with relatively short-term liabilities, typically in the form of deposits and relatively illiquid assets - usually loans to firms or households, this withdrawal can lead to a liquidity crunch, which could lead to bank failure or a run on banks causing economic instability. The threat of withdrawal when risk shifting is suspected reduces a bank's incentive to engage in asset substitution (Hughes, Lang, Moon & Pagano, 1997).

### **2.3. Other Factors**

Bank efficiency is not the only factor that is necessary to create an effective financial intermediation mechanism that allocates credit efficiently. A stable macro environment, with minimal business cycle fluctuations is also important.

Namibia has a relatively stable macro environment and the regulatory framework for its financial sector is determined by the Rand Common Monetary Area (CMA). However, this stable macro environment needs to be supported by appropriate infrastructure and facilities. Although, Namibia ranks quite highly in the usage of ICT compared to other countries in Sub-Saharan Africa the high cost of these services creates a barrier that may hinder the potential gains that could result from improved financial service provision by an efficient banking sector (Stork, 2005).

Also, despite effective provision of finance by X-efficient banks, gaps in the financial intermediary system may hinder its potential to contribute to economic growth. The lack of or weakness in a formal financial mechanism that provides managerial support geared to promoting the growth of small-scale enterprises in Namibia cannot be effectively replaced by banks (Ewing & Hubbard, 2005). Alternative institutions such as private sector, venture capital firms are better placed to perform this function.

Banks' lending policies also determine their efficiency in credit allocation. Inappropriate lending policies result in cheap credit being provided to medium and large-scale firms, regardless of the value of their return on investment (ROI), at the expense of higher yielding opportunities provided by small-scale enterprises (Obwona & Mugume, 2001). Such lending policies result in low productivity investment no matter how efficiently they are implemented.

Furthermore, the design of financing interventions also determines the effectiveness of the financial intermediation mechanism in allocating credit efficiently. Inappropriately designed financial provision strategies will not produce the desired results regardless of how efficiently they are implemented (DFID, 2004). In Namibia the design of an effective financing mechanism that targets the poorest of the poor could be improved (Investment Development Consultancy & Development Strategies, 2001).

In addition, M&A deals in the banking industry may affect the effectiveness of the financial intermediation mechanism in allocating credit efficiently. Merging banks

tend to take advantage of their higher, post-merger reserves by shifting their portfolios into higher risk, higher expected-return investments. These are typically high-yielding loans. Therefore, M&A in the banking industry could increase the effectiveness of the financial intermediation mechanism.<sup>11</sup>

Furthermore, besides corporate income tax, which represents direct taxation, banks are subject to indirect taxation through reserve requirements, which are usually remunerated at less-than-market rates. As opposed to corporate income tax that can be targeted at pure profit, making it relatively non-distorting, the reserve tax is proportional to the volume of deposit taking and is therefore a distorting tax (Demigürç-Kurt & Huizinga, 1998).<sup>12</sup> This distortion may affect the banking sector in a way that will have implications on economic growth.

Currently the commercial banks in Namibia can be categorised as either domestically or foreign owned. DeYoung and Nolle (1996) define a bank as foreign-owned if at least 25 percent of its shares are owned by foreign residents or institutions for at least 10 years while Demigürç-Kurt and Huizinga (1998) define a bank as foreign-owned if 50 percent or more of its shares are owned by foreign residents or institutions. Based on the latter definition, all privately owned banks in Namibia, except Bank Windhoek, are foreign-owned by South African-based owners (and controlled to an extent<sup>13</sup>). This implies that Namibia's banking sector is subject to a dual regulatory arrangement arising from legislation passed by the SARB (Ikhide, 2000). This has an effect on the BoN's role of influencing monetary policy through the Post Keynesian channel, which is unrelated to X-efficiency in the Namibian banking sector.

In addition, to explicit regulation and implicit regulation arising from the threat of depositor withdrawal, bank deposits can also be protected by deposit insurance. This insurance is designed to overcome the asymmetry of information in the banking system (Diamond and Dybvig, 1983). This eliminates the need for depositors to fear asset substitution. With the establishment of deposit insurance, depositors no longer have an incentive to monitor banks since their deposits are guaranteed up to a certain limit (Saidenburg & Schuermann, 2003). These benefits do not accrue to Namibia because it has no explicit deposit insurance scheme.

Although Namibia has no explicit deposit insurance scheme, the effectiveness of the financial intermediation mechanism may be impacted, where it exists.<sup>14</sup> Therefore,

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<sup>11</sup> This positive effect can be outweighed by the negative effects arising from an increase in market power in a concentrated banking sector.

<sup>12</sup> The effect of these direct and indirect taxes on interest margins and profits work in opposite directions, especially in developing countries.

<sup>13</sup> Quote arising from comments on working paper from banking industry practitioners in Namibia.

<sup>14</sup> Namibia sets its interest rate 20 basis points below that of the CMA. This has the same effect on the analysis as if an explicit deposit insurance scheme existed and may explain some of the variation in profits that is currently attributed to market power.

if deposit insurance is chosen to mitigate information asymmetry inherent in banking, its design matters in determining banking stability and efficiency. The fall in deposit rates that accompanies explicit deposit insurance makes the operation of small banks feasible, which provides a valuable source of alternative finance for small-scale enterprises. However, deposit insurance creates a subsidy that could be exploited by taking unnecessary risks, which would reduce the quality of the loan portfolio. This lowers net interest margins and profits, which in addition to affecting X-efficiency, could create a barrier for competition by discouraging new entry, beyond a certain point (Demigürç-Kurt & Huizinga, 1998).

### **3. IDENTIFYING INFLUENCING FACTORS**

This section focuses on describing the methodology that this report adopted to achieve its objectives. It begins with a description of the sample, data, model and its variables and then goes on to describe the procedure used to identify the factors influencing efficiency in Namibia's banking sector.

#### **3.1. Sample**

Between the first quarter of 1998 and the fourth quarter of 2003, the privately-owned banks in Namibia included Bank Windhoek, First National Bank Namibia, Nedbank Namibia and Standard Bank Namibia. The publicly-owned banks included Agribank and NamPost. With the exception of one institution (Agribank), the sample used in this report included commercial banks in Namibia.

The sample excluded City Savings and Investment Bank, SWABOU Bank, Namibia Development Corporation and the Development Bank of Namibia because these institutions were not in continuous existence from the first quarter of 1998 to the fourth quarter of 2003.

Although, NamPost is a bank that existed between the entire duration of the sample period, it was not included because it did not report a positive amount of net income in any period and its inclusion would have made its alternative profit X-efficiency ratios, which is one measure of efficiency used in this report, meaningless (DeYoung and Nolle (1996)). The negative net income for NamPost can be attributed, to some extent, to its regulation, which prohibits it from lending to borrowers either in the private or public sector. Therefore, it invests its mobilised deposits in government stock and treasury bills, guaranteed, short term, call deposits and funds with the National Housing Enterprise and short term, call deposits and funds with banks and building societies, which have lower returns than loans. Therefore, it is at a relative disadvantage when compared to the other banking institutions because it cannot offset the interest expenses arising from its mobilised savings and its relatively high branch network costs (NamPost has the widest network of distribution outlets of all banking institutions in Namibia).

Also, the sample in this report does not include the BoN because it does not lend directly to the private sector but lends to the Government or banks. Therefore, it does not provide the type of financial services that conform to intermediation theory.

In addition, the sample excludes banks with less than twenty full time employees in any year during the sample period (micro banks).<sup>15</sup>

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<sup>15</sup> Some studies exclude all banks with less than USD 50,000 in physical capital (DeYoung & Nolle, 1996).

Our sample period begins in 1998, in part because it was the year that the Banking Institutions Act was enacted based on the introduction of the Basel I Capital Accord. This report assumes that this had an impact on how banks in Namibia operated, relative to previous years. Investigation of its effect is beyond the scope of this research report.

The choice of a six year period (1998 to 2003) is based on the adoption of the distribution free approach which is used to estimate alternative profit X-efficiency. This period length ensures that external factors do not have a substantial effect on internal firm performance (Berger & Mester, 1999). Some authors argue that this period is too short for any meaningful trend analysis or statistical robustness (Ikhide, 2000), which is right in a small panel to some extent.

However, despite the fact that the number of banks is not large which may lead to the consistency of regression estimators being questioned, the results obtained can be considered indicative of conditions in the Namibian banking system.

