

Factors Influencing the Efficiency of Commercial Banks in Sri Lanka

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Abstract

The important status of the commercial banking sector in the financial environment of the economy has encouraged the researchers to inquire into the determinants of bank efficiency. This study focuses on two aspects related to bank efficiency in Sri Lanka. One is to identify the influence of bank-specific and operating environment factors on bank efficiency. The second is to find whether the ownership types of banks matter in explaining bank efficiency. To this end, two efficiency measures have been employed: Net Interest Margin (NIM) and Return on Assets (ROA). The selected sample consists of fourteen licensed commercial banks. Based on the data during the sample period 2001 – 2011, the estimation of parameters has been done using the random effect panel data approach. There are a few important findings. First, the estimation results associated with the two efficiency measures are somewhat different. Second, except for a few cases, we observe the expected sign of the parameters. Third, the determinants of efficiency vary across the ownership type of the banks. Fourth, in terms of the significance of the proposed determinants, ROA is a more suitable efficiency measure for state banks while NIM is a better measure for private and foreign commercial banks. Finally, there is a tendency for operating environmental factors becoming significant when efficiency is measured in terms of NIM, and bank-specific factors are more important in explaining efficiency when ROA is selected as the proxy.

Key words: bank efficiency, commercial banks, bank-specific factors, operating environment factors, net interest margin, return on average assets.

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Introduction

Commercial banks in Sri Lanka account for a significant percentage of the total assets of the financial system in Sri Lanka. As at the end of 2011, it amounted to 46.4 per cent of total assets of the financial system and 66.6 per cent of total assets of the entire banking sector in the country¹. Commercial banks play an important role in the modern financial services industry and they have become the principal financial intermediary in the fund transfer system. This important status of the commercial banks in the entire financial system in the economy has encouraged the researchers to inquire into the efficiency of the commercial banking sector.

In Sri Lanka, like in most of the other economies, commercial banks can be classified by ownership type into three groups: state-owned banks, private banks and branches of foreign banks. State-owned banks do not enjoy decision-making autonomy as their private counterparts do. They have to satisfy certain needs of the government either openly or through behind the curtain channels. However, there exists a large customer base for state-owned banks. Especially, older generations place much trust in them and rely heavily on them for their banking activities as well as other requirements such as pawning and leasing. However, younger generations seem to rely more on private and foreign banks, which have initiated new financial instruments and offer banking services in a more flexible manner. With the introduction of the new financial instruments by private and foreign banks, state banks seemed to have followed suit. The non-interest return component as a percentage of the total returns is higher in foreign bank branches compared to that percentage of the local banks.

In this context, a researcher can ask a number of relevant questions. We focus on two. The first is: What determines the efficiency of the commercial banks? The second is: Do ownership matter in determining the efficiency in the commercial banking sector. However, there is a dearth of published literature in the Sri Lankan context aimed at answering these questions. The objective of the present study is to make an attempt to answer the two questions.

Tracing the determinants of bank efficiency is important in a few respects. First, the banks themselves can focus on the sources of efficiency in their future planning. Second, it may also strengthen their armoury that can be used against adverse situations like financial crises. This is really important in the context of a capital

¹ Central Bank of Sri Lanka, Annual Report 2012

account that is being gradually liberalized. Third, the findings of a study like this may come in useful for policy makers. According to Edirisuriya (2007), financial sector reforms in Sri Lanka mainly focus on the banking sector, and improvement in bank efficiency is a pre requisite for development.

The remainder of the paper is structured as follows: In the next section, there is a brief literature review carried out with the intention of framing the conceptual model. Then the method is outlined. The section which describes the measures is followed by the presentation of the estimation results. Then these results are discussed with respect to the two measures of efficiency selected for the study. Managerial implications and the limitations of the study are recorded next. The final section contains key concluding remarks.

Literature review

The definitions of cost and profit efficiency correspond with two important economic objectives, namely, cost minimisation and profit maximisation (Maudos, Pastor, Perez and Quesada, 2002). Efficient bank performance implies improvement in profitability, increase in volume of funds channelling through the system and greater safety in terms of improved capital buffers in absorbing risk (Berger, Hunter, & Timme, 1993; Perera, Skully and Wickramanayake, 2007; Ramadan, Kilani and Kaddumi, 2011; Sufian, 2009).

Measuring bank efficiency

Researchers adopt different approaches to measure bank efficiency. The traditional method is based on financial ratios with which one can measure the overall financial soundness of a bank and the operational efficiency of the management (Chen and Yeh, 1998). Financial ratios compare a company's ratio with a benchmark ratio to judge its performance (Al-Shammari and Salimi, 1998). However, Maudos, Pastor, Perez and Quesada (2002) point out that financial ratios are not stable indicators to measure efficiency.

In the literature, various proxy measures are used to evaluate bank efficiency and the scope of these measures is different. Return on Assets (ROA) and Net Interest Margin (NIM) are the common proxy measures used to evaluate bank performance (Humphrey and Pulley, 1997; Demircuc-Kunt and Huizinga, 1999; Wu, Chen and

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Shiu, 2007; Athanasoglou, Brissimis and Delis, 2008; Chatzoglou, Diamantidis, Vraimaki, Polychrou and Chatzitheodorou, 2010; Khrawish, 2011; Sufian, 2012). Computation of ROA involves interest returns as well as non-interest returns while NIM is based only on interest returns.

Kumar and Gulati (2010) describe ROA as an overall performance measure as it captures non-interest return as well. Wu, Chen and Shiu (2007) state that ROA is an appropriate performance measure because it captures the profit efficiency of banks, and those banks that achieve the highest levels of profit are the most efficient banks. However, Maudos, Pastor, Perez and Quesada (2002) are of the opinion that ROA is not an appropriate measure to determine cost and profit efficiency as it fails to capture the dispersion of costs and profits among companies and countries.

NIM is a proxy measure used to evaluate the efficiency of cost of intermediation. According to Ho and Saunders (1981), "the bank is viewed as a dealer in the credit market acting as an intermediary between the demanders and suppliers of funds". Lin, Chung, Hsieh and Wu (2012) suggest that the NIM of a bank is a representation of net interest return and it produces sufficient earnings to enhance the capital base.

In addition to financial ratios, there are supplementary efficiency measurement techniques. One of them is parametric measures. For instance, the Stochastic Frontier Approach (SFA) uses econometric techniques to estimate a frontier and decompose the stochastic term of the regression model into an inefficiency component and a random error (Tochkov and Nenovsky, 2011). An alternative to parametric methods is nonparametric methods such as Data Envelopment Analysis (DEA). It uses mathematical programming to construct a piece-wise linear production frontier that envelops the observed data points and treats all deviations from the frontier as inefficiency. The input and output variables are quite similar to parametric measurements.

Determinants of bank efficiency

Bank efficiency is often expressed as a function of bank-specific and operating environment factors. Previous studies focus on operating expenses, management, capital strength, asset quality, bank size and non-interest income as bank-specific determinants (Demirguc-Kunt and Huizinga, 1999; Kosmidou, 2008; Wu, Chen and Shiu, 2007; Sufian and Habibullah; 2010; Khrawish, 2011; Schiniotakis, 2012; Perera, Skully and Nguyen, 2012).

