African Review of Economics and Finance | ISSN 2042-1478 | Volume 9 | Issue 2 | December 2017

An evaluation of the efficiency of the banking sector in Zimbabwe

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Abstract

The study evaluates the cost and revenue efficiency of the Zimbabwean banking sector using the data envelopment analysis and Tobit regression model. Revenue and cost efficiency increased between 2009 and 2012 as a result of economic stability and growth registered in the economy. The trend in efficiency was negatively affected during 2013-2014 as a result of declining economic growth and price controls, which were imposed on the banking sector. The study established that private banks were more revenue and cost efficient compared to public banks. Domestic banks were relatively cost and revenue efficient compared to foreign banks supporting the home field advantage hypothesis. Commercial banks were cost and revenue efficient compared to building societies. The main drivers of both cost and revenue efficiency are cost income ratio, capital adequacy, macroeconomic growth and inflation. The results mean that banking sector efficiency is dependent on the decisions of the bank regulators and bank management. It is recommended that the government should improve the operating environment for banks and desist from interfering with operation of market forces. Competition among banks should be encouraged to improve the efficiency of the banking sector.

Keywords: Cost and revenue efficiency, Data envelopment analysis, Tobit regression, Zimbabwe

1. Introduction

Banking efficiency measures how close a production unit gets to its production possibility frontier, composed of sets of points that optimally combine inputs in order to produce one unit of output (Kablan, 2010). Efficiency can be distinguished between allocative and technical efficiency (Hassan and Sanchez, 2007). Allocative efficiency is the extent to which resources are being allocated to the use with the highest expected value. A firm is technically efficient if it produces a given set of outputs using the smallest possible amount of inputs (Falkena et al, 2004). A combination of the technical efficiency and allocative efficiency provides a measure of economic efficiency. Economic efficiency can be distinguished into cost efficiency, revenue efficiency and profit efficiency. Cost efficiency measures how far a bank's cost is apart from the best practice bank's cost that produces the same output level and under the same environmental conditions (Lovell, 1993). Revenue efficiency measures the ratio between current revenues to optimal revenues given prices and output. Profit efficiency measures the ratio of current profits to optimal profits, given inputs, output and their respective prices (Hassan and Sanchez, 2007).

The study of banking sector efficiency is of interest to policymakers and scholars for a number of reasons (Karimazadeh, 2002). An efficient banking system has lower spreads between lending and deposit rates which stimulate greater demand for loans which encourages mobilisation of savings. Wide spreads affect intermediation and distort prices which impairs the role of the financial system in contributing to economic growth (Ikhide, 2000). Banking sector efficiency is important for the design of monetary policy. Understanding the primary efficiency transmission channel allows policymakers to obtain feedback on how changes in the regulatory environment affect bank efficiency and how efficiency translates into bank performance (Kablan, 2010). Banking sector efficiency assists in benchmarking an individual bank against international best practice and assessing the effect of various measures on the performance of these institutions (Das and Ghosh, 2009).

The current study is motivated by the developments that took place in Zimbabwean banking sector between 2009 and 2014. The banking sector was accused by policy makers and the banking public of profiteering through high interest rates and exorbitant bank charges to cover their operational inefficiencies. This concern resulted in the central bank instituting the Memorandum of understanding (MoU), which regulated the pricing of banking products in 2013. The instigation of the MoU in guiding the pricing of banking products warrants

an investigation into the efficiency of the banking sector to establish whether the profitability of the banks during the period was a result of abuse of market power or due to banking sector efficiency. This is important given that the banking system assets constitute a substantial proportion of total output of the financial sector making the performance of the sector of systematic position in the Zimbabwean economy.

The study contributes to the literature by analysing the evolution of cost and revenue efficiency in Zimbabwean banking system for the period 2009-14. The study also contributes to the debate on the efficiency differences between domestic and foreign banks; private and public banks; commercial banks and building societies. The study further contributes to the ongoing debate on the determinants of banking sector efficiency. There is no similar study that have been undertaken in Zimbabwe of which the authors are aware of.

The study is organised as follows: Section two gives an the overview of the Zimbabwean banking sector; section three reviews the literature on banking sector efficiency: section four outlines the methodology adopted for the study; section five presents the findings of the study. Conclusions and recommendations are discussed in section six.

2. Overview of the banking sector

The banking sector in Zimbabwe has transformed since the country attained independence. The banking sector has undergone four distinct phases: post-independence (1980-1990), the reform period (1991-1999), the crisis period (2000-2008) and the stability period (2009-2014). During the post-independence period (1980-1990) the banking sector was heavily regulated and followed a segmented market approach. The sector was oligopolistic in nature and was dominated by a few foreign banks with limited competition (Chipika and Malaba, 2011). Banks formed cartels to fix interest rates. The entry and exit into the sector was limited by various regulatory barriers. Pricing of banking products was determined by the banks and the government determined the minimum lending rates; typical of repressive financial regulatory regimes (Mabika, 2001). The financial system was liberalised in 1991. Regulatory barriers were lifted and new entrants were allowed into the banking sector leading to the licensing of the first indigenous bank in 1997 (Mumvuma *et al*., 2003). Financial liberalisation did not bring much change in terms of product offering on the market. Banks competed in the provision of generic products such as deposits and lending to established corporates (Kanyenze *et al.*, 2011).