### 3.2. Data

The banking information and data used in this report is obtained from financial statements contained in each individual bank's annual reports over the period 1998 to 2003. This data is assumed to be relatively accurate and clean as required by generally accepted accounting and auditing principles and legal obligation enforced by the regulatory bodies. An assessment of the extent to which transfer pricing strategies are used to shift costs is beyond the scope of this research report.

For the macroeconomic measure of efficiency data is obtained from the World Development Indicators (World Bank, 2000 - 2005).

Due to the need for higher frequency data to enable the analysis of its dynamic structure, this report relied on an econometric technique based on exponential interpolation that is linear in logs to create an interpolated quarterly series from the available annual efficiency estimates for the microeconomic measures of efficiency (Jefferies & Kayawe, 1998).<sup>16</sup> The same was not done for the macroeconomic measure because interest spreads depend on the base rate set by the BoN and are constant over an extended period of time.

For the microeconomic measures of efficiency, this report uses the United States dollars (USD), where 1USD = NAD6.2. The use of a single currency will enable cross-country comparisons with other banking sectors on the continent.

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<sup>16</sup> The exponential interpolation formula used is  $\hat{x}_{t+1} = \sqrt{x_t x_{t+2}}$ . It is based on Intriligator (1978).

From this we can derive the exponential extrapolation formula  $\frac{x_{t+1}^2}{x_t} = x_{t+2}$

In addition, the data is in real values, which is obtained by dividing all variable values with the consumer price index (CPI) for the relevant year in each country (1995=100). This controls for the effect of inflation on input and output prices and profitability.<sup>17</sup>

### 3.3. Model

To identify the factors that influenced efficiency in Namibia's banking sector between 1998 and 2003, we use an ANCOVA model. This is specified as follows:

$$E\hat{F}F = f(BS_{it}, OG_{it}, OC_{it}, MC_{it}, R_{it}) + u_{it}$$

#### Equation 1: ANCOVA Efficiency Model: General Function

Where:<sup>18</sup>

*EFF* represents the estimated microeconomic and macroeconomic measures of efficiency;

*BS* represents the bank size vector;

*OG* represents the organizational form and governance vector;

*OC* represents the other bank characteristics vector;

*MC* represents the market characteristics vector;

*R* represents the identity of primary regulator vector;

*u* represents the error term

*i* represents the *i*<sup>th</sup> bank; *i* = 1...5

*t* represents the year *t*=1...6

This report recognises that the independent variables included in the model do not cover the full range of variables that could potentially be included. Some studies have included variables that capture information system, ICT, HRM and empowerment separately (Frei, Harker & Hunter, 1998). This report does not include such factors because they are directly under the control of management and are incorporated in alternative profit X-efficiency. For a similar reason, we also do not include financial equity capital and non-performing loans in the model because they

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<sup>17</sup> Inflation is associated with higher profitability because bank income tends to increase more with inflation than bank costs (Demigurc-Kurt & Huizinga, 1998).

<sup>18</sup> The component variables of each vector are defined and described in Appendix B

are included in the alternative profit X-efficiency function as well. The empirical assessment of these factors can be pursued in the context of a branch-level efficiency study.

In principle, this report could also include other variables that account for other external factors in Namibia that are exogenous to management decision making but may affect performance, e.g., variables that account for demand, like income growth, unemployment rate or whether the bank is located in an urban or rural area. Some other variables that could be included are the standard deviation of ROA to capture bank risk, a bank's choice of investment portfolios, its mix of funding sources between core deposits and purchased funds, legal or taxation variables, financial structure and measures that capture deregulation. This will be pursued in a future, continental study because tax and legal regimes can only be examined in a cross-country context if the sample analyzed covers a 6 year time period.<sup>19</sup>

For alternative profit X-efficiency, equation (1) makes indicative rather than conclusive findings i.e. it provides a summary of association rather than causality, which makes it essentially a correlation analysis (Collins, 2002). This is because it is estimated using variables that are correlated with the independent variables in equation (1). Therefore, the dependent and independent variables are not completely exogenous and this lack of exogeneity can bias the coefficient estimates on all the regressors (Casu & Molyneaux, 2003). In addition, the standard error of its dependent variable is not accounted for.

Other studies have attempted to overcome this shortfall by using truncated regression models to account for the fact that alternative profit X-efficiency scores are censored (Lovell, Walters & Wood, 1995). Still other studies propose the use of a stochastic frontier technique as opposed to OLS to estimate the parameters of the ANCOVA model in equation (1), to account for the fact that the included explanatory variables fail to explain the entire variation in the calculated X-efficiencies and the unexplained variation mixes with the regression residuals, adversely affecting statistical inference (Bhattacharyya et al., 1997 in Casu & Molyneaux, 2003). Finally, studies that use the data envelopment analysis approach to estimate alternative profit X-efficiency adopt the Tobit regression model to overcome this obstacle.

The final verdict on which technique can control for the econometric issues of the ANCOVA model in equation (1) is a potential area for future research. One approach would be to apply the Spearman rank correlation or Wilcoxon signed rank technique to explore the relationships between alternative profit X-efficiency and its potential factors. Another would be to conduct a sub-set analysis in a continental study consisting of all financial intermediaries in Africa, excluding insurance companies. This should have more banks, which is useful when confidence intervals are large. This would involve analyzing subsets of banks with relatively high and

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<sup>19</sup> Within country tax regimes may change over the long term.

relatively low efficiency values to explore the robustness of the posited relationships (Berger & Humphrey, 1997).

### **3.4. Procedure**

To identify factors that influence efficiency in Namibia's banking sector, OLS is applied to a random effects, panel data set of the variables specified in equation (1) using data relevant to the period between 1998 and 2003. The overall microeconomic and macroeconomic estimates of efficiency in the Namibian banking sector in each period are regressed on the independent variables that capture potential factors that may account for differences in the environment in which the bank operates.

Limited Dependent Variables (LIMDEP) version 7.0 is the econometric software used to empirically identify the variables that influence the efficiency of Namibia's banking sector, which is a proxy for its efficiency in credit allocation in this report.

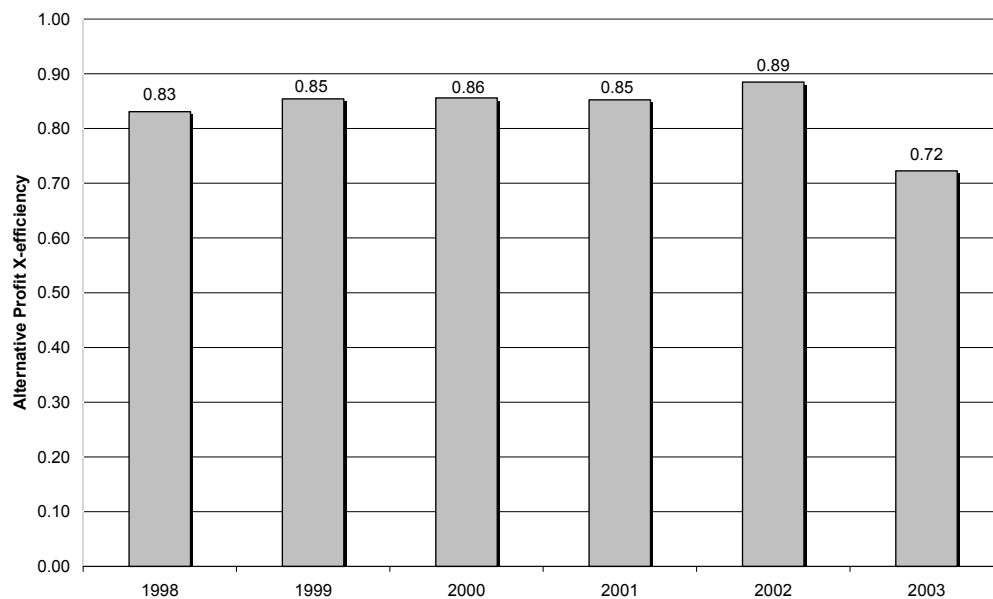
## 4. RESULTS AND DISCUSSION

### 4.1.1. Efficiency

Three alternative measures of efficiency are used in this report. They will be investigated below.

#### 4.1.1.1. Alternative Profit X-efficiency

The first measure that this report uses to represent efficiency in the banking sector is alternative profit X-efficiency. It is based on microeconomic foundations and is thought to be the most robust estimate measure out of those used in this report. The annual alternative profit X-efficiencies in Namibia's banking sector are illustrated in Figure 8 below.