The empirical findings of Molyneux and Thornton (1992) show that efficient banks are expected to operate at low cost. A few other researchers also agree with the same opinion, which is explained as a negative relationship between efficiency and operating expenses (Kosmidou, 2008; Schiniotakis, 2012; Perera, Skully and Nguyen, 2012). Sufian (2012) mentions that more productive and efficient banks use information technology to reduce operating expenses. As Molyneux and Thornton (1992) reveal, a major portion of operating expenses are comprised of staff cost and it has a strong positive relationship with ROA. This counter-intuitive finding suggests that high profits earned by firms in a regulated industry may motivate them to pay high salaries to their employees.

A strong capital structure is positively related to bank efficiency. Equity to total assets is used as a proxy to measure capital strength of banks (Sufian and Habibullah, 2010). A solid capital base is a buffer for banks to withstand unstable macroeconomic conditions and to increase safety for their depositors (Angbazo, 1997; Athanasoglou et al., 2008; Demirguc-Kunt and Huizinga, 1999; Kosmidou, 2008; Ramadan, Kilani and Kaddumi, 2011).

Poor asset quality causes bank failures (Athanasoglou et al., 2008). It creates a negative impact on both bank's profitability as well as efficiency by reducing the interest income and increasing the provisions costs (Kosmidou, 2008; Schiniotakis, 2012). Asset quality is measured using the ratio of loan loss reserves to gross loans. It indicates how much of the total bad loan portfolio has been provided for but not charged off (Kosmidou, 2008). It is argued that the credit risk is also negatively related to bank efficiency.

Whether the size of the bank could influence performance is an interesting issue for researchers. The empirical results are mixed and some studies disclose a positive relationship between bank size and ROA (Chatzoglou, Diamantidis, Vraimaki, Polychrou and Chatzitheodorou, 2010; Khrawish, 2011; Kosmidou, 2008; Ramadan, Kilani and Kaddumi, 2011; Sufian, 2012; Wu, Chen and Shiu, 2007). However, Kosmidou (2008) mentions that the effect of size is insignificant for ROA and there is a possibility that large banks may generate low profits. Furthermore, Athanasoglou, et al. (2008) and Schiniotakis (2012) are of the view that bank size does not matter in determining the efficiency of commercial banks.

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In addition to bank-specific factors, bank efficiency is influenced by operating environment factors as well. The variables normally cited in the literature are inflation, interest rate, economic growth, regulatory requirements by the authorities and market interest rates. Sufian and Habibullah (2010) focus on the impact of inflation on bank efficiency. Inflation affects performance positively since lending rates adjust upwards faster than fixed deposit rates in order to be in line with inflationary situations. Furthermore, high real interest rates are positively associated with higher interest margins, especially in developing countries (Demirguc-Kunt and Huizinga, 1999; Kosmidou, 2008; Molyneux and Thornton, 1992; Ramadan et al., 2011).

The economic growth represented by the growth rate of GDP determines the demand for and supply of loans and deposits. Demand for financial services tends to grow as the economy expands and societies become wealthier (Sufian and Habibullah, 2010). Therefore, higher GDP growth rates positively affect ROA and NIM (Demirguc-Kunt and Huizinga, 1999). Flannery (1981) is of the opinion that market interest rates impact on commercial bank revenues, costs, and profitability.

Capital adequacy, liquid asset ratio and statutory reserve requirements are the main regulatory requirements imposed by banking regulators (Aluthge, 2001; Demirguc-Kunt and Huizinga, 1999; Molyneux and Thornton, 1992). Demirguc-Kunt, Laeven and Levine (2004) explain that the bank regulations restrict the freedom of bankers to conduct their business to boost NIM. Regulatory requirements increase the cost of operations. Therefore, it has a negative relationship with bank efficiency.

Furthermore, Rouissi and Bouzgarrou (2012) highlight that the influence of determinants may vary with the ownership type of the bank. The study states that, in developing markets, foreign banks show higher efficiency compared to their domestic counterparts. Mercan, Reisman, Yolalan and Emel (2003) show that foreign and privately owned Turkish commercial banks outperform their state-owned competitors. Perera, Skully and Wickramanayake (2007) suggest that state-owned South Asian banks are more inefficient than private-owned ones. This finding is consistent with a number of arguments in the literature that privately held firms should perform better than their state-owned counterparts. Differently, Molyneux and Thornton (1992) argue that ownership status is irrelevant to bank profitability.

Conceptual model

ROA can be thought of as an overall measure of bank efficiency, which includes non-interest returns as well as interest returns. NIM can be taken as a measure of efficiency that is based only on interest returns. We decided to use both measures as the comparison of results associated with two measures is more likely to have important managerial implications. Accordingly, both ROA and NIM are used as dependent variables (denoted by *be* in equations in this and the following sections) in the proposed model.

As discussed in the preceding section, both bank-specific and operating environmental factors are among the potential determinants of the efficiency of banking performance. Accordingly, a set of variables which are more appropriate for use in the Sri Lankan context have been selected as independent variables in the model. Operating expenses management (*oe*), asset quality (*aq*), credit risk (*cr*), capital adequacy (*ca*) and the size of the bank (*bz*) have been selected to be the bank-specific determinants of efficiency. The operating environment factors selected for the study are economic growth (*gr*), inflation (*inf*), market interest rates (*ir*), risk-free investment rate (*rf*) and regulatory requirements (*rr*) by the authorities. The functional dependence in the proposed model is given by equation (1).

$$be = f(oe, aq, cr, ca, bz, gr, inf, ir, rf, rr) \quad (1)$$

Method

The unit of analysis in the study is individual commercial banks. The banking sector in Sri Lanka consists of twelve domestic licensed commercial banks, twelve foreign bank branches and nine licensed specialized banks. The study is limited to licensed commercial banks. Two state-owned commercial banks (People's Bank and Bank of Ceylon), nine domestic private commercial banks (Commercial, HNB, Sampath, Seylan, NDB, DFCC Vardhana, Nations Trust, Pan Asia, and Union) and three foreign bank branches (HSBC, Standard Chartered and Citibank) are included in the sample. One private commercial bank has been eliminated from the sample since it was established later than the beginning of the sample period. Nine foreign bank branches have been excluded for non-availability of data. As at the end of 2011, the selected sample accounts for about 99 per cent of the total assets of commercial banks.

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The sample period involves eleven years from 2001 to 2011. Selection of the sample period is mainly determined by the availability of data. The data sample includes fourteen units (commercial banks) and data related to those fourteen units for eleven time periods (years), thus providing the researchers with 154 observations. It comprises both time series and cross sectional dimensions. Therefore, either pooled or panel data approaches have to be used in order to estimate the relevant parameters. It is a well-known fact that pooled data analysis neglects the heterogeneity among units. On the contrary, panel data analysis explicitly captures the unobserved heterogeneity among units. To test whether the unobserved heterogeneity is present in the data, a redundant fixed effect test is performed. If the test results indicate the presence of unobserved heterogeneity in the data, then the panel data approach has to be employed for the estimation of parameters in order to avoid heterogeneity bias.

In the panel data analysis, there are two estimation methods, namely, fixed effect approach (FE) and random effect approach (RE). In the FE approach, the unobserved heterogeneity among units is assumed to be a time invariant and non-random phenomenon. The RE approach takes the unobserved heterogeneity among units as a time invariant but random component which is assumed to be lumped into the residual term. If unobserved heterogeneity is related to the regressors, the use of FE is usually recommended as the RE estimators will be biased due to the relationship between the regressors and the composite error term. On the other hand, if unobserved heterogeneity is not related to the regressors, then either RE or FE can be used. However, in a situation like this, RE is said to be preferred to FE as the degree of freedom is usually low in the case of FE due to the use of dummies, the number of which is equal to the number of units. The Durbin-Wu-Hausman test is employed to choose between FE and RE.