The Zimbabwean economy experienced an economic crisis during the period (2000-2008) characterised by hyperinflation and significant economic decline. GDP is estimated to have declined by 40 per cent during the period (GoZ, 2009). Hyperinflation peaked in July 2008 at 231 million per cent (GoZ, 2009). During the crisis period the banking sector experienced a number of challenges. These included; poor standards of corporate governance, inadequate risk management, use of depositor's funds for speculative investments, insider dealing and abuse of Central Bank liquidity advances. The Central Bank responded by abandoning the lender of last resort function and instituting a raft of measures to control the problem (Makoni, 2010). The confidence of banking public declined as a result of the closure of banks, cash shortages and erosion of savings by hyperinflation. Consequently people resorted to keeping their money outside the banking sector (Kanyenze *et al*., 2011). In an effort to restore macroeconomic stability, the government abandoned the local currency in favour of a basket of currencies in 2009. The local currency was abandoned as a measure to arrest the severe macroeconomic disruption and restore macroeconomic stability after a decade of monetary and financial disorder. The policy managed to arrest the debilitating hyperinflation and economic decline. Inflation declined sharply and fell to below two per cent, before further declining into the negative territory for most parts of 2014 and 2015 (ZimStats, 2015).

Table 1: Banking Sector Statistics (2009-2014)

Key Indicators	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Total Assets (US$ Billion)	2.19	3.69	4.74	6.12	6.74	7.11
Total loans (US$ Billion)	693	1.56	2.76	3.56	3.08	3.84
Net capital Base (US$ Millions)	382	458	512	644	706	909
Total deposits(US$ Billion)	1.36	2.31	3.04	4.41	4.73	4.96
Net Profit (US$ Million)	9.50	37.95	86.0	69.2	4.46	24.4
Return on Assets (%)	0.60	-2.02	2.43	1.64	0.06	0.37
Return on equity (%)	2.47	0.57	15.13	9.17	0.51	2.54
CAR (%)	27.26	27.34	13.51	13.07	14.01	18.20
Loan –Deposit Ratio (%)	50.99	86.25	90.59	93.27	102.36	77.41
Net Interest Margin (%)	3.29	5.75	8.21	14.81	15.26	4.20
Liquidity ratio (%)	97.44	70.88	56.80	55.70	40.57	38.20
Cost to income Ratio (%)	94.38	148.95	185.11	99.95	173.43	96.63

The stable macroeconomic environment significantly impacted on the banking sector as shown in Table 1. The sector experienced growth in the deposits, loans and assets. The total amount of deposits, loans and assets stood at US$1.36 billion, US$0.693 billion and US1.92 billion respectively as at the end of 2009. Total deposits, loans and assets grew to US$4.96 billion, US$3.84 billion and US$7.11 billion respectively as at September 2014. Corresponding to the increase in deposits and loans was the increase in the loan to deposit ratio which increased from 51 percent in December 2009 to 102.3 percent in 2013. The increase in loan deposit ratio meant the growth in loans was greater than the growth in deposits. The high loan to deposit ratio compromised the ability of banks to meet withdrawal demands meaning banks were over lending to meet high demand for credit in the economy.

The banking sector was profitable during the period 2009-2012 as shown in Table 1. Profitability increased significantly between 2009 and 2011 before declining in 2012 and 2013. Total profits in the banking sector increased from US$9.5 million in 2009 to US$86 million in 2011. The profits declined to US$69.2 million and US$4.46 million in 2012 and 2013 respectively. The decline in profitability is reflected in the return on equity which reached a maximum of 15.13 percent in 2011 before declining to 9.17 percent and 0.51 percent in 2012 and 2013 respectively. The interest rate margin, increased from 3.29 per cent in 2009 to 15.26 per cent in 2013. The wide interest rate spreads among banking institutions is a result of the different costs and lending rates of banks. Small banks suffered high weighted costs of funds a symptom of the high costs they faced in mobilising funds. Despite the relatively low costs of funds for some banks, the maximum lending rates continued to be high.

The number of banking institutions decreased from twenty eight in 2008 to twenty by mid-2014. The decline in the number of banks was a result of the collapse, consolidations and mergers. Mergers and acquisitions were necessitated by the stringent regulatory capital requirements. Bank collapses were mostly attributed to poor corporate governance, insolvency and imprudent lending activities (RBZ 2014). The market share of the top four banks declined from 97 percent in 2008 to 48 percent in 2012. The 97 percent market share was a result of flight to quality which was experienced during the period 2000-8. The decline in the market shares was attributed to the mergers and acquisitions, the need to increase capital requirements, stringent risk management guidelines and increased competition in the banking sector.