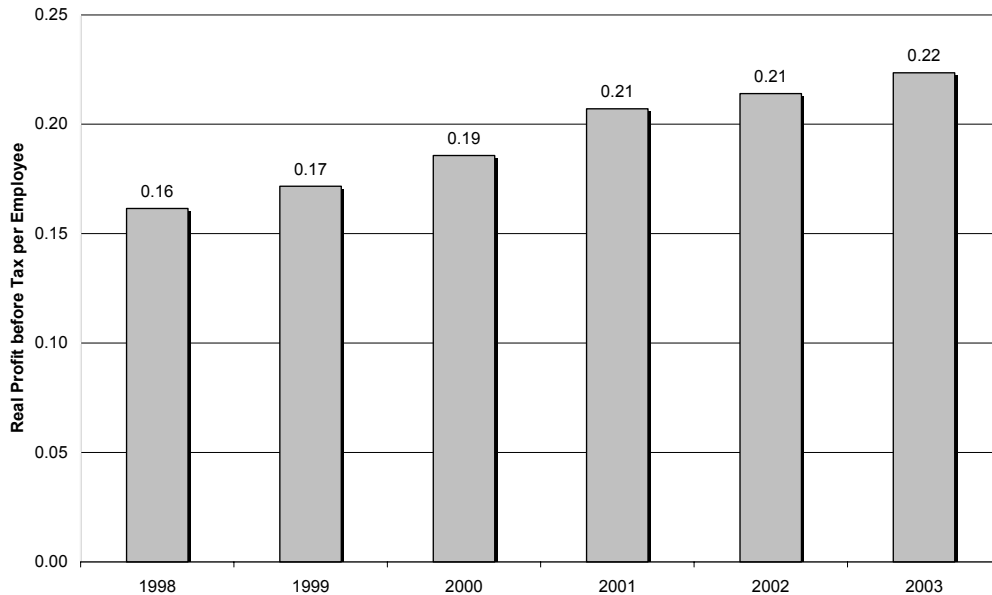
**Figure 8: Alternative Profit X-efficiency in Namibia's Banking Sector between 1998 and 2003**

Source: Adongo, Stork & Hasheela (2005)

Although the results of this measure should be taken as indicative rather than conclusive, due to various technical issues discussed in the previous section as well as the performance of the F-statistic in Table 6 below, it would be useful to explore the posited relationships as a correlation exercise (Berger & Mester, 1997).

#### 4.1.1.2. Profit before Tax per Employee

The second measure that this report uses to represent efficiency in the banking sector is profit before tax per employee. Although it also has a microeconomic foundation, it is based on accounting principles and is used in current banking surveys conducted by accounting and auditing firms (KPMG, 2004a and 2004b). The annual profit before tax per employee efficiencies in Namibia's banking sector is illustrated in Figure 9 below.

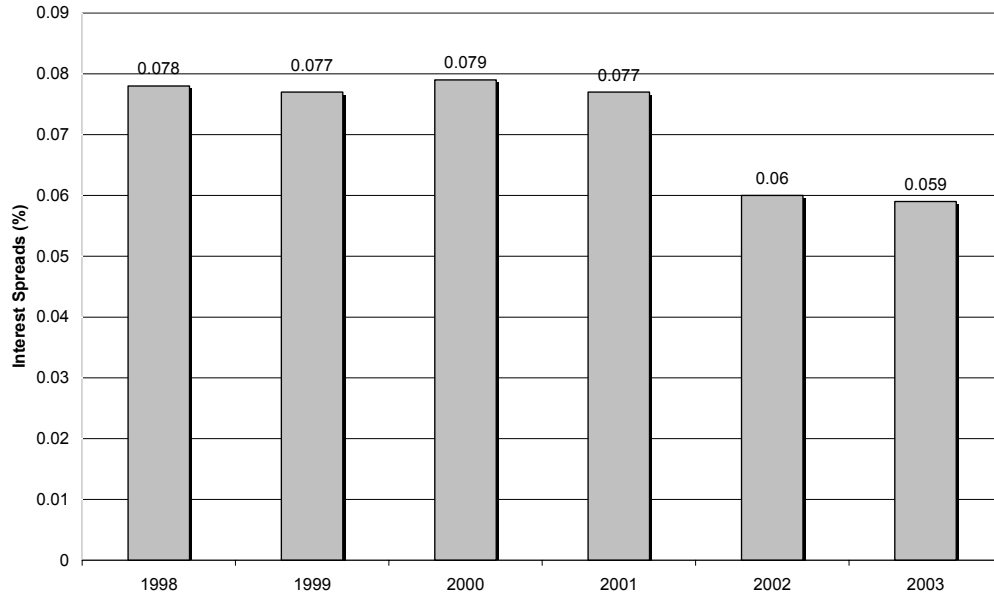


**Figure 9: Profit before Tax per Employee in Namibia's Banking Sector between 1998 and 2003**

Source: Banks' Annual Reports

#### 4.1.1.3. Interest Spread

The last measure that this report uses to represent efficiency in the banking sector is the interest spread. It is a macroeconomic measure. For the interest spread measure the wider the spread the more inefficient the banking sector is assumed to be. Therefore, in the discussions below the coefficient signs for this measure have the opposite interpretation from the other measures. Since 2001 the annual interest spread in Namibia has been falling which suggests that efficiency in Namibia's banking sector has been increasing. This is illustrated in Figure 10 below.



**Figure 10: Interest Spreads in Namibia's Banking Sector between 1998 and 2003**

Source: World Development Indicators (2000 to 2005).

All three measures have the same general pattern between 1998 and 2002 and indicate that efficiency in Namibia's banking sector increased over that period. However in 2003 alternative profit X-efficiency indicates that efficiency in Namibia's banking sector fell, the profit before tax per employee indicates that efficiency in Namibia's banking sector increased at approximately the same rate as it had in previous years, while the reduction in interest spread was only slight between 2002 and 2003 compared to the previous reduction suggesting that efficiency only improved slightly. These differences highlight the fact that the assumption that is used to generate each measure is inherently different.<sup>20</sup>

The results of the application of the methodology described in the previous section are summarized in Table 6 below.

<sup>20</sup> The alternative profit X-efficiency reflects a delayed response with the fall in efficiency occurring in 2003 as opposed to 2002 for the interest spread measure.

**Table 6: Correlation Analysis Results for Namibia**

Independent Variables	Microeconomic		Macroeconomic
	Alternative Profit X-efficiency ( $a\hat{x}$ )	Profit Before Tax per Employee ( $ac\hat{c}eff$ )	Interest Spread ( $\hat{ir}$ )
	Coefficient	Coefficient	Coefficient
SMLBANK	0.35503E+15	-0.373E+15	-0.4856E+15
MEDBANK	0.12727	0.02534	0.1746*
LRGBANK	-0.0462296	0.06678	-0.1204*
MERGED	0.245776**	-0.09636	-0.1043*
ACQUIRED	0.170395***	0.1261	-0.1829**
INBHC	-0.077454	-8.785*	-0.7215
MUL_LAY	0.22738***	0.0831	-0.0008613
OUTST	0.15224E+16*	-0.6082E+15**	-0.6122E+14
PUB_TRAD	-0.15224E+16*	0.6082E+15**	0.6122E+14
AGE	-0.0101766**	0.8177E-04	0.000834
Ln LGTA	-0.81412*	-0.4789	-0.06433
HERF	-0.0005092	0.002785*	-0.000866***
SHARE	4.5357*		
GOVT	-0.35503E+15	0.373E+15	0.4856E+15
	$R^2 = 0.107405$	$R^2 = 0.701179$	$R^2 = 0.530653$
	F[13, 106]= 0.98 p value = 0.47472	F[12, 107]= 20.92 p value = 0.0000	F[12, 107]= 10.08 p value = 0.0000
	Durbin-Watson Statistic = 1.55842	Durbin-Watson Statistic = 2.33194	Durbin-Watson Statistic = 0.70074
	No. of Panel Observations = 120	No. of Panel Observations = 120	No. of Panel Observations = 120

Note: \* significant at the 1% level, \*\* significant at the 5% level, \*\*\* significant at the 10% level. HUGBANK and BON are not included in the regressions to avoid perfect collinearity.