Equations (2) and (3) depict FE and RE versions of the relevant model².

FE:

$$be_{it} = \sum_{i=1}^n \mu_i D_i + \sum_{j=1}^m \alpha_j X_{ijt} + \sum_{k=1}^l \beta_k Y_{kt} + \varepsilon_{it} \quad (2)$$

² More specifically, the FE model indicated in equation (2) is a least square dummy variable fixed effect model. Alternatively, one can use either first difference or time demeaned fixed effect models.

RE:

$$be_{it} = \mu + \sum_{j=1}^m \alpha_j X_{ijt} + \sum_{k=1}^l \beta_k Y_{kt} + u_{it} \quad (3)$$

where be_{it} is efficiency measure of bank i in period t ; X_{ijt} is bank i 's j^{th} bank-specific factor in period t ; Y_{kt} is k^{th} operating environment factor in period t ; α_j is the coefficient of j^{th} bank-specific factor; β_k is the coefficient of k^{th} operating environment factor; D_i is a dummy variable which is equal to 1 for bank i and 0 otherwise; ε_{it} is stochastic error term; and u_{it} is composite error term which is equal to unobserved heterogeneity plus ε_{it} .

The same model is estimated for both dependent variables. In addition, with each dependent variable, four regressions are run. First, the model is estimated using the entire sample. Then the regressions are run using sub-samples, namely, domestic state-owned banks, domestic private banks, and foreign bank branches. In subsequent sections, these samples are known as 'Overall', 'State', 'Private' and 'Foreign', respectively. The objective of using these sub-sample regressions is to compare the impact of the ownership type on bank efficiency. Parameter estimation is carried out using e-views version 6.

Measures

Return on assets (ROA), the broader measure of bank efficiency out of the two measures selected for this study, is measured by the net income as a percentage of the total assets of a bank. The other efficiency measure net interest margin (NIM) is measured by the difference between the interest paid out by banks on deposits and borrowings and the interest income earned on loans and investments as a percentage of total assets.

Operating expenses management is measured using cost to income ratio (denoted by c). It is expected to explain expenses management relative to the revenue generated by the bank. The ratio of equity to total assets is used as a proxy for the capital adequacy variable (ca). It indicates the bank's capacity to absorb shocks and the stability of the bank. The measurement of asset quality is assumed to be represented by the loan loss provision compared to gross loans (denoted by l). The proxy measure of bank size (bz) is total assets of the bank. As a proxy to the credit

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risk, non-performing loans ratio (denoted by npl), which indicates non-performing loans as a percentage of gross loans, is used.

Growth rate of the real Gross Domestic Production (denoted by $gdpgr$) is used to represent economic growth. Market interest rate is assumed to be represented by the prime lending rate (denoted by plr). The three-months Treasury bill rate (denoted by tbr) has been selected as the substitute for the risk free investment rate. Statutory reserve ratio (denoted by srr) is the proxy measure of regulatory requirements by authorities. Changes in the Colombo Consumer Price Index (CCPI) is used to measure inflation (inf).

Equations (2) and (3) can be rewritten more specifically in terms of the measures suggested for each variable as follows:

$$be_{it} = \sum_{i=1}^n \mu_i D_i + \alpha_1 ci_{it} + \alpha_2 ca_{it} + \alpha_3 ll_{it} + \alpha_4 bz_{it} + \alpha_5 npl_{it} + \beta_1 gdpgr_t + \beta_2 inf_t + \beta_3 srr_t + \beta_4 tbr_t + \beta_5 plr_t + \varepsilon_{it} \quad (4)$$

$$be_{it} = \mu + \alpha_1 ci_{it} + \alpha_2 ca_{it} + \alpha_3 ll_{it} + \alpha_4 bz_{it} + \alpha_5 npl_{it} + \beta_1 gdpgr_t + \beta_2 inf_t + \beta_3 srr_t + \beta_4 tbr_t + \beta_5 plr_t + u_{it} \quad (5)$$

where be_{it} is efficiency measure of bank i in period t ; ci_{it} is operating expenses ratio of firm i in period t ; ca_{it} is capital adequacy of firm i in period t ; ll_{it} is loan loss provision of firm i in period t ; bz_{it} is the size of bank i in period t ; npl_{it} is non-performing loans of firm i in period t ; $gdpgr_t$ is growth rate of real GDP in period t ; inf_t is inflation rate in period t ; srr_t is statutory reserve requirement in period t ; plr_t is prime lending rate in period t ; tbr_t is treasury bill rate in period t .

The study gathered secondary quantitative data for the relevant variables from annual reports of domestic licensed commercial banks, annual reports and other published data of CBSL, rating reports and general articles published by Fitch Rating Lanka and Ram Rating.

Table 1: Descriptive statistics and the correlation matrix

	Mean	Std. D	Kurtosis	Skewnes	J Bera	NIM	ROA	bz	ca	ci	ll	npl	gdpgr	inf	plr	srr	tbr
NIM/ROA	4.71	1.72	11.58	-1.92	567.16	1											
ROA	0.87	3.7	34.2	-4.7	9816.02	0.61	1										
hz	132,670.90*	156,217.90*	7.94	2.07	266.7	0.114	0.108	1									
ca	9.04	6.09	9.54	1.08	304.66	0.332	0.376	-0.263	1								
ci	16.17	538.54	139.64	-11.54	123,230.8	0.344	0.52	0.065	0.055	1							
ll	1.27	2.52	30.63	4.96	5530.68	0.004	-0.182	-0.097	-0.088	0.025	1						
npl	8	8.51	12.31	2.63	733.66	-0.185	-0.381	-0.103	-0.424	0.059	0.315	1					
gdpgr	12.69	3.13	2.43	0.73	15.62	0.279	0.239	0.238	0.243	0.207	-0.098	-0.29	1				
inf	5.48	2.65	4.72	-1.48	74.76	0.032	-0.029	-0.062	-0.065	-0.052	-0.135	0.037	-0.137	1			
plr	12.69	3.13	2.43	0.726	15.616	0.109	-0.014	-0.02	-0.02	-0.042	-0.112	0.019	-0.114	0.912	1		
srr	9.07	1.27	1.66	1.65	24.27	-0.381	-0.149	-0.311	-0.27	-0.057	-0.122	0.043	-0.229	0.179	0.11	1	
tbr	11.12	4.43	3.14	1.13	32.89	0.102	0.005	-0.01	0.005	-0.032	-0.126	-0.043	-0.014	0.845	0.922	0.222	1

Notes: NIM – net interest margin, ROA – return on average assets, npl – non performing loans, ll – loan loss provision, bz – bank size, ca- capital adequacy, ci –operating expenses, inf –inflation, gdpgr – growth rate of gross domestic production, tbr – treasury bill rate, srr – statutory reserve requirement, plr – prime lending rate

* Values are given in Rupees million.

Results

This section includes the descriptive statistics, correlation analysis, results of the fixed effect redundant test and the Hausman test, and presentation of the results obtained from the proposed model with respect to two dependent variables using all four samples.

Descriptive statistics and correlation analysis

Table 1 presents descriptive statistics and correlation matrix of data used in the study. The linear relationship between two proxy measures of efficiency, namely, ROA and NIM, is 0.610. Though the two efficiency measures show a significant positive relationship, they are not perfectly correlated. This supports the view that ROA is a measure that captures efficiency in overall business activities of banks while NIM represents efficiency in only interest-related activities of banks.