The quality of bank assets also declined between 2009 and 2014 as shown by the increase in non-performing loan ratio. The level of non-performing loans (NPLs) increased from 1.8 per cent in February 2009 to 20.1 per cent by September 2014. The NPLs retarded financial intermediation and forced banks to cut down on their lending. Banks had to incur increasing costs in pursuing the defaulting borrowers while on the other hand banks had to write off incomes they had anticipated.

The banking sector also faced the challenge of an undercapitalised central bank. The failure by the government to capitalise the central bank impacted the performance of banks given that there was limited activity on the interbank market. The Central Bank could not play its lender of last resort function and failed to introduce relevant liquid instruments acceptable by the market.

The above cited developments that took place during the period 2009-2014 impacted the performance of the banking sector including its efficiency motivating the current study.

3. Literature review

Banking sector efficiency has been measured by two main methods; the parametric and non-parametric methods (Stavarek and Řepkova, 2012). The parametric or econometric method and the non-parametric or mathematical programming method differ in their underlying assumptions of the random noise and the structure of production technology. There are a number of parametric methods of measuring banking sector efficiency which include the stochastic frontier approach (SFA), distribution free approach (DFA) and thick frontier approach (TFA). The parametric methods assume specific functional form of the cost function or production technology. It also allows for an error term composed of symmetrically distributed random error and truncated inefficiency terms. Poghosyan and Borovička (2007) argue that the main drawback of the parametric method is the imposition of functional form on the behaviour of economic variables.

The non-parametric methods are based on linear programming method. The efficiency frontier is formed as a piecewise linear combination of best-practice observations. Wu *et al* (2006) and Mukherjee *et al* (2002) identified two main nonparametric methods; data envelopment analysis (DEA) and free disposal Hull (FDH). Hassan and Sanchez (2007) argue that the non-parametric approach does not require a production function in order to calculate and ascertain the

determinants of efficiency of the firm. The approach is based on mathematical programming methods.

The Data Envelope Analysis (DEA) was developed by Charnes, Cooper and Rhodes (1978) to measure relative efficiency based on the data of selected inputs and outputs of a number of entities called decision making units (DMUs). The model is based on linear programming technique which allows the calculation of the relative efficiency of each DMU (Hassan and Sanchez, 2007). The relative efficient points are then used to define the efficiency frontier and evaluate the inefficiency of other DMUs (Jemric and Vujcic, 2002).

Studies including Fries and Taci (2005) and Hassan and Sanchez (2007) shows that the three is still debate around the DEA method. The controversy is around the choice of inputs and outputs of banks emanating from what is perceived to be the role of the bank. Some of the inputs include number of employees, costs for inputs, net worth, borrowings, operating expenses, employees, number of branches, interest expenses, non-interest expenses, deposits, deposits etc. On the other hand the outputs have included loans, other earning assets, deposits, investments, other income, performing loan assets, non-interest free based incomes, total revenue, earning assets.

Another controversy in literature on banking sector efficiency is on the superiority between domestic and foreign banks. Berger *et al.* (2000) identified two prominent hypothesis that explains the efficiency difference between domestic and foreign banks; the home field advantage hypothesis and the global advantage hypothesis. The home field advantage postulates that domestic banks are generally more efficient than foreign banks due to organisational diseconomies in operating or monitoring an institution from a distance. Diseconomies emanate from differences in regulatory and supervisory environments. The global advantage hypothesis suggests that foreign banks are able to overcome these disadvantages and operate more efficiently. They spread their superior managerial skills or best-practice policies and are able to lower their costs. The studies by Bonin, Hasan and Wachtel (2005), Buchs & Mathiesen (2005), Bonaccorsi Di Patti and Hardy (2005) highlight the contention on the subject of domestic and foreign bank efficiency. On the other hand studies by Fries and Taci (2005), Kraft, Hofler and Payne (2006), Bonin *et al.* (2005) and Boubakri *et al.* (2005) highlight the debate between the efficiency of private and public banks.

Another area of debate is on the determinants of banking sector efficiency. Studies which have been undertaken around the area remain inconclusive. Cook

et al. (2000) identified size, credit and ownership structure while Grigorian and Manole (2002) identified foreign ownership and consolidation, level of capitalisation, market share and GDP per capita. Fries and Taci (2005) found that asset ownership and banking sector development were the main drivers of efficiency whilst Pasiouras *et al.* (2007) discovered that size of the bank GDP per capita and unemployment drove banking sector efficiency. Hassan and Sanchez (2007) identified that efficiency was determined by the degree of capitalisation, profitability ratios, the interest rate spread and GDP growth, loan loss reserves, the value of stock traded and inflation.

4. Study methodology

The study employs a two-step approach to evaluate the determinants of cost and revenue efficiency during the period (2009-2014). Firstly, the data envelopment approach is used to estimate the efficiency scores of the banking sector. In the second step, the Tobit model is used to evaluate the determinants of efficiency. The study included eighteen banking institutions which operated during the period 2009 to 2014. The banking institutions included commercial banks; building societies and a savings bank. The data for the study was drawn from published financial statements (balance sheets and income statements) of the banking institutions and Government Budget Statements and Zimbabwe Statistic Agents (ZimStats) publications.