#### 4.1.2. Bank Size

The bank size variables are operationalized using zero-one dummy variables to allow for non-monotonicity and nonlinearities in the relationship between bank size and efficiency. The theory underlying the bank size variables is based on economies of scale. As a firm grows larger it should benefit from economies of scale until a

particular point when diseconomies set in (Griffiths & Wall, 1996). Therefore, theory expects a negative relationship between small size and efficiency, a positive relationship between medium size and efficiency and a negative relationship between large size and efficiency i.e. a sequential relationship. The findings for each measure are discussed below.

#### **4.1.2.1. Alternative Profit X-efficiency**

As shown in Table 6 above, the signs of the coefficients for the alternative profit X-efficiency measure imply that the small and medium banks benefit from economies of scale. However, diseconomies of scale set in when banks become large. However, based on the model in this report there is no evidence that a relationship exists between size and alternative profit X-efficiency. This is because none of the size variables are statistically significant at the 5 % or 10% levels.

For the alternative profit X-efficiency measure the finding can be attributed to the procedure used to control for heterogeneity arising from bank size differences. This procedure involves the normalization of each variable using financial equity capital to control for scale bias (Adongo, Stork & Hasheela, 2005). Therefore, the finding of non-significance is essentially a confirmation that the adoption of this procedure was successful.

#### **4.1.2.2. Profit before Tax per Employee**

As shown in Table 6 above, the signs of the coefficients for the profit before tax per employee measure imply that medium banks and large banks benefit from economies of scale. However, small banks experience diseconomies of scale because they cannot take advantage of the benefits that accrue to banks that are larger in size. However, based on the model in this report there is no evidence that a relationship exists between size and profit before tax per employee. This is because none of the size variables are statistically significant at the 5 % or 10% levels.

For the profit before tax per employee measure the finding can be attributed to the use of the robust covariance matrix in LIMDEP to control for heterogeneity arising from bank size differences. Therefore, the finding of non-significance is essentially a confirmation that this procedure was successful.

#### **4.1.2.3. Interest Spreads**

As mentioned earlier a higher interest spread denotes inefficiency as opposed to efficiency. As shown in Table 6 above, the signs of the coefficients for the interest measure imply that medium banks do not benefit from the advantages of a larger size. However, large banks benefit from economies of scale. Therefore, the economy of scale theory is clearly depicted by this measure. In addition, based on the model in this report there is evidence that a relationship exists between medium

and large size and interest spreads. This is because the variables that capture medium and large-size are statistically significant at the 1% level. There is no evidence to suggest that the negative relationship between small size and inefficiency, according to the interest spread measure, exists. This is because its coefficient is not significant at the 5% or 10 % level.

#### **4.1.2.4. Summary**

While there is no evidence using the microeconomic measures, that a relationship exists between bank size and efficiency in the banking sector, evidence exists that size is related to the macroeconomic measure of efficiency adopted in this study – interest spreads. Therefore, no consistent picture emerges across all three models.

### **4.1.3. Organizational Form and Governance**

Economies of scale theory also explain the variables that capture organisational form. Underlying the variables that capture organisational governance of a bank is principal-agent theory (Myers & Majluf, 1984). The variables in this section are also operationalised as zero-one dummy variables and are discussed below.

#### **4.1.3.1. Organisational Form**

##### **4.1.3.1.1. Alternative Profit X-efficiency**

###### **4.1.3.1.1.1. Mergers**

Theory states that mergers can influence efficiency due to lower per unit bank costs, post-merger; the ability of the consolidated banking organization to diversify risk by shifting their output mixes to less risky portfolio allocations; or the ability to shift the output mix to higher-risk, higher-expected return investments due to higher reserve capital levels. Therefore, a positive relationship is theoretically expected between mergers and efficiency.

As shown in Table 6 above, the signs of the coefficients for the alternative profit X-efficiency measure imply that mergers are positively related to efficiency, as theoretically expected. In addition, based on the model in this report there evidence to support the relationship between mergers and alternative profit X-efficiency. This is because the variable capturing mergers is statistically significant at the 5% level.

###### **4.1.3.1.1.2. Acquisitions**

Acquisitions affect efficiency through the same channel as mergers. As shown in Table 6 above, the signs of the coefficients for the alternative profit X-efficiency measure imply that acquisitions are also positively related to efficiency, as

theoretically expected. In addition, based on the model in this report there evidence to support the relationship between acquisitions and alternative profit X-efficiency. This is because the variable capturing acquisitions is statistically significant at the 10% level.

#### **4.1.3.1.2.Profit Efficiency before Tax per Employee**

##### **4.1.3.1.2.1.Mergers**

As shown in Table 6 above, the signs of the coefficients for the profit efficiency before tax per employee measure imply that mergers are negatively related to efficiency, which does not conform to theoretical expectation. However, based on the model in this report there is no evidence to support the relationship between mergers and profit efficiency before tax per employee because the variable capturing mergers is not significant at the 5% or 10% level, in this case.

##### **4.1.3.1.2.2.Acquisitions**

Acquisitions affect efficiency through the same channel as mergers. As shown in Table 6 above, the sign of the coefficients for the profit efficiency before tax per employee measure imply that acquisitions are also positively related to efficiency, as theoretically expected. However, based on the model in this report there is no evidence to support the relationship between acquisitions and profit efficiency before tax per employee because the variable capturing acquisitions is not statistically significant at the 5% or 10% level.

#### **4.1.3.1.3.Interest Spreads**

##### **4.1.3.1.3.1.Mergers**

As shown in Table 6 above, the coefficient sign for the interest spread measure is negatively related to inefficiency (positively related to efficiency), which conforms to theoretical expectation. In addition, based on the model in this report there is evidence to support the relationship between mergers and interest spreads because the variable capturing mergers is significant at the 1% level, in this case.

##### **4.1.3.1.3.2.Acquisitions**

Acquisitions affect efficiency through the same channel as mergers. As shown in Table 6 above, the sign of the coefficient for the interest spread measure implies that acquisitions are also negatively related to inefficiency (positively related to efficiency), as theoretically expected. In addition, based on the model in this report there is evidence to support the relationship between acquisitions and interest

spreads because the variable capturing acquisitions is statistically significant at the 5% level.

#### **4.1.3.1.4. Summary**

While there is evidence based on the alternative profit X-efficiency measure and the macroeconomic measure, that a relationship exists between M&A activity and efficiency in the banking sector, this is not carried over into the profit before tax per employee measure. Therefore, no consistent picture emerges across all three models.

#### **4.1.3.2. Organisational Governance**

The organisational governance vector includes variables capturing holding company ownership, whether or not the holding company is multi-layered, whether or not the holding company is located outside the country and whether or not the holding company is publicly traded. The variables in this section are also operationalised as zero-one dummy variables and are discussed below.

##### **4.1.3.2.1. Holding Company Ownership**

Theory argues that banks are involved in cross-border M&A activity in various industries and the holding company is the vehicle that allows them to do so. It is expected that an indirect reporting structure, which leads to slightly weaker policy compliance than direct reporting structures, will lead to a negative influence between holding company ownership and bank efficiency.

###### **4.1.3.2.1.1. Alternative Profit X-efficiency**

As shown in Table 6 above, the sign of the coefficient for the variable capturing holding company ownership in the alternative profit X-efficiency measure is negatively related to efficiency, which conforms to theoretical expectation. However, based on the model in this report there is no evidence to support the relationship between ownership by a holding company and alternative profit X-efficiency because the variable capturing holding company ownership is not significant at the 5% or 10% level, in this case.

###### **4.1.3.2.1.2. Profit Efficiency before Tax per Employee**

As shown in Table 6 above, the sign of the coefficient for the variable capturing holding company ownership in the profit efficiency before tax per employee measure is also negatively related to efficiency, which conforms to theoretical expectation. In addition, based on the model in this report there is evidence to support the relationship between ownership by a holding company and profit efficiency before

tax per employee because the variable capturing holding company ownership is significant at the 1%.

#### **4.1.3.2.1.3. Interest Spread**

As shown in Table 6 above, the sign of the coefficient for the variable capturing holding company ownership in the interest spread measure is negatively related to inefficiency (positively related to efficiency), which does not conform to theoretical expectation. However, based on the model in this report there is no evidence to support the relationship between ownership by a holding company and interest spreads because the variable capturing holding company ownership is not significant at the 5% or 10% level, in this case.