Correlations among independent variables are insignificant except for three variables. The correlations between *plr* and *inf*, *inf* and *tbr* and *plr* and *tbr* are 0.912, 0.845 and 0.922, respectively. The high correlation between the two interest rates and the inflation rate can be explained with the help of the Fisher hypothesis which suggests a one-for-one relationship between the nominal interest rate and the inflation rate. Since both *tbr* and *plr* are nominal interest rates, there may also be a tendency that they show a close linear association over time. Accordingly, though they are suggested to be important as the determinants of bank efficiency, in order to avoid multi-collinearity problems, *inf* and *tbr* have been excluded from the analysis. Out of the two interest rates, *plr* is assumed to be more suitable in analyzing bank efficiency and, for that reason, it has been retained.

After these changes, equations (4) and (5) can be rewritten as follows:

$$\begin{aligned}
 be_{it} = & \sum_{i=1}^n \mu_i D_i + \alpha_1 ci_{it} + \alpha_2 ca_{it} + \alpha_3 ll_{it} + \alpha_4 bz_{it} + \alpha_5 npl_{it} + \beta_1 gdpgr_t + \beta_2 srr_t \\
 & + \beta_3 plr_t + \varepsilon_{it} \qquad (6)
 \end{aligned}$$

$$\begin{aligned}
 be_{it} = & \mu + \alpha_1 ci_{it} + \alpha_2 ca_{it} + \alpha_3 ll_{it} + \alpha_4 bz_{it} + \alpha_5 npl_{it} + \beta_1 gdpgr_t + \beta_2 srr_t \\
 & + \beta_3 plr_t + u_{it} \qquad (7)
 \end{aligned}$$

Fixed effect redundant test and Hausman test

Table 2 reports the results of the redundant fixed effect test. As both F and χ^2 statistics imply, the null hypothesis of the absence of unobserved heterogeneity is rejected at even 1% level of significance in favour of the use of the panel data approach. To proceed with the panel data analysis, as the next step, it has to be decided whether to use FE or RE approach. Results of the Hausman test suggest that there is no significant difference between the parameters given by both RE and FE approaches³. Though either FE or RE can be used under circumstances like these, it has been decided to proceed with the more parsimonious RE approach for the task of estimating the parameters of the relevant model.

Table 2: Fixed effect redundant test

Effects Test	Statistic	d.f.	Prob.
Cross-section F	12.6453	(13,132)	0.000
Cross-section Chi-square	124.566	13	0.000

The model with NIM as the measure of bank efficiency

The results related to the estimation of the model wherein dependent variable NIM is reported in Table 3. In the case of the Overall sample, more than 50 per cent of the variation in NIM is explained by the selected bank-specific and operating environment factors. This result is corroborated by the higher F statistic which implies a higher overall fit of the regression. The Durbin-Watson statistic which is equal to 1.026 indicates no positive or negative autocorrelation. Capital adequacy, operating expenses, prime lending rate and statutory reserve ratio seem to be crucial in determining NIM of commercial banks in the Overall sample.

Table 3: Regression results when Net Interest Margin is taken as the efficiency measure

Variable	Coefficient			
	Overall	State	Private	Foreign
μ	6.123 (5.952)	9.243 (4.431)	5.660 (3.619)	5.757 (4.101)
bz	-1.29E-06 (-1.521)	-2.18E06*** (-21.362)	-1.30E-06 (-0.574)	2.86E-06 (1.213)

³ To conserve space, detailed results are not reported here.

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Table 3: Contd...

Variable	Coefficient			
	Overall	State	Private	Foreign
<i>ca</i>	0.122*** (2.472)	0.034 (0.612)	0.197*** (6.879)	-0.031 (-1.579)
<i>ci</i>	0.001*** (14.445)	-0.036*** (-241.34)	0.001*** (10.460)	0.058*** (5.692)
<i>ll</i>	-0.051 (-0.776)	-0.144 (-0.695)	-0.083 (-0.514)	-0.056 (-0.659)
<i>npl</i>	-0.008 (-0.612)	0.02 (0.332)	-0.016 (-0.697)	0.007 (0.195)
<i>gdpgr</i>	0.047 (1.202)	0.057 (0.579)	0.05 (1.082)	-0.014 (-1.297)
<i>plr</i>	0.089*** (2.599)	-0.027 (-1.737)	0.060** (1.916)	0.25*** (5.541)
<i>srr</i>	-0.398*** (-4.447)	-0.175*** (-6.649)	-0.386*** (-2.763)	-0.567*** (-5.588)
R^2	0.548	0.463	0.706	0.613
Adjusted R^2	0.523	0.132	0.680	0.484
Durbin-Watson Stat	1.023	1.733	1.041	1.273
F-Stat	21.953***	1.398	27.028***	4.748***
No. observations	154	22	99	33

Values in parentheses are t-statistics; Estimation of the parameters is based on the model given in Equation (7); *significant at 0.1, **significant at 0.05, *** significant at 0.01

In the State sample, though the R^2 is 0.46, as the insignificant F statistic suggests the overall fit of the model is poor. However, the bank size, operating expenses and the statutory reserve ratio seem to be important in explaining the variations in bank efficiency.

The regressions based on both Private and Foreign samples show relatively high explanatory power and good overall fit. In the case of the Private sample, capital adequacy, operating expenses management, prime lending rate and statutory reserve requirement are crucial in explaining efficiency. However, when we turn to the Foreign sample, this role is played by operating expenses, prime lending rate and statutory reserve requirement.

When all four samples are taken together, capital adequacy, operating expenses, prime lending rate and statutory reserve requirement are the crucial determinants of NIM in the commercial banks in Sri Lanka.

The model with ROA as the measure of bank efficiency

Estimation results of the model in which ROA is the efficiency measure is reported in Table 4. In the overall sample, though the explanatory power of the proposed determinants of bank efficiency is moderate (represented by the R^2 of 0.47), overall fit of the model is strong. Capital adequacy, operating expenses and non-performing loans are the bank-specific factors that are significantly related to ROA. Apparently, none of the macroeconomic factors plays any remarkable role in explaining ROA.

The best explanatory power (given by R^2 of 0.927) and overall fit out of all eight regressions is found in the State sample with ROA as the dependent variable. Except for the prime lending rate, all the other macroeconomic factors and bank specific factors contribute to explaining the variations in ROA during the sample period.

Though the explanatory power in the Private sample is at a satisfactory level (given by R^2 of 0.63), that in the Foreign sample is extremely poor (given by R^2 of 0.16). Operating expenses and non-performing loans are the only significant proposed determinants in the Private sample. In the Foreign sample, it is the bank size and non-performing loans which significantly help explain the variations in ROA.

Table 4: Regression results when Return on Assets is taken as the efficiency measure

Variable	Coefficient			
	Overall	State	Private	Foreign
μ	2.052 (2.237)	-3.282 (-4.613)	3.593 (1.546)	9.986 (2.59)
bz	-1.54E-07 (-0.203)	2.62E-06*** (6.207)	-8.30E-07 (-0.335)	-9.39E-06** (-2.147)
ca	0.145** (1.704)	0.067*** (3.179)	0.201 (2.583)	-0.003 (-0.052)
ci	0.003*** (25.841)	0.028*** (4.752)	0.003*** (16.117)	-0.075*** (-3.228)
li	-0.168 (-0.716)	0.202* (2.021)	-0.441 (-0.845)	-0.001 (-0.016)
npl	-0.118** (-2.107)	-0.005** (-1.813)	-0.165*** (-3.022)	-0.107 (-0.935)

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Table 4: Contd...