Banks in Zimbabwe can be broadly categories into commercial, savings bank and building societies. These can further be decomposed into private and public banks and domestic and foreign banks. Commercial banks provide current and deposit account facilities, loans and overdrafts to needy business organizations and mortgage financing. Building societies offer savings, fixed deposits, personal and company loans, and mortgage lending. The savings bank is involved in offering deposit accounts, savings accounts, loans and overdrafts, and mortgage financing. The Banking sector in Zimbabwe is moving towards universal banking model which allows banks to offer facilities outside their traditional scope.

The Zimbabwe banking sector is composed of both domestic and foreign banks. Domestic banks are those banks which have predominantly local shareholding. Foreign banks have majority foreign shareholding. Foreign banks are obligated to follow the regulations of both the home and host countries. Another distinction in the banking sector is between private and public banks. Private Banks are those banks in which the government does not have majority

shareholding while public banks are those banks whose major shareholder is the government.

The study employs the DEA model because the method is able to accommodate multiple inputs and multiple outputs. The model is also convenient in that it does not require prior aggregation of the outputs or a specific functional form of the production function. Hassan and Sanchez (2007) argue that the approach allows the analyst to select inputs and outputs depending on the managerial focus assisting in the what-if analysis. The DEA model can be used with variables of different units without the need for standardization (e.g. number of transactions, number of staff). The method is not without its challenges. The problem with the DEA method is that the results cannot be interpreted with confidence if the integrity of data is violated. To avoid this problem, less data manipulation was done. Another problem of the DEA is that it does not work well with high dimensional data. The study resolved this by using less inputs and outputs so as to avoid being high dimensional.

The DEA method is able to distinguish the efficiency among the various categories of banks. The study is going to distinguish cost and revenue efficiency among the following categories; foreign and domestic banks so as to determine whether banks in Zimbabwe follow the home field advantage hypothesis or the global advantage hypothesis. Secondly the study compares efficiency differences between the private banks and public banks to contribute to the debate on the efficiency difference between private and public banks. Lastly the study compares the efficiency difference between commercial banks and building societies. This has been necessitated by the development where banks are operating under universal banking licence which allows them to venture into all types of banking. The list of banking institutions is provided as an appendix.

There are two alternative orientations available in using the DEA method. One is input-oriented, and the other is output-oriented. In the input-oriented model, the inputs are minimized and the outputs are kept at their current levels. In the output-oriented model, the outputs are maximized and the inputs are kept at their current level. The results also differ depending on the assumptions underlying their calculations i.e. variable returns to scale (VRS) or constant returns to scale (CRS). The choice between CRS and VRS affects the shape of the envelope surface and resultantly on the number of efficient DMUs. CRS attains if proportional increase in all inputs leads to a proportional increase in output. Models that applies the CRS are called the CCR models. The CCR Model

develops the Farrells efficiency measurement concept from several inputs and one output to several inputs and several outputs into one virtual input and output which gives the efficiency score. Karimzadeh (2012) argue that the CRS model is more restrictive and yields fewer number of efficient units and lower efficient scores as compared to the alternative VRS hence its choice for the current study. The study therefore uses the input oriented CRS model.

Assume there are n DMUs and the jth DMU, DMU_j, produces s outputs (y_{ij},… ,y_{sj}) by using m inputs (x_1j,…, x_mj). The efficiency score observed DMU_0 is given as the optimal value to the following linear programming model:

$$\begin{aligned} &\theta_o^* = \min \theta \\ &\text{s.t} \\ &\sum_j \lambda_j x_{ij} \leq \theta x_{io, i=1,\dots,m} \\ &\textstyle\sum_j \lambda_j y_{rj} \geq y_{ro,} r = 1, \dots, s \\ &\lambda_j \geq 0, j = 1, \dots, m \end{aligned} \tag{1}$$

This is an input oriented constant return to scale (CRS) model. λ_j is the intensity variable which minimizes θ. The efficiency of DMU_0 is determined from efficiency score θ_o^* and its slack values. If $\theta_o^* = 1$ and there is no slack, DMU_0 is said to be efficient. $\theta_o^* = 0$ and there are non-zero slacks, DMU_0 is inefficient and is regarded as weakly efficient. The weakly-efficient DMUs and efficient DMUs constitute the efficient frontier.

The intermediation approach by Sealey and Lindley (1977) influenced the definition of the inputs and outputs for the study. The intermediation approach views the bank as an intermediary that facilitates the transfer of funds from surplus agents to deficit agents rather than producers of loans and deposit account services. Three inputs considered for the evaluation of the bank efficiency are deposits, labour and capital. These constitutes the major inputs of the bank. Labour is responsible for carrying out the banking activities. Deposits mobilisation is the main business of the bank. The outputs of the study are total loans (short-term, medium and long-term loans), and total income (sum of interest income and non-interest income). These outputs represent bank revenue and the major profit making business activities.

Whether products (inputs and outputs) should be measured in terms of the number of accounts or dollar values present a further complication. This study follows Kolari and Zardkoohi (1987) in favour of using dollar values because banks compete to increase the market share for dollar amounts rather than the number of accounts. Secondly, the various accounts offered by banks have

different costs; for example, time deposit accounts differ from savings accounts. Thirdly, banks offer a number of services, in which case the dollar amount is the only common denominator; for example, custodial services cannot be measured in terms of the number of accounts.