#### **4.1.3.2.2. Multi-layered Holding Company**

One theoretical argument is that a multi-layered holding company should even have a stronger negative influence on efficiency due to more indirect reporting structures. However, this report found that the banks it defined as having a multi-layered holding company structure separated their subsidiaries into distinct business operations between 1998 and 2003. To the extent that such banks managed to separate their distinct processes, such a holding company structure should be positively related to efficiency.

##### **4.1.3.2.2.1. Alternative Profit X-efficiency**

As shown in Table 6 above, the sign of the coefficient for the variable capturing whether or not a bank's holding company is multi-layered in the alternative profit X-efficiency measure is positively related to efficiency, this supports the theory that a separation in functional processes is positively related to efficiency. In addition, based on the model in this report there is evidence to support the relationship between this effect and alternative profit X-efficiency because the variable capturing the structure of a bank's holding company is significant at the 10% level.

##### **4.1.3.2.2.2. Profit Efficiency before Tax per Employee**

As shown in Table 6 above, the sign of the coefficient for the variable capturing whether or not a bank's holding company is multi-layered in the profit efficiency before tax per employee measure is positively related to efficiency, this supports the theory that a separation in functional processes is positively related to efficiency. However, based on the model in this report there is no evidence to support the relationship between this effect and profit efficiency before tax per employee because the variable capturing the structure of a bank's holding company is not significant at the 5% or 10% level.

#### **4.1.3.2.2.3. Interest Spread**

As shown in Table 6 above, the sign of the coefficient for the variable capturing whether or not a bank's holding company is multi-layered in the interest spread measure is negatively related to inefficiency (positively related to efficiency), which supports the theory that a separation in functional processes is positively related to efficiency. However, based on the model in this report there is no evidence to support the relationship between this effect and interest spreads because the variable capturing the structure of a bank's holding company is not significant at the 5% or 10% level.

#### **4.1.3.3. Holding Company Located Internationally**

Theory argues that bank's with holding companies located outside Namibia will suffer from information asymmetry disadvantages compared to those whose holding companies are located in a country. Therefore, a negative influence is expected between this variable and efficiency.

##### **4.1.3.3.1.1. Alternative Profit X-efficiency**

As shown in Table 6 above, the sign of the coefficient for the variable capturing whether or not a bank's holding company is located internationally in the alternative profit X-efficiency measure is positively related to efficiency, this does not support the theoretical argument of information asymmetry. In addition, based on the model in this report there is evidence to support the relationship between this effect and alternative profit X-efficiency because the variable capturing the location of a bank's holding company is significant at the 1% level. This contrary result can be explained by the argument that between 1998 and 2003, cross-border M&A activity occurred in Namibia's banking sector and the holding company was the vehicle for this to be undertaken. Therefore, better performing banks acquired those that were not as successful.

##### **4.1.3.3.1.2. Profit Efficiency before Tax per Employee**

As shown in Table 6 above, the sign of the coefficient for the variable capturing whether or not a bank's holding company is located internationally in the profit efficiency before tax per employee measure is negatively related to efficiency, this supports the theoretical argument of information asymmetry. In addition, based on the model in this report there is evidence to support the relationship between this effect and profit efficiency before tax per employee because the variable capturing the location of a bank's holding company is not significant at the 5% level.

##### **4.1.3.3.1.3. Interest Spread**

As shown in Table 6 above, the sign of the coefficient for the variable capturing whether or not a bank's holding company is located internationally in the interest spread measure is negatively related to inefficiency (positively related to efficiency), which does not support the theoretical argument of information asymmetry. However, based on the model in this report there is no evidence to support the relationship between this effect and interest spreads because the variable capturing the location of a bank's holding company is not significant at the 5% or 10% level.

#### **4.1.3.4. Holding Company Publicly Traded**

Theory argues that bank's with publicly traded holding companies should benefit from the pressure exerted by outside shareholders on the ultimate owners of a bank to increase their equity.

##### **4.1.3.4.1. Alternative Profit X-efficiency**

As shown in Table 6 above, the sign of the coefficient for the variable capturing whether or not a bank's holding company is publicly traded in the alternative profit X-efficiency measure is negatively related to efficiency, this does not support the theoretical expectation. In addition, based on the model in this report there is evidence to support the relationship between this effect and alternative profit X-efficiency because the variable capturing whether or not a bank's holding company is publicly traded is significant at the 1% level.

This contrary result may be explained by the alternative argument that the absence of an active retail investor community in Namibia may result in a market structure for the stock exchanges that is below the semi-strong level, which is the minimum level required for shareholder activity to be reflected accurately in share price.<sup>21</sup> It may also be explained by the fact that confidence in instruments issued by banks is highly regarded by the investor community who do not actively monitor changes as for other enterprises. Finally, this contrary result may also be explained by the fact that banks may rely more on mobilised savings as opposed to purchased funds for issuing loans in an environment where surplus savings exist (Uanguta, 2000)

##### **4.1.3.4.1.2. Profit Efficiency before Tax per Employee**

As shown in Table 6 above, the sign of the coefficient for the variable capturing whether or not a bank's holding company is publicly traded in the profit efficiency before tax per employee measure is positively related to efficiency, this supports the theoretical argument of shareholder pressure. In addition, based on the model in this report there is evidence to support the relationship between this effect and profit

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<sup>21</sup> The measurement of the market microstructure for the NSX is beyond the scope of this report.

efficiency before tax per employee because the variable capturing whether or not a bank's holding company is publicly traded is significant at the 5% level.

#### **4.1.3.4.1.3. Interest Spread**

As shown in Table 6 above, the sign of the coefficient for the variable capturing whether or not a bank's holding company is publicly traded in the interest spread measure is positively related to inefficiency (negatively related to efficiency); this does not support the theoretical expectation. However, based on the model in this report there is no evidence to support the relationship between this effect and interest spreads because the variable capturing whether or not a bank's holding company is publicly traded is not significant at the 5% or 10% level.

#### **4.1.3.5. Summary**

Although there is no overall consistent picture across all three measures of the robustness of each of the variables capturing organisational governance, the alternative profit X-efficiency measure and the interest spreads confirm the same theoretical expectations in all cases except in the variable capturing holding company ownership. This conformity is not as clear in the case between profit before tax per employee and interest spreads.

### **4.1.4. Other Bank Characteristics**

The other bank characteristics that compose this vector are their age and respective risk levels.

#### **4.1.4.1. Age**

Theory argues that a bank's age should influence efficiency through the learning by doing hypothesis (Mester, 1996). This states that the longer a bank exists the more efficient it should be.

##### **4.1.4.1.1. Alternative Profit X-efficiency**

As shown in Table 6 above, the sign of the coefficient for the variable capturing a bank's age in the alternative profit X-efficiency measure is negatively related to efficiency, this does not conform to the theoretical expectation. In addition, based on the model in this report there is evidence to support the relationship between this effect and alternative profit X-efficiency because the variable capturing the bank's age is significant at the 5% level.

This non-conformity to the theoretical expectation could be because the ICT innovations required in modern-day banking would be easier for a relatively newer entrant to adopt as they are less hindered by traditional practices and norms.

#### **4.1.4.1.1.2. Profit Efficiency before Tax per Employee**

As shown in Table 6 above, the sign of the coefficient for the variable capturing a bank's age in the profit efficiency before tax per employee measure is positively related to efficiency, this conforms to the theoretical expectation of learning by doing. However, based on the model in this report there is no evidence to support the relationship between this effect and profit efficiency before tax per employee because the variable capturing the bank's age is not significant at the 5% or 10% level.

#### **4.1.4.1.1.3. Interest Spread**

As shown in Table 6 above, the sign of the coefficient for the variable capturing a bank's age in the interest spread measure is positively related to inefficiency (negatively related to efficiency), this does not support the theoretical expectation. However, based on the model in this report there is no evidence to support the relationship between this effect and interest spreads because the variable capturing the location of a bank's age is not significant at the 5% or 10% level.

#### **4.1.4.2. Summary**

Although there is no overall consistent picture across all three measures of the robustness of the variable capturing a bank's age the alternative profit X-efficiency measure and the interest spreads confirm the same theoretical expectations as opposed to the profit before tax per employee and interest spreads.