Variable	Coefficient			
	Overall	State	Private	Foreign
<i>gdpgr</i>	-0.023 (-0.275)	0.071*** (5.134)	-0.125 (-1.084)	0.22 (1.129)
<i>plr</i>	0.008* (0.125)	-0.01 (-0.307)	0.007 (0.112)	-0.032 (-0.619)
<i>srr</i>	-0.198* (-1.146)	0.075** (2.465)	-0.264 (-0.99)	-0.442 (-1.238)
R^2	0.474	0.927	0.632	0.163
Adjusted R^2	0.445	0.882	0.60	-0.116
Durbin-Watson Stat	1.204	1.558	1.172	1.697
F-Stat	16.321***	20.623***	19.344***	0.583
No. observations	154	22	99	33

Values in parentheses are t-statistics; Estimations of the parameters is based on the model given in Equation (7); *significant at 0.1, **significant at 0.05, *** significant at 0.01

Discussion

In this section, the impact of the significant determinants of bank efficiency is discussed with respect to the two efficiency measures (NIM and ROA) separately. The reason for such a seemingly artificial separation is that it helps the researchers to compare the present findings with findings in previous studies on each of these measures easily. However, in the third sub-section, the results obtained with respect to the two efficiency measures are compared.

The model with NIM as the measure of bank efficiency

The results emerging from all the regressions wherein NIM is taken as the dependent variable indicate that operating expenses, capital adequacy and bank size are the significant bank-specific factors showing a positive relationship with NIM. Operating expenses are the only variable which has common significance in every sample. The importance of the other two variables as the determinants of bank efficiency changes across sub samples. Statutory reserve requirements and prime lending rate are the two operating environment variables that have significant impact on NIM. This is somewhat consistent in all four samples.

The regression results of the Overall sample supports the previous researchers' argument that capital adequacy positively influences bank performance. Previous research findings show that adequately capitalized banks would seek a higher NIM in order to maintain their top positions (Demirguc-Kunt and Huizinga, 1999; Kannan, Narain and Ghosh, 2001; Lin, Chung, Hsieh and Wu, 2012). However, capital adequacy has limited relevance for foreign banks. First, it is due to the better quality of their assets that capital requirement in absolute terms is relatively lower than in the other two types of banks. Second, foreign banks generate a higher return from off-balance-sheet business for which the statutory capital requirement is significantly smaller. In the case of state banks too it is an insignificant factor. There again, the large volumes of state and statutory institutional business they handle carry less statutory capital. We observe that capital adequacy shows a significant positive impact on the efficiency of the private banks.

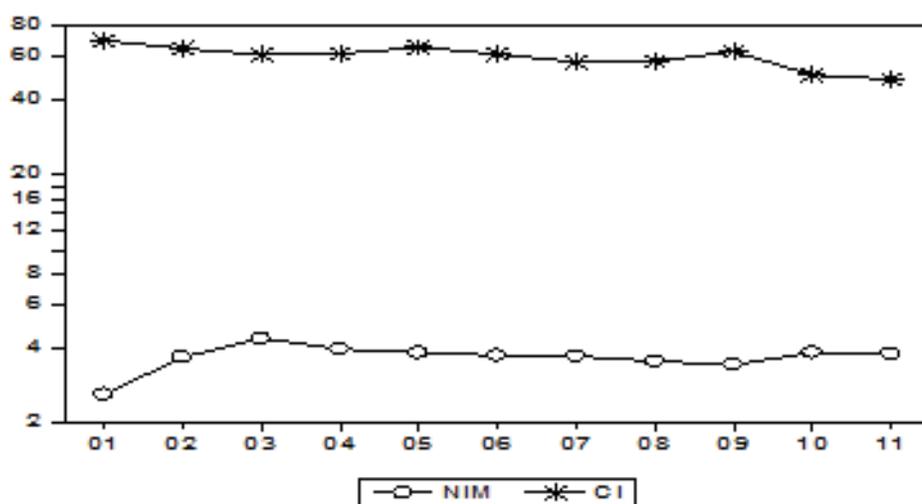
The reason for the significant role of capital adequacy in the Overall and Private samples is that private sector commercial banks handle a variety of customers falling into different risk categories, ranging from 0 to 100 risk weightage. Therefore, these banks have to maintain a comparatively large amount of capital to meet statutory capital standards. When the risk is high, banks tend to keep high interest margins as well. However, state and foreign banks handle primarily two different sets of customers. Foreign bank branches handle top end customers who could obtain a superior credit rating from rating agencies. For them, the statutory capital requirement in absolute values is less compared to any high risk portfolio. The NIM that could be received from such customers is relatively lower. The two state banks transact a fair share of their business with government departments and statutory institutions which could obtain Treasury guarantees for which capital requirements are less. Government organisations pay comparatively lower rates due to their higher credit rating. On the other hand, margins are small. Due to these, capital adequacy may be less important for state and foreign commercial banks when efficiency is measured in terms of NIM.

Athanasoglou et al., (2008) and many other researchers confirm that the operating expenses are negatively and strongly linked to NIM, showing that cost decisions of bank management influence bank performance. As cited by Lin et al., (2012), Maudos and Solis (2009) find that high margins are largely explained by average operating costs. Therefore, the predicted relationship between operating expenses management and NIM is negative. A somewhat surprising finding of our study is that operating expenses management shows a positive relationship with NIM in the

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Overall, Private and Foreign samples. This supports the observations of Khawaja and Din (2007), which emphasize that there could be a positive relation of NIM with administrative cost, which implies that as the profitability of the bank decreases due to the increase in administrative cost, the bank recoups the losses by increasing the spread. This can happen through charging more on loans or paying less to depositors or some combination of the two methods. However, the results associated with the state-owned banks in Sri Lanka support the argument of Athanasoglou et al., (2008) showing a negative relationship. Out of all the commercial banks in the Overall sample, the two state banks record the highest operating expenses ratios. Figure 1 is an illustration of how NIM and operating expenses of Bank of Ceylon vary over time during the sample period. It clearly shows that the negative relationship is common in most of the situations throughout the sample period.

Figure 1: Relationship between Net Interest Margin and Operating Expenses of Bank of Ceylon



Source: Published statistics of Bank of Ceylon

Ho and Saunders (1981) found that bank size is an important factor in determining NIM. They report that large banks maintain small NIM and small banks' NIM is slightly high. Kannan, Narain and Ghosh (2001) find that NIM varies positively with the bank size. However, Athanasoglou, et al. (2008) observes that the bank size does not matter in determining NIM. We find that bank size does not significantly affect NIM in Overall, Private and Foreign samples. However, bank size is significant and negative in the State sample. We observe that the two state banks account for

the highest volume of total assets and their large bank size negatively contributes to NIM. This result in the State sample supports the findings of Ho and Saunders (1981).

Molyneux and Thornton (1992) find a positive association between bank returns and the level of interest rates. Their results suggest that the prime lending rate is a significant variable with a positive influence on NIM. Flannery (1981) mentions that market rate emerges as a prominent influence on bank's costs and revenues. Although there is a greater reliance on interest rate, the effects of market rate changes for loans and deposits may cancel each other out in the case of most of the large banks. We find a significant and positive relationship between the prime lending rate and NIM.