The estimation of cost efficiency requires the specification of the prices of inputs. The price of a deposit is calculated as an interest expense over total deposits (price of labour is labour costs over total number of employees and price of capital is calculated as total expenses less labour expenses over total assets). The calculation of revenue efficiency requires the specification of the prices of the output. Price of total revenue is defined as total revenue divided by fixed assets, while price of loans is defined as interest income divided by total loans.

In the second stage the study employed the Tobit econometric regression model. The model is useful when the dependent variables are limited by a specific threshold. The Tobit model was first suggested in econometrics literature by Tobin in 1958, and can be regarded as truncated or censored regression models where expected errors are not equal to zero. DEA scores fall between the interval zero and one making the dependent variable a limited-dependent variable. Maddala (1983) and Jackson and Fethi (2000) argue that under such circumstances, estimating the regression using the ordinary least square leads to biased parameter estimates, since OLS assumes a normal and homoscedastic distribution of the disturbance and the dependent variable. Coelli *et al*. (1998) and Casu and Molyneux (2003) are some of the studies that have employed this method included those of, to arrive to the estimate scores.

Sanchez *et al.* (2013) posited that the efficiency of a banking system depends on bank-level performance, the level of development in the financial system, and the macroeconomic health of the country. The following model will tested empirically:

$$EF_{it} = \alpha_i + \beta_1 ROA_{it} + \beta_2 LNSIZE_{it} + \beta_3 LI_{it} + \beta_4 CAD_{it} + \beta_5 NPL_{it} + \beta_6 CIR_{it} + \beta_7 GDPG_{it} + \beta_8 INF_{it} + \beta_9 MKT_{it} + \varepsilon_{it} \quad (2)$$

The variables in equation (2) are explained. Credit risk (NPL) measures the ratio of non-performing loans to the total loan portfolio. An increase in the ratio implies that the quality of the loan portfolio is deteriorating hence the lower expected efficiency. Capital adequacy (CAD) measured by the ratio of equity capital to total assets reflects the bank's management efficiency and risk preference. A highly efficient bank is able to increase capitalisation if it is efficient through retaining more earnings as capital according to Carvallo and Kasman (2005), which establishes a positive relationship between efficiency

and capital. Competition (LI) as substituted by the Lerner index is expected to have a positive effect on efficiency. The greater the competition in the banking sector, the more it is expected that the banks will be efficient. The Cost-to-income (CIR) ratio is a measure of efficiency in profitability; the higher this ratio, the lower is the expected efficiency. Return on assets (ROA) measures the profitability of the banking institutions. It is related to the optimal use of resources. The expectation is a positive relationship between the profitability and efficiency measures. The proxy for the Size of the bank (SIZE) is the amount of its assets. It is used to measure the possible cost advantages associated with size according to Sufian (2009) and is expected to be positively related to efficiency.

Market share (MKT) is expected to have a negative relationship with bank efficiency. Increasing market share for a single banking institution reduces the amount of competition in the banking sector. Sufian (2009) argue that the smaller the market share for individual banks the higher the competition in the market. The effect of economic growth (GDPG) on efficiency is ambiguous. This is because growth in GDP has an effect on both demand and supply for loans according to Carvallo & Kasman (2005). Inflation (INF) as a measure of economic instability has a negative effect on the banking sector efficiency as argued by Boyd *et al*. (2001), and Khan, Senhadji and Smith (2001).

5. Results

This section presents the findings of the study and describes the efficiency analyses based on the calculated efficiency scores. The study starts by providing the descriptive statistics of the variables provided in the study.

Table 2: Descriptive Statistics

	CAD	LNSIZE	NPL	CIR	MKT	LIRISK	LI	GDPG	INF
Mean	0.23	18.66	0.07	0.10	0.05	0.82	0.04	0.01	0.00
Median	0.16	18.81	0.04	0.08	0.03	0.73	0.03	0.01	0.00
Maximum	0.91	21.26	0.62	0.44	0.28	3.93	0.52	0.06	0.03
Minimum	0.04	14.86	0.00	-0.03	0.00	0.00	-0.25	-0.10	-0.08
Std. Dev.	0.17	1.14	0.09	0.06	0.06	0.55	0.05	0.01	0.02
Skewness	1.71	-0.38	2.53	1.46	2.06	2.54	2.68	-0.97	-3.02
Kurtosis	5.71	2.89	12.06	6.31	7.26	12.40	33.06	27.89	13.29
Observations	396	396	396	396	396	396	396	21	21

Table 2 shows the mean, the maximum, minimum and the standard deviation of the variables under study. The data sets are a balanced panel with 396