#### **4.1.4.3. Risk**

Theory postulates that risk, captured by the ratio of loans to gross total asset in this report, should be positively related to bank efficiency because a risk-loving bank will issue more loans, which are more highly valued than securities. Based on the market power hypothesis, the higher market power existing in loan markets compared to other product markets in which banks operate increases the potential for higher profits due to adverse pricing by more powerful banks. Therefore, a concentrated market may result in findings of efficiency even though this may not strictly be the case.

An alternative theory is that risk, should have a negative influence on efficiency because more lending in an environment dominated by small and micro enterprises is associated with a higher credit and business risk.

#### **4.1.4.3.1.1. Alternative Profit X-efficiency**

As shown in Table 6 above, the sign of the coefficient for the variable capturing a bank's risk in the alternative profit X-efficiency measure is negatively related to

efficiency, this conforms to the alternative theoretical expectation. In addition, based on the model in this report there is evidence to support the relationship between this effect and alternative profit X-efficiency because the variable capturing the bank's risk is significant at the 1% level.

#### **4.1.4.3.1.2. Profit Efficiency before Tax per Employee**

As shown in Table 6 above, the sign of the coefficient for the variable capturing a bank's risk in the profit efficiency before tax per employee measure is negatively related to efficiency, this also conforms to the alternative theoretical expectation. However, based on the model in this report there is no evidence to support the relationship between this effect and profit efficiency before tax per employee because the variable capturing the bank's risk is not significant at the 5% or 10% level.

#### **4.1.4.3.1.3. Interest Spread**

As shown in Table 6 above, the sign of the coefficient for the variable capturing a bank's risk in the interest spread measure is negatively related to inefficiency (positively related to efficiency); this does not support the alternative theoretical expectation. However, based on the model in this report there is no evidence to support the relationship between this effect and interest spreads because the variable capturing the bank's risk is not significant at the 5% or 10% level.

#### **4.1.4.4. Summary**

Although there is no overall consistent picture across all three measures of the robustness of the variable capturing a bank's risk the alternative profit X-efficiency measure and the profit before tax per employee confirm the alternative theoretical expectations as opposed to the interest spreads.

Risk management in general and small business credit scoring in particular can contribute to reducing the costs of the banking sector in Namibia to the extent that it assists banks in automating the credit and risk management process. This should have an indirect impact on the Namibian banking sector's efficiency.

#### **4.1.5. Market Characteristics**

The market characteristics variable included in this report is the H-index. It measures the banking industry's market structure, which is used to evaluate its level of concentration. Theory argues the more concentrated a banking sector the more efficient it will seem. However, the market power hypothesis explains this seeming efficiency as arising because powerful banks can set and maintain adverse price changes in their favour, which affect the welfare of a society.

#### **4.1.5.1. Alternative Profit X-efficiency**

As shown in Table 6 above, the sign of the coefficient for the variable capturing concentration in the banking industry in the alternative profit X-efficiency measure is negatively related to efficiency, this does not conform to the theoretical expectation. However, based on the model in this report there is no evidence to support the relationship between this effect and alternative profit X-efficiency because the variable capturing the H-index is not significant at the 5% or 10% level.

This puzzling result can be explained by the fact that the procedure used to measure alternative profit X-efficiency controls for concentration in a banking sector by using output quantities rather than output prices as one of its independent variables (Adongo, Stork & Hasheela, 2005). Therefore, this result is essentially a confirmation that the adoption of this procedure was successful.

The concentration ratio, which is the share of local market deposit concentration, is included as a robustness check for the H-Index.

As shown in Table 6 above, the sign of the coefficient for the variable measuring the concentration ratio for Namibia's banking industry in the alternative profit X-efficiency measure is positively related to efficiency, this conforms to the theoretical expectation. In addition, based on the model in this report there is evidence to support the relationship between this effect and alternative profit X-efficiency because the variable measuring the concentration ratio is significant at the 1% level.

For the remaining measures the H-index is sufficient to measure the effect of concentration in the banking industry on its efficiency. Inclusion of the concentration ratio in these measures may result in severe multicollinearity.

#### **4.1.5.2. Profit Efficiency before Tax per Employee**

As shown in Table 6 above, the sign of the coefficient for the variable capturing concentration in the banking industry in the profit efficiency before tax per employee measure is positively related to efficiency, this also conforms to the theoretical expectation. In addition, based on the model in this report there is evidence to support the relationship between this effect and profit efficiency before tax per employee because the variable capturing concentration the banking industry is significant at the 1% level.

#### **4.1.5.3. Interest Spread**

As shown in Table 6 above, the sign of the coefficient for the variable capturing concentration in the banking industry in the interest spread measure is negatively related to inefficiency (positively related to efficiency), this conforms to theoretical expectation. In addition, based on the model in this report there is evidence to support the relationship between this effect and interest spreads because the

variable capturing concentration in the banking industry is significant at the 10% level.

#### **4.1.5.4. Summary**

The effect of concentration in the banking industry on efficiency in Namibia's banking sector is consistent across all three measures. This suggests that market power influenced efficiency in Namibia's banking sector between 1998 and 2003. This robust finding provides empirical evidence that the market power hypothesis for mergers is confirmed in Namibia (Berger & Hannan, 1997). Therefore, although M&A is positively associated with efficiency in Namibia's banking sector the adverse effects on pricing work in the opposite direction and should be considered by the regulator in any anti-trust assessment of potential M&A deals.

#### **4.1.6. Regulator**

Theory expects that the identity of each bank's regulator should have an effect on efficiency to the extent that charter requirements are different. In fact, the main anecdotal argument is that publicly owned banks should be less efficient than commercial banks. This report identified banks in Namibia whether or not they are regulated by the Government. The variable is operationalised as zero-one dummy variables and is discussed below

##### **4.1.6.1. Alternative Profit X-efficiency**

As shown in Table 6 above, the sign of the coefficient for the variable capturing regulation by the Government in the alternative profit X-efficiency measure is negatively related to efficiency, this conforms to the theoretical expectation. However, based on the model in this report there is no evidence to support the relationship between this effect and alternative profit X-efficiency because the variable capturing regulation by the Government is not significant at the 5% or 10% level.

##### **4.1.6.2. Profit Efficiency before Tax per Employee**

As shown in Table 6 above, the sign of the coefficient for the variable capturing regulation by the Government in the profit efficiency before tax per employee measure is positively related to efficiency, this does not conform to the theoretical expectation. However, based on the model in this report there is no evidence to support the relationship between this effect and profit efficiency before tax per employee because the variable capturing regulation by the Government is not significant at the 5% or 10% level.

#### **4.1.6.3. Interest Spread**

As shown in Table 6 above, the sign of the coefficient for the variable capturing regulation by the Government in the interest spread measure is positively related to inefficiency (negatively related to efficiency), this conforms to theoretical expectation. However, based on the model in this report there is no evidence to support the relationship between this effect and interest spreads because the variable capturing regulation by the Government is not significant at the 5% or 10% level.

#### **4.1.6.4. Summary**

Although there is no overall consistent picture across all three measures of the direction of effect on efficiency for the variable capturing regulation by the Government, all measures find there is no evidence to support the theoretical expectation.

In addition, to the variables included in the ANCOVA model; factors such as business cycle changes and measurement error in the accounting figures could explain some of the variation in alternative profit X-efficiency (Berger & Humphrey, 1993). These are captured in the error term.

## **5. CONCLUSION**

The main goal of this report was to identify the factors influencing efficiency in Namibia's banking sector.

To achieve this goal this research report adopted two microeconomic measures – alternative profit X-efficiency and profit before tax per employee (an accounting ratio) - to represent the efficiency of individual banks. In addition, a macroeconomic measure - the interest rate spread between deposit and lending rates - was also adopted to represent efficiency in Namibia's banking sector.

In this report, each of these efficiency measures was regressed, using OLS, on an ANCOVA model consisting of a random effects, panel dataset of various features of banks in Namibia to identify factors that influenced efficiency in Namibia's banking sector between 1998 and 2003.

The report found that the effect of concentration on efficiency in Namibia's banking sector was robust across all three measures between 1998 and 2003. This finding provides empirical evidence that the market power hypothesis for mergers is confirmed in Namibia (Berger & Hannan, 1997). Therefore, although M&A is positively associated with the measures of efficiency in Namibia' banking sector the effects of adverse pricing on the welfare of the society work in the opposite direction and should be considered by the regulator in any anti-trust assessment of potential M&A deals.