Table 5 presents the composition of total income of all the commercial banks in Sri Lanka. It is evident that more than 75 per cent of the total income is derived from interest income. The fact that interest is the primary source of income may be the reason for the high significance of the prime lending rate on NIM in the Sri Lankan context. However, previous researchers found that the prime lending rate has mixed results over NIM.

Table 5: Composition of the total income of commercial banks

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
II	68	86	81	80	84	111	156	232	287	299	267
NII	14	17	17	25	27	28	31	36	46	49	52
Total Income	82	102	98	105	111	139	188	268	333	348	319
II as a % of Total Income	82.7	83.7	82.4	76.6	75.3	79.9	83.3	86.5	86.1	85.9	83.8

Notes: II – interest income; NII – non-interest income; Values are given in billions of rupees

Source: CBSL published statistics, 2012

The impact of the statutory reserve requirement on NIM is statistically significant and negative. Increase in the statutory reserve ratio is a reduction of investable funds while cost remains unchanged. This will cause the reduction of interest income and thereby bring the interest margin down. Our results confirm the previous research findings. However, there exists an alternative view as well. Higher reserve requirements will constrain bank lending by squeezing excess reserves, lowering the money multiplier, pushing market interest rates higher and widening NIM (Cargill

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and Mayer, 2006; Ma, Xiandong and Xi, 2011). Kalish and Gilbert (1973) raise an alternative argument that bank regulation is not an indicator which causes banks to produce at excessive cost.

There is also a set of variables which do not contribute to bank efficiency when it is measured in terms of NIM. The growth rate of real GDP, non-performing loans and loan loss provisions have a insignificant impact on NIM. However, this contradicts the results reported in Demirguc-Kunt and Huizinga's (1999). Khawaja and Din (2007) also find a significant impact of non-performing loans on NIM. They argue that, as non-performing loans increase, it leads to increased intermediation cost of banks, which translates into lower NIM.

The model with ROA as the measure of bank efficiency

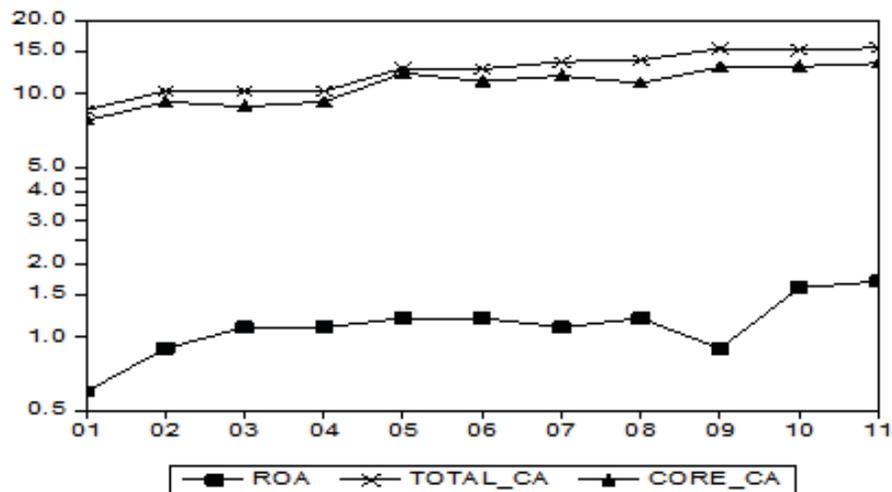
Operating expenses exert a significant impact on ROA in the Overall sample as well as in all three sub samples. In addition to operating expenses, capital adequacy and non-performing loans are also significant variables in explaining ROA in all the samples except for Foreign. However, the relevance of operating environment factors to bank efficiency is very low when it is measured in terms of ROA.

According to most of the studies, there must be a negative relationship between ROA and operating expenses ratio. The banks aiming at increasing profitability are more concerned about lowering their operational cost (Molyneux and Thornton, 1992; Kosmidou, 2008; Schiniotakis, 2012). Athanasoglou et al., (2008) find that the operating expenses are negatively and strongly linked to ROA. However, we find a positive relationship between the two variables, which is consistent with the findings of Molyneux and Thornton (1992), a study which argues that the relationship is positive because a part of high profits earned by firms might have been distributed as performance benefits among employees.

When a bank maintains high capital adequacy, it does not consider external financing much and also bank capital acts as a safety net in the case of adverse developments. Therefore, banks will be able to increase their profitability (Athanasoglou et al., 2008; Khrawish, 2011; Kosmidou, 2008). In addition, well-capitalized banks face lower risk of going bankrupt which reduces their costs of funding. Our findings wherein capital adequacy is significantly positively related to ROA support the above arguments developed in previous studies.

Figure 2 illustrates a positive relationship between capital adequacy and ROA in the entire Sri Lankan commercial banking system. The regression results show that capital adequacy is statistically significant and there exists a positive relationship in Overall and State samples since it is the cheapest source of long term funds.

Figure 2: Relationship between capital adequacy and ROA



Source: CBSL published statistics, 2012

Khrawish (2011) finds that there is a significant positive relationship between bank size and ROA in the commercial banks of Jordan. However, Kosmidou (2008) finds that large banks make low profits. Furthermore, Athanasoglou, et al., (2008) and Schiniotakis (2012) are of the view that bank size does not matter in determining the efficiency of commercial banks. The results of this study more or less support the findings of Athanasoglou, et al. (2008) and Schiniotakis (2012). When bank efficiency is measured in terms of ROA, we find mixed results. Bank size is a significant determinant that negatively affects ROA only in the case of foreign banks. The relationship between bank size and ROA is significantly positive in the case of state banks.

Non-performing loans arise due to the poor quality of assets in the bank's loans portfolio. Higher efficiency is expected to be correlated with better credit risk evaluation or a lower non-performing loan ratio (Goddard, Molyneux & Wilson, 2004). Barr, Killgo, Siems and Zimmel (2002) also confirm the negative relationship between bank efficiency and non-performing loans. In terms of ROA, non-performing

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loans are a negative significant determinant of bank efficiency in Overall, State and Private samples. These results confirm earlier findings.

Aluthge (2001) argues that profits are depressed with the increasing statutory reserve ratio. Our findings with respect to Overall, Private and Foreign samples provide empirical evidence for this argument. However, we find a positive significant relationship between the statutory reserve ratio and ROA when it comes to the state banks. Bringing out a reason for this strange relationship remains a difficult task.

The growth rate of real GDP is expected to have a positive relationship with the performance level (Khravish, 2011). Favourable economic conditions may have a positive effect on the demand for and supply of banking services (Sufian, 2009). Surprisingly, economic growth exerts a significant impact with the expected positive sign only in the State sample. In all the other samples it remains an insignificant factor. Molyneux and Thornton (1992) show a positive relationship between interest rate and profitability. However, we find that the prime lending rate does not have a significant impact on ROA. It is weakly significant (at 10% level) only in the Overall sample. The higher loan loss reserves imply higher risk on assets or poor asset quality. If the asset quality is poor, there exists a higher probability of an increase in default risk which will subsequently lower the bank's profitability (Athanasoglou, et al., 2008; San and Heng, 2013). However, contrary to these arguments and previous findings, we observe that the impact of loan loss provision ratio on ROA is positive and significant (only at 10% level of significance) among state banks. In all the other samples, loan loss provision remains an insignificant factor.