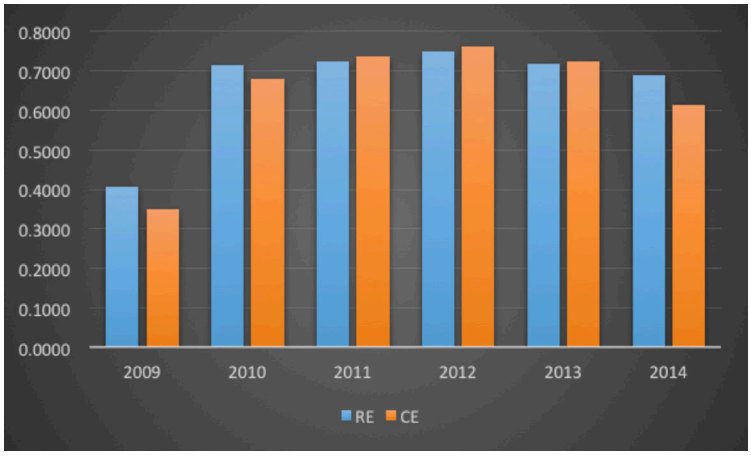
observations taken for 18 banks over the period of 21 quarters. The variation of the data set is minimal as reflected by the low standard deviations.

The mean revenue efficiency scores of the Zimbabwean banks for the period 2009-2014 was 66.4 per cent. The result implies that banks could have generated the same amount of revenue using 66.4 percent of the actual amount of resources used. In other words in the generation of the current income banks encountered 33.6 percent level of wastage.

The mean cost efficiency scores of the Zimbabwean banks for the period 2009-2014 was 64.7 per cent. The result implies that banks could have produced the same amount of output using 35.3 percent less resources i.e. banks failed to minimise the amount of input in the production of banking services. The result implies that banks were marginally cost efficient comparing with revenue efficient. The difference in efficiency between the two was a marginal 1.7 percent.

Figure 1 illustrates the trend in revenue efficiency (RE) and cost efficiency (CE) during the period 2009-2014. Revenue and cost efficiency increased during the period 2009-2012. The increase is attributed to significant growth in bank balance sheets; assets, capital levels, deposits and loans. The growth in bank balance sheets during 2009-2014 took place after the decimation of the balance sheets during hyperinflation and the wiping of the same when the country abandoned its local currency. There was also increased competition among the banks as they sought to attract new clients who had abandoned banking during the hyperinflation period (2000-2008). The economy also stabilised and the registered first positive growth in a decade in 2009 and subsequent years which increased demand for banking products.

Figure 1: DEA Annual Cost and Revenue Mean Scores



Cost and revenue efficiency declined in 2013 and 2014. The decline in efficiency could be explained by a number of reasons. In 2013 the government introduced a memorandum of understanding between banks and the central bank to guide the pricing of the banking products. This was d facto the introduction of price controls in the banking sector. Banks were therefore constrained in their revenue generation. During the period the growth of the economy decelerated which increased defaults by those who had borrowed from the banks which increased the non-performing loans. The economy started to experience declining capacity utilisation and the shedding of labour which led banks to slow down on their asset creation. Banks became more involved in recovery of bad loans which increased their costs as well as reducing their incomes through increased provisioning.

Table 3: Average Efficiency Score between Public and Private Banks

	Revenue Efficiency		Cost Efficiency	
Year	**Public revenue efficiency**	**Public revenue efficiency**	**Public revenue efficiency**	**Public revenue efficiency**
2009	0.4573	0.5739	0.4736	0.5398
2010	0.6884	0.7821	0.6773	0.7185
2011	0.7017	0.7268	0.7707	0.6125
2012	0.6988	0.8074	0.8142	0.7804
2013	0.6394	0.7250	0.8138	0.6993
2014	0.6268	0.6926	0.6922	0.5408
Average	0.591	0.685	0.654	0.645

Table 3 shows the average revenue and cost efficiency scores for public and private banks. The table shows that private banks were on average more efficient in revenue generation. Despite the superior efficiency in revenue generation, both private and public banks were very inefficient. The average revenue inefficiency levels for private and public banks for the whole period was 31.5 percent and 40.9 percent. This reflects the level of waste encountered by private and public banks respectively. Studies by Fries and Taci (2005) and Kraft, Hofler and Payne (2006) also found that private banks were efficient compared to public banks. Public banks were marginally cost efficient compared to private banks. The average cost efficiency scores for public banks and private banks were 65.4 per cent and 64.5 per respectively. The result implies that private and public banks encountered wastages of 34.6 percent and 35.5 percent respectively. Similar results were obtained in a study done by Boubakri *et al.* (2005). The trend in the both cost and revenue efficiency shows that public and

private banks experienced increased efficiency during the period 2009-12 and a decline thereof in 2013-14. This follows the overall trend experienced for all banks as explained above.