Although there is no overall consistent picture across all three measures of the robustness of the variable capturing a bank's risk, risk management in general and small business credit scoring in particular can contribute to reducing the costs of the banking sector in Namibia to the extent that it assists banks in automating the credit and risk management process. This should have an indirect impact on the Namibian banking sector's efficiency.

It is hoped that the findings of this study will inform the efforts of regulatory bodies to areas that they can intervene to improve the effectiveness of the banking sector in Namibia in allocating credit efficiently, which should have positive implications for economic growth.

## 6. REFERENCES

Adongo, J., Stork, C., & Hasheela, E. (2005). Measuring the alternative profit X-efficiency of Namibia's banking sector. Research Report 36. Namibia: NEPRU.

Agribank. (1997 - 2003). Annual Reports.

Angula, N. (2005). Statement by the Right Honourable Minister at the launch of the partnership with Bank Windhoek on the development of national guidelines for the preparation of business plans. Namibia:

[http://www.grnnet.gov.na/News/Archive/2005/June/week3/bank\\_rpt.htm](http://www.grnnet.gov.na/News/Archive/2005/June/week3/bank_rpt.htm). Date accessed: October, 23, 2005.

Athanassopoulos, A.D., Soteriou, A. & Zenios, S. (March, 1997). Disentangling within and between country efficiency differences of bank branches. Pennsylvania: Wharton Financial Institutions Centre.

Bank of Namibia. (1998 – 2003) Annual Reports.

Bank Windhoek (1997 – 2003) Annual Reports.

Berger, A. N. & Hannan, T.H. (1997). Using measures of firm efficiency to distinguish among alternative explanations of the structure-performance relationship. *Managerial Finance*, 23.

Berger, A. N. & Humphrey, D. B. (January, 1997). Efficiency of financial institutions: International survey and directions for future research. Working Paper 97-05. Pennsylvania: Wharton Financial Institutions Centre.

Berger, A. N. & Mester, L. J. (January, 1997). Inside the black box: What explains differences in the efficiencies of financial institutions? Pennsylvania: Wharton Financial Institutions Centre

Berger, A. N. & Mester, L. J. (January, 1997). Inside the black box: What explains differences in the efficiencies of financial institutions? Pennsylvania: Wharton Financial Institutions Centre

Berger, A.N. & Mester, L.J. (February, 1999). What explains the dramatic changes in cost and profit performance of the U.S. banking industry? Pennsylvania: Wharton Financial Institutions Centre.

Casu, B. & Molyneux, P. (2003). A comparative study of efficiency in European banking. United Kingdom: University of Wales.

Collins, S. (December, 2002). International financial integration and growth in developing countries: Issues and implications for Africa. in *African Economic*

Research Consortium: Plenary Session. Vol. 13, Supplement 2. London: Oxford University Press

Commercial Bank of Namibia. (1997 – 2003) Annual Reports.

COSATU. (2005). COSATU submission on the national credit bill B-18 2005. South Africa: COSATU Parliamentary Office. [www.cosatu.org.za/docs/2005/Credit.pdf](http://www.cosatu.org.za/docs/2005/Credit.pdf). Date accessed: October 23, 2005.

Dahl, J. (July, 2002). Situation, potential and need for assistance. Working Paper. Namibia: NEPRU

Demirgüç-Kurt, A. & Huizinga, H. (January, 1998). Determinants of commercial bank interest margins and profitability: Some international evidence.

DeYoung, R. & Nolle, D. E. (Nov 1996). Foreign-owned banks in the United States: Earning market share or buying it? *Journal of Money, Credit and Banking*, Vol. 28, No. 4, Part 1: 622-636.

DFID. (November, 2004). Evaluation of impact of CGS on financial sector deepening. London: Enterplan: Creating a natural advantage.

Diamond, D.W. & Dybvig, P.H. (1983) Bank runs, deposit insurance and liquidity. *Journal of Political Economy* 91: 401-419.

Ewing, J and Hubbard, J. (August 15, 2005). The bell tolls for Germany Inc. *Business Week Magazine*: [www.businessweek.com/magazine/content/05\\_33/b3947011\\_mz001.htm](http://www.businessweek.com/magazine/content/05_33/b3947011_mz001.htm)

Feldman, R. (September, 1997). Small business loans, small banks and a big change in technology called credit scoring. *The Region*. Minneapolis: Federal Reserve Bank of Minneapolis.

Finscope. (2004). Profiling demand for financial services in Botswana, Namibia, Lesotho & Swaziland. Finmark Trust: Making financial markets work for the poor. Namibia: Presentation at Bank of Namibia.

First National Bank of Namibia. (1997 – 2003). Annual Reports.

Frei, F.X., Harker, P.T., & Hunter, L.W. (June 1998), Inside the black box: What makes a bank efficient? Philadelphia: Wharton Financial Institutions Centre.

Galbis, V. (January, 1977). Financial intermediation and economic growth in less-developed countries: A theoretical approach. *Journal of Development Studies*, 13 – 2: 58-72.

Griffiths, A. & Wall, S. (1996). *Intermediate microeconomics: Theory and applications*. England: Addison Wesley Longman.

Grossman, M., Mwatotele, J., Stork, C. & Tobias, P. (May, 2005). SME development and impact assessment 2004. Namibia: Institute for Public Policy Research

Harper, M. & Arora, S.S. (2005). Small customers, big market: Commercial banks in microfinance. p 67 in Small enterprise development: An international journal of microfinance and business development. (March, 2005). The international year of micro credit theme issue: The financing of microfinance. Vol. 16:1. ITDG Publishing.

Hartmann, P, (September, 2004). The impact of financial infrastructure transformation on monetary policy execution – the Namibian experience. Keynote Address at the Perago User Group Conference. BIS Review 53. South Africa: [www.sadcbankers.org](http://www.sadcbankers.org).

Hughes, J. P., Lang, W., Moon, C.G. & Pagano, M.S. (October, 1997). Measuring the efficiency of capital allocation in commercial banking. Working Paper 98-2.

Ikhide, S. (July, 2000). Efficiency of commercial banks in Namibia. Occasional Paper 4. Namibia: Bank of Namibia.

Investment Development Consultancy & Development Strategies. (2001). Evaluation of EC country strategy: Namibia 1996-2000

James, C. (September, 1996). Risk adjusted return on capital (RAROC) based capital budgeting and performance evaluation: A case study of bank capital allocation,

Jefferies, K., & Kayawe, T. (September, 1998). Interpolating quarterly GDP from annual data. The Research Bulletin. Gaborone: Bank of Botswana Research Department, 16 – 2: 33-47.

Jenkins, C. & Thomas, L. (November 1996). Is southern Africa ready for regional monetary integration? Working Paper 97-3. Oxford: Centre for the Study of African Economies.

KPMG. (2004a). Banking survey Africa 2004: Financial services. KPMG: Audit, Tax and Advisory.

KPMG. (2004b). Banking survey South Africa 2004: Financial services. KPMG: Audit, Tax and Advisory.

KPMG. (2004c). Banking: Customer satisfaction at what price? How financial institutions are improving customer satisfaction and managing their costs: Financial services. KPMG: Audit Tax and Advisory.

Latimer, A. (June 1995). How the RMA/Fair Isaac credit-scoring model was built. Journal of Commercial Lending, Vol. 77, 10.

Luccheti, R., Papi, L., & Zazzaro, A. (April, 2000). Banks' efficiency and economic growth: a micro-macro approach. Italy: Universita di Ancona.

Mester, L.J. (1996). A study of bank efficiency taking into account risk-preferences. *Journal of Banking and Finance*, 20: 389-405.

Mester, L.J. Nakamura, L.I. & Renault, M. (1998). Checking accounts and bank monitoring. Working Paper, 98-25. Philadelphia: Federal Reserve Bank of Philadelphia.

Ministry of Trade and Industry. (2000). The small business baseline survey: The Khomas Region. Vol. 3. Namibia: Republic of Namibia in Dahl, J. (July, 2002). Situation, potential and need for assistance. Working Paper No Namibia: NEPRU.

Ngalande, E.E. (April, 2003). The importance of financial system modernisation in Africa. Keynote Address at the Perago User Group Conference. BIS Review 27 South Africa: [www.sadcbankers.org](http://www.sadcbankers.org).

Obwona, M. & Mugume, A. (2001). Credit accessibility and investment decisions in Uganda's manufacturing sector: An empirical investigation. *African Review of Money, Finance and Banking-Supplementary Issue on Savings and Development*. Italy: Giordano Dell Amore Foundation.