Comparison of the results with respect to ROA and NIM

We observe that the same set of independent variables behave in a somewhat different manner with two measures of bank efficiency. This result is partly explained by the absence of a close linear association between ROA and NIM⁴. Conceptually, while ROA covers both interest as well as non-interest returns, NIM is based only on interest returns. Therefore, one can argue that ROA is a more comprehensive measure than NIM.

Out of eight proposed determinants, six are significant in explaining the efficiency of state banks when efficiency is measured in terms of ROA. However, the number of significant factors for state banks comes down to three when efficiency is expressed

⁴ As Table 1 indicates, the correlation between ROA and NIM is 0.61.

in terms of NIM. This observation suggests that, in terms of the efficiency sources used in the study, ROA is a better measure of efficiency for state banks in Sri Lanka. On the contrary, based on the same reasoning, NIM can be suggested as a better measure of efficiency for both private banks and foreign bank branches in Sri Lanka⁵. Furthermore, efficiency of the state banks is better explained by the selected set of explanatory variables when ROA is selected to be the dependent variable⁶. However, with the same set of explanatory variables, the efficiency of both private and foreign banks is better explained when efficiency is measured in terms of NIM⁷. One reason for these observations may be the variation in the breakdown of interest and non-interest returns across three types of banks. The interest and non-interest return components of state, private and foreign banks are 84% and 14%, 83% and 17% and 72% and 28%, respectively. The absence of an explanatory variable that adequately captures the non-interest return component may be another reason.

Another notable observation is that the importance of the operating environmental factors is well reflected in the results when efficiency is measured in terms of NIM. On the other hand, bank-specific factors play a more important role in explaining efficiency when efficiency is measured in terms of ROA⁸.

The use of NIM and ROA as efficiency measures leads to contradictory results as well. For instance, in the case of state banks, the relationship between bank size and NIM is negatively significant whereas the relationship between bank size and ROA is positively significant. A similar type of contradiction is found in the relationships of statutory reserve ratio with ROA and NIM of state banks. The former is positive while the latter is negative.

Managerial implications

This paper offers two important observations that may come in useful for any decision-making party who would use ROA and NIM as efficiency measures. First,

5 In Private sample, coefficients of *ca*, *ci*, *plr* and *srr* are significant when NIM is used as the efficiency measure. However, when ROA is taken as the efficiency measure, only the coefficients of *ci* and *npl* are significant. When it turns to the Foreign sample, coefficients of *ci*, *plr* and *srr* are significant with NIM whereas the coefficients of only *bz* and *ci* are significant with ROA.

6 Compare R^2 values: 0.463 with NIM and 0.927 with ROA

7 Compare R^2 values: among private banks it is 0.706 with NIM but 0.632 with ROA; among foreign banks, it is 0.613 with NIM but 0.163 with ROA.

8 Reader is referred to Tables 3 and 4.

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the two measures respond to various sources of determinants differently. Second, their responsiveness to the same set of efficiency sources varies across different ownership types of commercial banks.

The result that the determinants of efficiency vary across ownership types of commercial banks has important implications for the strategic planning of each type. For instance, an important source of efficiency for foreign banks is prudent operating expenses management. They need to take the negative relationship between bank size and efficiency into account seriously. Their efficiency is closely associated with macroeconomic variables such as the prime lending rate and statutory reserve ratio as well. However, when it comes to the state banks, the focus must be on the decisions related to proper operating expenses management, capital adequacy and reducing non-performing loans. Being state banks, their efficiency does not rely much on the prime lending rate. However, they seem to benefit from economic growth.

We find that capital adequacy positively contributes to bank efficiency. This implies that practising managers should consider the possibility of improving capital strength beyond the statutory requirements to enhance bank performance. Similarly, our results show that operating expenses contribute positively to the bank's profits. The increase in profits surpasses the increase in costs. Hence, management of banks may concentrate on a proper balance between operating expenses and performance.

The Central Bank of Sri Lanka (CBSL) often inspects how reasonable the prevailing NIM in our banking system is comparing it with banking systems elsewhere (Perera, Skully, & Wickramanayake, 2007). It may be due to the fact that CBSL is more interested in upholding benefits for savers and borrowers. However, whether NIM is a proper measure for this purpose is a sensible question that can be raised. For instance, the three foreign banks in our sample make more than one fourth of their income from non-interest sources. Therefore, in measuring efficiency, the regulators need to pay attention to non-interest sources of income for the banks as well. Accordingly, CBSL can reconsider ROA as a banking efficiency measure to view the broader picture and thereby safeguard the interests of not only the depositors and borrowers but also the users of other banking services.

Limitations and directions for future research

To capture the transition period accurately, the most critical point for commencing the sample period for the study is the year 1998. However, due to the non-availability of financial information in a few banks, the study was based on the data for the period 2001 – 2011. During the period 1998 – 2001, commercial banks in Sri Lanka recorded an average ROA of 0.3 per cent. The results of this study would have been different if those three years were included in the sample period. Athanasoglou et al. (2008) find that inflation has a significant impact on bank performance in Greece. However, as explained in the Results section, the inflation variable has been excluded in this study in order to avoid multi-collinearity problems.

Conclusions

The objectives of this paper are to identify the determinants of bank efficiency and to find whether the ownership matters in determining efficiency among commercial banks in Sri Lanka. Based on the data from the sample period from 2001 to 2011, the random effect panel data approach brings out a number of important findings.

First, the estimation results associated with the two efficiency measures are somewhat different. When NIM is taken as the proxy for bank efficiency, operating expenses management, capital adequacy and bank size are the significant bank-specific factors that determine efficiency. Significant operating environment factors are prime lending rate and the statutory reserve requirement. When bank efficiency is represented by ROA, in addition to operating expenses management, capital adequacy, bank size and non-performing loans also become significant in determining efficiency. However, the evidence for the impact of operating environment factors is very weak with ROA.

Second, except for a few cases, we observe the expected sign of the parameters. Capital adequacy and prime lending rate are positively related to efficiency whereas statutory reserve requirements and non-performing loans show a negative relationship with bank efficiency. Except for the state-owned banks, operating expenses management is somewhat surprisingly positively related to bank efficiency. The size of the bank shows an awkward relationship with the two measures of efficiency. It is positively related to ROA and negatively related to NIM in the case of state banks. However, bank size negatively influences the efficiency of the foreign banks in Sri Lanka. The statutory reserve ratio also shows different results with the two efficiency measures.

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Third, there are two proposed determinants which do not have a notably significant impact on bank efficiency. For instance, loan loss provision is not a determinant of bank efficiency among the selected sample of all fourteen commercial banks during the sample period. Economic growth has a significant positive impact only on the efficiency of state banks when efficiency is measured in terms of ROA.

Fourth, the determinants of efficiency vary across the ownership type of the banks. In the case of state-owned commercial banks, operating expenses management, capital adequacy, bank size, non-performing loans, economic growth and statutory reserve requirement are the significant determinants of efficiency. In the case of private commercial banks, operating expenses management, capital adequacy, prime lending rate and statutory reserve requirements are significant in explaining efficiency. Operating expenses management, bank size, prime lending rate and statutory reserve requirement are the determinants of efficiency in the foreign banks in Sri Lanka.

Fifth, in terms of the significance of the proposed determinants, ROA is a more suitable efficiency measure for state banks. On this reasoning, NIM is a better measure of efficiency for private and foreign commercial banks. Finally, there is a tendency that operating environmental factors become significant when efficiency is measured in terms of NIM. However, bank-specific factors are more important in explaining efficiency when ROA is selected to be the proxy.