Table 4: Average Efficiency Score - Domestic and Foreign Banks

	Revenue Efficiency		Cost Efficiency	
Year	**Foreign**	**Domestic**	**Foreign**	**Domestic**
2009	0.4801	0.5741	0.6415	0.4803
2010	0.6071	0.8206	0.7215	0.7046
2011	0.4829	0.8129	0.5624	0.7343
2012	0.5877	0.8197	0.6446	0.8430
2013	0.5563	0.7636	0.5506	0.7917
2014	0.5452	0.7291	0.3482	0.6615
Average	0.544	0.710	0.561	0.680

Table 4 shows the average revenue and cost efficiency scores for domestic and foreign banks. The results suggest that domestic banks were more cost and revenue efficient than foreign banks. The average revenue efficiency score for the domestic banks is 71 per cent while the average revenue efficient score for foreign banks is 54.4 per cent. The average cost efficiency score for domestic banks is 68 percent and for foreign banks is 56.1 per cent. The results reveal the efficiency superiority of domestic banks. The results are similar to that of Green, Murinde and Nikolov (2004). The results support the home field advantage hypothesis as argued Berger *et al*. (2000). The home field advantage postulates that domestic institutions are generally more efficient than institutions from foreign nations as result of organisational diseconomies of operating or monitoring a subsidiary from a distance.

Table 5: Average Efficiency Scores - Building Societies and Banks

	Revenue Efficiency		Cost Efficiency	
Year	**Commercial**	**Building**	**Commercial**	**Building**
2009	0.5309	0.4272	0.5961	0.2765
2010	0.7444	0.8205	0.7925	0.4181
2011	0.7096	0.7617	0.7264	0.5471
2012	0.7997	0.7257	0.8184	0.6811
2013	0.7120	0.6851	0.7367	0.6829
2014	0.6864	0.6486	0.5874	0.5924
Average	0.6757	0.6232	0.6854	0.5133

Table 5 shows the average efficiency scores of building societies and commercial banks. The results show that commercial banks out-performed building societies in both revenue and cost efficiency. The mean cost efficiency score for commercial banks is 68.5 per cent while that of Building Societies is 51.33 per cent. This means that commercial banks are able to manage their cost better than building societies. The average revenue efficiency scores for commercial banks and building societies are 67.6 per cent and 62.3 per cent respectively. These results confirm that commercial banks are more efficient in revenue generation compared to building societies. Given that banks operate under a universal banking licence, building societies need to improve on their efficiency performance for them to start competing against commercial banks.

Table 6: Tobit Regression Results

	Revenue Efficiency		Cost Efficiency	
Variable	**Coefficient**	**Standard error**	**Coefficient**	**Standard error**
C	-0.2474	0.4899	0.9241	0.4211
LI	0.2195***	0.0501	0.2778***	0.0408
LNSIZE	0.0512	0.0655	-0.0737	0.0562
CAD	-0.1711	0.1276	-0.7529***	0.1101
NPL	0.1284	0.1678	0.2637	0.1438
CIR	0.5598**	0.2563	1.2053***	0.2249
GDPG	0.0099***	0.0032	0.0071***	0.0027
INF	2.3622***	0.7310	2.8951***	0.6278
ROA	-0.1254**	0.0539	-0.0452	0.0330
MKT	0.7457*	0.4296	0.6021*	0.3572
	Mean Dependent Var.	0.6471	Mean Dependent Var.	0.6641
	S.E of regression	0.2015	S.E of regression	0.2266
	Sum of squared Residuals	15.6400	Sum of squared Residuals	19.7800
	Log likelihood	-48.3500	Log likelihood	-111.510
	AIC	0.2997	AIC	0.6180
	Schwartz Criterion	0.4103	Schwartz Criterion	0.7293

Understanding the determinants of inefficiency allows regulators as well as managers to develop strategies for enhancing efficiency in the banking sector. The Tobit (censored) regressions with boundaries of zero at the left and one at the right is applied and the results are shown in Table 6. The table shows that there is a positive relationship between competition measured by the Lerner Index and cost and revenue efficiency. This implies that an increase in the banking

sector competition increases both the cost and revenue efficiency. This was a result of increased competition in the banking sector as banks fought to increase their deposit base and grow their loan books. Banks were involved in aggressive promotions for their products. These results confirm the "quiet life" hypothesis for the Zimbabwean banking sector which assumed that competition should positively influence efficiency. The results are supported by Schaek and Čihák (2008) who investigated the relationship between efficiency and competition. They found that increased competition increased bank soundness through the efficiency channel.

Capital adequacy has a negative and statistically significant relationship with cost efficiency. The findings appear to suggest that the more efficient banks are less capital intensive and that the less efficient banks hold more capital in the process. This means that some of the highly capitalized banks were enjoying diseconomies of scale hence their efficiency was declining. Smaller banks enjoyed economies of scale which helped them enjoy increased profitability. Another reason for the negative relationship arises from the fact capitalisation of banks was a result of shareholder injection for most banks. Berger & Mester (1997) argued that a banking institution which increases its capital through issuance of additional shares rather than using deposits yields an inverse relationship between efficiency and capitalisation levels. The absence of a relationship between revenue efficiency and capital adequacy is supported by Pasiouras et al. (2007) who did not find any significant relationship between the level of capitalisation and measures of efficiency.

There is a positive and significant relationship between cost efficiency and non-performing loans. This result implies that an increase in the amount of NPLs increases the level of cost efficiency. This result is counterintuitive as credit risk is supposed to be negatively related to cost efficiency. Non-performing loans are also not significant in explaining revenue efficiency of the banks. This is supported by Altunbas *et al*. (2000) who argued that efficiency is not very sensitive to credit risk.