Rowland, J. (September, 1995). Credit scoring: Big opportunities for small and start-up businesses. *Credit World*. Vol. 84, 1: 21-24.

Rutherford, R. (1995) Securitizing small business loans: A banker's action plan. *Commercial Lending Review*, 10(1), 62-74.

Saidenburg, M. & Schuermann, T. (2003). The new Basel Capital Accord and questions for research. Pennsylvania: Wharton Financial Institutions Centre.

Standard Bank Namibia. (1997-2003) Annual Reports.

Stork, C. (May, 2005). Half a G behind and way too expensive. *Insight Magazine*, Issue 8. Namibia: Insight.

Uanguta, E.N. (2000). Determinants of private domestic savings in sub-Saharan Africa: The case study of Namibia (1980-1998). Working Paper 75. Namibia: NEPRU.

World Bank. 2000 -2005. *World Development Indicators*. Washington D.C.: World Bank

Zuboff, S. (1985). Automate / informate: the two faces of intelligent technology. *Organizational Dynamics*, Fall, 5-18.

**Appendix A: Description of Variables in ANCOVA Model**

Variable	Definition	Mean	Standard Deviation
Dependent Variable ( <i>EFF</i> )			
$\hat{\pi}$	Estimated alternative profit efficiency in logarithmic form	-0.9558	0.1699
$\hat{r}$	Estimated interest rate spread in logarithmic form	-2.644	0.127
$\hat{c}^{eff}$	Estimated profit efficiency before tax per employee in logarithmic form	-1.67757	0.2754
Bank Size Variables			
SMLBANK	Dummy equals one if bank has real gross total assets of less than USD 1 million	-	0.402
MEDBANK	Dummy equals one if bank has real gross total assets of between USD 1 million and USD 5 million	-	0.425
LRGBANK	Dummy equals one if bank has gross total assets of between USD 5 million and USD 10 million	-	0.425
HUGBANK	Dummy equals one if bank has gross total assets of over USD 10 million	-	0.129
Organisation Form/Governance			
MERGED	Dummy equals one if bank survived one or more bank level mergers during the period (i.e. absorbed the assets of one or more other banks)	-	0.18
ACQUIRED	Dummy equals one if bank acquired a different bank during the period	-	0.18
INBHC	Dummy equals one if bank is owned by a bank holding company	-	0.402
MUL_LAY	Dummy equals one if the bank is in a multi-layered bank holding company i.e. bank has insurance	-	0.402

	subsidiary		
OUTST	Dummy equals one if the bank's highest holding company is located outside the country	-	0.492
PUB_TRADED	Dummy equals one if the bank's highest holding company is registered and traded on a financial market	-	0.492
Other Bank Characteristics			
AGE	Number of years bank has existed	59.9	29.72
LGTA	Ratio of total loans to gross total assets in logarithmic form	-0.2109	0.0993
Market Characteristics			
HERF	Herfindahl index of local output market concentration	2415.17	40.5
SHARE	Bank's share of local deposit market concentration (used as a robustness check for HERF)	0.2	0.11
Regulator			
BON	Dummy equals one if the bank is governed by the Bank of Namibia	-	0.402
GOVT	Dummy equals one if the bank is governed by the Government.	-	0.402
Number of Panel Observations		120	

Note: The qualitative, independent variables are defined using zero-one dummy variables to account for non-monotonicity and non-linearity in their relationship with efficiency. The quantitative independent variables are specified as logged, continuous variables. For a continental study it will be useful to include variables unique to each country such as national income and unemployment rate.

## Appendix B: Technical Discussion

The function estimated in this study is specified as follows:

$$\ln EFF_{it} = \beta_1 SMLBANK_{it} + \beta_2 MEDBANK_{it} + \beta_3 LRGBANK_{it} + \beta_4 HUGBANK_{it} + \beta_5 MERGED_{it} + \beta_6 ACQUIRED_{it} + \beta_7 INBHC_{it} + \beta_8 MUL\_LAY_{it} + \beta_9 OUTST_{it} + \beta_{10} PUB\_TRADED_{it} + \beta_{11} AGE_{it} + \beta_{12} LGTA_{+it} + \beta_{13} HERF_{it} + \beta_{14} SHARE_{it} + \beta_{15} GOV_{it} + \varepsilon_{it}$$

### Equation 2: ANCOVA Model: Estimated Function

Each variable is described and defined in Appendix A above.

### Cointegration:

Cointegration allows us to find out whether a linear combination of two or more time series is stationary and indicates the existence of a long-run or equilibrium relationship between them.

The Johansen Cointegration Test was applied to the three alternative efficiency measures to test for the existence of cointegration relationships. The findings are discussed below.

#### Alternative Profit X-efficiency

In the linear form, the trace test and the max-eigenvalue test show that there is cointegration at both the 5% and 1% levels. This is because the trace and max-eigen statistics are larger than the critical values hence rejecting the null hypothesis of no cointegration. In the logarithm form, the trace test and the max-eigenvalue test indicate two cointegrating equations at the 5% level and one cointegrating equation at the 1% level. This is because the trace and max-eigen statistics are greater than the critical value at the 5% level, hence rejecting the null hypothesis of at most 1 cointegrating equation. This shows that there is cointegration in the ANCOVA model that uses alternative profit X-efficiency to measure efficiency.

#### Profit Efficiency before Tax per Employee

The null hypothesis of no cointegration in row 1 in the logarithm and non-logarithm form is rejected, since the trace statistic and the max-eigen statistic are greater than the critical values at the 5% and 1% level. The null hypothesis of at most 1 cointegrating relation in row 2 is accepted since the trace statistic and the max-eigen statistic are less than the critical values at both the 5% and 1% level. In both cases, the trace test and the max-eigenvalue test indicate that there is cointegration between the two variables at both the 5% and 1% significance levels. This shows that there is a long-run relationship between the real profit before tax per employee and the ratio of total loans to gross total assets.

#### Interest Rate Spread

In both the logarithmic and non-logarithmic form, the trace test and the max-eigenvalue test indicate that there is cointegration between the two variables at both the 5% and 1% significance levels. In both cases, the null hypothesis of no cointegration in row 1 is rejected since the trace statistic and max-eigen statistic are greater than the critical values at the 5% and 1% level. In row 2, the null hypothesis of at most 1 cointegrating relation is accepted since the trace statistic and max-eigen statistic are less than the critical values at both the 5% and 1% level. These results thus show that there is a long-run relationship between interest rate spread and the ratio of total loans to gross total assets.

### **Multicollinearity:**

Multicollinearity refers to a condition where the explanatory variables are linearly intercorrelated either perfectly or less than perfectly as follows:

$$\lambda_1 X_1 + \lambda_2 X_2 + \dots + \lambda_k X_k = 0$$

### **Equation 3: Multicollinearity.**

Multicollinearity is a feature of any econometric model and is only a problem if it is severe. Severe multicollinearity is defined as a case where the explanatory variables have a correlation factor exceeding 0.8 (Gujarati, 2003).

Since our dataset consists of zero-one dummy variables, it is not easy to apply standard tests of multicollinearity such as correlation matrices or auxiliary regression analysis to assess multicollinearity. Despite this hindrance a correlation matrix was examined for each of the alternative measures of efficiency.

For alternative profit X-efficiency, multicollinearity was found to be severe between medium-sized banks and the variables capturing small banks, ownership by a holding company and the identity of regulator. In addition, severe multicollinearity was identified between the concentration ratio and variables capturing small banks and the identity of the regulator.

For profit efficiency before tax per employee, multicollinearity was found to be severe between medium-sized banks and the variables capturing small banks, ownership by a holding company and the identity of regulator. In addition, severe multicollinearity was identified between the concentration ratio and variables capturing the identity of the regulator.

For interest spreads, multicollinearity was found to be severe between medium-sized banks and the variables capturing small banks, ownership by a holding company and the identity of regulator. In addition, severe multicollinearity was identified between the concentration ratio and variables capturing the small bank.

These finding suggests that dropping medium banks or small banks from the model should improve the statistical robustness of the model. However, this report adopts

the “do nothing” school of thought to deal with multicollinearity (Blanchard in Gujarati, 2003) because the capturing the dynamics of bank size provides valuable economic insight on its effect on efficiency in Namibia's banking sector.