References

- Al-Shammari, M., & Salimi, A. (1998). Modelling the operating efficiency of banks: a nonparametric methodology. *Logistics Information Management*, 11 (1), 5-17.
- Aluthge, C. (2001). *Financial sector liberalisation in Sri Lanka: a macro level inquiry into capital accumulation, investment, growth and stability*, Amsterdam: Free University.
- Angbazo, L. (1997). Commercial bank net interest margins, default risk, interest-rate risk, and off-balance sheet banking. *Journal of Banking & Finance*, 21, 55-87.
- Athanasoglou, P. P., Brissimis, S. N., & Delis, N. D. (2008). Bank-specific, industry-specific and macroeconomic determinants of bank profitability. *Journal of International Financial Markets, Institutions and Money*, 18. 121–136.
- Barr, R. S., Killgo, K. A., Siems, T. F., & Zimmel, S. (2002). Evaluating the productive efficiency and performance of US commercial banks. *Managerial Finance*, 28 (8). 3-25.

Berger, A. N., Hunter, W. C., & Timme, S. G. (1993). The efficiency of financial institutions: A review and preview of research past, present, and future. *Journal of Banking and Finance*, 17. 221-249.

Cargill, T. F. & Mayer, T. (2006). The Effect of Changes in Reserve Requirements during the 1930s: The Evidence from Nonmember Banks. *The Journal of Economic History*, 66 (2). 417-432.

Central Bank of Sri Lanka. (2012). *Annual report*. Colombo.

Chatzoglou, P. D., Diamantidis, A. D., Vraimaki, E., Polychrou, E., & Chatzitheodorou, K. (2010). Banking productivity: an overview of the Greek banking system. *Managerial Finance*, 36 (12). 1007–1027.

Chen, T., & Yeh, T. (1998). A study of efficiency evaluation in Taiwan's banks. *International Journal of Service Industry Management*, 9 (5). 402 – 415.

Demirguc-Kunt, A., & Huizinga, H. (1999). Determinants of commercial bank interest margins and profitability: some international evidence. *The World Bank Economic Review*, 13 (2) 379-408.

Demirguc-Kunt, A., Laeven, L., & Levine, R. (2004). Regulations, Market Structure, Institutions, and the Cost of Financial Intermediation. *Journal of Money, Credit and Banking*, 36 (3). 593-622.

Edirisuriya, P. (2007). Effects of financial sector reforms in Sri Lanka: evidence from the banking sector. *Asia Pacific Journal of Finance and Banking Research*, 1 (1). 45-64.

Flannery, M. J. (1981). Market interest rates and commercial bank profitability: an empirical investigation. *The Journal of Finance*, 36 (5). 1085-1101.

Goddard, J., Molyneux, P., & Wilson, J. O. S. (2004). Dynamics of growth and profitability in banking. *Journal of Money, Credit and Banking*, 36 (6). 1069-1090.

Ho, T. S. Y., & Saunders, A. (1981). The determinants of bank interest margins: theory and empirical evidence. *The Journal of Financial and Quantitative Analysis*, 16 (4). 581-600.

Humphrey, D. B., & Pulley, L. B. (1997). Banks' responses to deregulation: profits, technology, and efficiency. *Journal of Money, Credit and Banking*, 29 (1), 73-93.

Kalish, L., & Gilbert, R. A. (1973). An analysis of efficiency of scale and organisational form in commercial banking. *Journal of Economics*, 21. 293-307.

Kannan, R., Narain, A., & Ghosh, S. (2001). Determinants of net interest margin under regulatory requirements: an econometric study. *Economic and Political Weekly*, 36 (4). 337-344.

Khawaja, M. I., & Din, M. (2007). Determinants of interest spread in Pakistan. *The Pakistan Development Review*, 46 (2). 129-143.

Khrawish, H. A. (2011). Determinants of Commercial Banks Performance: Evidence from Jordan. *International Research Journal of Finance and Economics*, 81. 148-159.

Factors Influencing the Efficiency of Commercial Banks in Sri Lanka

- Kosmidou, K. (2008). The determinants of banks' profits in Greece during the period of EU financial integration. *Managerial Finance*, 34 (3). 146–159.
- Kumar, S., & Gulati, R. (2010). Measuring efficiency, effectiveness and performance of Indian public sector banks. *International Journal of Productivity and Performance Management*, 59(1). 51-74.
- Lin, J., Chung, H., & Hsieh, M., & Wu, S. (2012). The determinants of interest margins and their effect on bank diversification: Evidence from Asian banks. *Journal of Financial Stability*, 8. 96–106.
- Ma, G., Xiandong, Y., & Xi, L. (2011). China's evolving reserve requirements. *Bank for International statement working papers*, 360. 1-29.
- Maudos, J., Pastor, J. M., Perez, F., & Quesada, J. (2002). Cost and profit efficiency in European banks. *Journal of International Financial Markets, Institutions and Money*, 12. 33–58.
- Mercan, M., Reisman, A., Yolalan, R., & Emel, A. B. (2003). The effect of scale and mode of ownership on the financial performance of the Turkish banking sector: results of a DEA-based analysis. *Socio-Economic Planning Sciences*, 37. 185–202.
- Molyneux, P., & Thornton, J. (1992). Determinants of European bank profitability: A note. *Journal of Banking and Finance*, 16. 1173-1178.
- Perera, S., Skully, M., & Nguyen, M. (2012). Market concentration and pricing behaviour of Sri Lankan banks. *South Asian Journal of Global Business Research*, 1 (1). 63-78.
- Perera, S., Skully, M., & Wickramanayake, J. (2007). Cost efficiency in South Asian banking: the impact of bank size, state ownership and stock exchange listing. *International Review of Finance*, 7 (1). 35–60.
- Ramadan, I. Z., Kilani, Q. A., & Kaddumi, T. A. (2011). Determinants of bank profitability: evidence from Jordan. *International Journal of Academic Research*, 3 (4). 180-191.
- Rouissi, R. B., & Bouzgarrou, H. (2012). Cost efficiency of French commercial banks: domestic versus foreign banks. *The International Journal of Business and Finance Research*, 6 (4). 101-112.
- San, O. T., & Heng, T. B. (2013). Factors affecting the profitability of Malaysian commercial banks. *African Journal of Business Management*, 7 (8). 649-660.
- Schiniotakis, N. I. (2012). Profitability factors and efficiency of Greek banks. *EuroMed Journal of Business*, 7 (2). 185–200.
- Sufian, F. (2009). Factors Influencing Bank Profitability in a Developing Economy: Empirical Evidence from Malaysia. *Global Business Review*, 10 (2). 225-241.
- Sufian, F. (2012). For which option is credit risk more representative on China banks' total factor productivity: Efficiency change or technological progress? *China Finance Review International*, 2 (2). 180–202.

Sufian, F., & Habibullah, M. S. (2010). Bank-specific, industry-specific and macroeconomic determinants of bank efficiency: Empirical evidence from the Thai banking sector. *Journal of Applied Economic Research*, 4 (4). 427-461.

Tochkov, K. & Nenovsky, N. (2011). Institutional reforms, EU accession, and bank efficiency in transition economies: evidence from Bulgaria. *Emerging Markets Finance & Trade*, 47(1). 113-129.

Wu, H., Chen, C., & Shiu, F. (2007). The impact of financial development and bank characteristics on the operational performance of commercial banks in the Chinese transitional economy. *Journal of Economic Studies*, 34 (5). 401–414.