Return on assets has a negative relationship with both cost and revenue efficiency. This implies that profitability has a detrimental effect on cost and revenue efficiency. This arises from the fact that increased profitability is associated with increased market power (reduced competition) which reduces the levels of efficiency. In this case sustained profitability is an indication of market power which has been dragging efficiency.

Cost- income ratio has a positive and statistically significant relationship with both revenue and cost efficiency. A lower CIR ratio may impact performance positively because the use of new electronic technology, for instance ATMs and other automated means of delivering services reduced other types of expenditure hence improves the efficiency of the banks.

Market share has a positive and significant relationship with both revenue and cost efficiency. In Zimbabwean banking sector, an increase in market share could be achieved through intense competition sustainable by efficient banks and those banks enjoying economies of scale in production as argued by Grigorian and Manole 2002). The result supports the Efficient-Structure paradigm, which suggests that relatively efficient banks compete more aggressively for greater market share which leads to a more concentrated market as discussed by Demsetz (1973).

Economic growth has a positive effect on both cost and revenue efficiency. In Zimbabwe both cost and revenue efficiency have been a function of economic activity. Efficiency increased during 2009-12 when the economy was growing and took a downward turn during 2013-14 when the rates of economic growth decelerated. Therefore economic activity has been a driver of the efficiency of banks in Zimbabwe as it boost the demand for banking products. This result is supported by Daley and Mathews (2009) and Delis and Papanikolaou (2009) who found that there is a positive and significant relationship between economic activity and efficiency.

Inflation has a positive and significant relationship with both cost and revenue efficiency. This result arose from the fact that Zimbabwean economy experienced very low rates (negative at times) during the period 2009-2012. The negative inflation rates hinders planning by financial institutions and is harmful to the banking sector (Khan *et al*. 2001). The decline in the inflation negatively impacted financial intermediation. This reduced the efficiency of the banking sector. This result hold to a certain level of inflation beyond which the normal negative relationship would subsists.

6. Conclusion

The study sought to evaluate the cost and revenue efficiency of the Zimbabwean Banking sector using the data envelopment analysis and Tobit regression method. The results shows that banks were operating with cost and revenue inefficiency levels of above thirty percent. This implies that banking institutions

encountered resource wastages in their production of banking services and generation of revenue. The study has shown that banks could produce more banking products using the same level of inputs if they reduce their inefficiency. Alternatively banking institutions could produce more revenue than currently produced without increasing the amount of inputs.

The study illustrates that cost and revenue efficiency increased during the period 2009-2012. The increase in efficiency was a result of increased economic activity which led to an increase in demand for the various banking products. The period was also characterised by intense competition as banks sought to regain market shares which were lost during the period 2000-2008. Cost and revenue efficiency declined in 2013 and 2014. The decline in efficiency is attributed to the memorandum of understanding which was put in place between the central bank and banking institutions. The memorandum of understanding outlined the pricing structure of the banking products. As a result of the MoU the profits of the banking sector declined in 2013. The price controls had a negative impact on cost and revenue efficiency reflected on the decline in the efficiency.

The study revealed that private banks are more revenue-efficient compared to public banks, conversely public banks are more cost-efficient than private banks. The results revealed that domestic banks were relatively efficient compared to foreign banks supporting the home field advantage hypothesis. Commercial banks were superior in relative efficiency (both cost and revenue) compared to building societies. The results are of significance because of the universal banking licence which allows banking institutions to venture into any banking business irrespective of whether there are commercial banks, savings bank or building societies. There are also important given there is freedom of entry and exit in the banking sector. Foreign banks are do not face any restriction to enter the banking sector.

An evaluation of the determinants of the banking sector efficiency suggest that both bank specific factors and macroeconomic factors determines cost and revenue efficiency. The study established that cost and revenue efficiency are determined by banking competition, bank size, credit risk, bank capitalisation, economic growth and inflation. The result implies that efficiency in the banking sector is dependent on the strategies that bank management adopt and also the policy measures put in place to enhance the macroeconomic environment. Policy makers should ensure that they put in place procompetitive policies in order to improve the efficiency of the banking sector. This then calls for the

implementation of financial sector reforms in order to remove all bottlenecks that hinders competition. The study revealed that tampering with market forces is detrimental to the efficiency. The imposition of the memorandum of understanding in 2013 was accompanied by the decline in both revenue and cost efficiency supporting the need for upholding the operations of free market forces. The macroeconomic environment has a bearing on the efficiency of the banking sector in Zimbabwe. This means an increase in economic activities increases the demand for financial services which increases efficiency. This result calls for banking policy makers to put in place user friendly policies that enhances economic activity.

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Acknowledgements

The researchers are indebted to the anonymous reviewers and the Editor in Chief of this journal who provided valuable comments and suggestions in the preliminary drafts of the article. The authors also acknowledges the financial support which was provided by the Economic Research Southern Africa (ERSA).

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