Profitability Determinants of the Ghanaian Banking Sector in Ongoing Wave of Consolidation

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Abstract

The purpose of this research is to examine the influence of both internal and external factors that determine the profitability of Ghanaian banks. The period under consideration extends from 1997-2014. To determine factors that determine the commercial bank profitability in Ghana, the research employed random effects and pooled ordinary least square models. Internal variables, both financial and non-financial were obtained from the database of Ghana Association of Bankers over the period 1997-2014. The macroeconomic variables were retrieved from Ghana Statistical Service (GSS) and Bank of Ghana (BOG) databases. The results of our study reveal that internal and external variables significantly influence bank profitability, non-interest income is not the sole determinant of profitability as other internal variables, such as capital to assets, GDP growth are statistically significant. However, determinants such as liquidity, deposit ratio, overhead, non-performing loans, number of employees, inflation and real interest rate do not impact significantly on banks' profitability in Ghana. The research could not include more qualitative factors. Future research could include more qualitative factors, for example, management leadership style with the quantitative factors and test the long run effects using a cointegration approach. The main value of this paper is the analysis of new empirical evidence using a current data.

Keywords: profitability, Ghanaian banks, inflation, determinants

1. Introduction

The efficiency and stability of the financial sector are important to economic growth (Levine, 1997; Rajan & Zingales, 1998). Researchers have argued that economic growth can never be achieved without the development of the financial sector (Lin & Nugent, 1995). Ghana's financial sector is regarded relatively well developed. The recent financial crisis has showed that an efficient financial system is critical for economic growth. Bawumia et al. (2008) indicate that the banking sector accounts for 70% of the financial sector banking. This implies that the sector plays an important role since a failure of this sector could have adverse effect on the entire economy. The industry's profit before tax margin has improved significantly from 17% to 45.3% between 2009 to 2013 respectively. In the period under study, the return on assets (ROA) improved significantly from 1.4% to 4.1%.Between 2012 and 2013, total assets grew by 13% from GHS27, 100m to GHS36, 100m. Average Return on equity in the same period stood at 27.5% from 23.8%. Although the industry profitability was affected during the financial melt down between 2008 and 2011, the impact or the losses were significant. Besides, within the Sub-Saharan Africa banks appear to be very profitable. Flamini et al. (2009) found that for the past 10 years the average returns on assets stood at 2 percent clearly above the other parts of the world.

Recently, determinants of banks profitability have been debated and received a lot of scholarly attention. In 2010, the then governor of the central bank of Ghana posed a question "what factors have been driving higher profits in the banks in Ghana?" (Daily Graphic, 2010). This question has drafted many researchers and policy makers into several debates in Ghana, all in the pursuit to derive some reasons for the huge performance gab among Ghanaian banks. Factors that determine commercial bank profitability have been supported theoretically but it lacks an empirical support. The present study seeks to examine the influence of both internal and external factors that determine commercial banks profitability in Ghana in the ongoing wave of consolidation. Mullineaux (1978) study concludes that the composition of balance sheet has significant effects on profitability. The relationship can either be positive or negative depending on the structure of the balance sheet items. This makes previous

research mixed and inconclusive. The inconclusive findings of previous studies indicate that this problem deserves new research. First and foremost, findings from this research would contribute immensely in formulating future policies by bank managers and regulatory authorities which would target in improving the profitability of the commercial banks. In addition, since early 2011 the banking sector has witnessed significant amount of merger and activities with some observers predicting further merger activity and view recent capital requirement increases as being aimed at spurring consolidation (Essien, 2014). Therefore the relevance of this study for the ongoing wave of consolidation banking markets cannot be under estimated. Finally, there is no recent study on the factors that determines commercial banks profitability in Ghana using a current data.

The study employed random effects and pooled ordinary least square models to examine the factors that determine commercial Bank profitability in Ghana using data from 1997 to 2014. The study sample period is seen to be adequate and important to draw robust results about the significant determinants of commercial banks profitability.

The rest of the paper is organized as follows: The next session provides a review of related studies. Section three describes the data and methodology. Section four discusses the results of the empirical analysis and section five provides discussions and recommendation of the study.

2. Related Studies

Recent studies have focused more attention on factors that determines commercial bank profitability. The bank profitability determinants are grouped into internal factors (Bank specific) and external factors (country specific). Among the internal factors are financial statements factors and non-financial statement factors such as number of employees and number of branches. Mullineaux (1978) and Hester and Zoellner (1996) studies found that changes in balance sheet items affect bank profitability significantly. Heggested (1977), note that liability items and assets items have an adverse and positive impact on profitability respectively. Emery (1971) also found positive impact on profitability whiles Heggested (1977) Smirlock (1985) and Kwast and Rose (1982), found that size has no effect on profitability. Hester and Zoellner (1966) also found no relationship between size and profitability.

Bourke (1989), the first to capture internal variables in a profitability study, revealed that all internal variables were directly associated to profitability. Molyneux and Thornton (1992) found similar results to support Bourke's study using all European banks in their study sample. Effects of internal determinants on bank profitability have been studied by a lot of researchers using American data and among these notable researchers are Hester and Zoellner (1966), Haslem (1968, 1969), Fraser and Rose (1971), Fraser et al. (1974), Heggested (1977), Mullineaux (1978), Kwast and Rose (1982), Smirlock (1985), except Bourke (1989), Molyneux and Thornton (1992) and Stienherr and Huveneers (1994) which used international data. Fraser and Rose (1971) and Haslem (1968) found that balance sheet items and portfolio selection do not affect profitability. Similarly, Haron (2004) finds that money supply, liquidity, expenditures and the levels of interest rates have positive influence on profitability whereas capital and market share affect profitability negatively. Hassan & Bashir (2003) note that an increase in capital ratio and loan ratios affect profitability measures positively and negatively respectively. Haron and Azmi (2004) study also conclude that market share capital structure, liquidity and bank sizes have no impact, while deposit, asset structure, total expenditures, consumer price index and money supply affect profitability significantly. Naceur (2003) concludes that the stock market development, capital ratio and loans positively affect profitability whereas bank's size shows a negative impact.

This study will use return on asset (ROA) as one measure of profitability to capture the effects of determinants (internal and external) on commercial bank profitability. Keeton and Matsunga (1985) argue that ROA is a superior indicator of calculating bank profitability since it measures how profitably and efficiently management is using its assets. The following research works have adopted ROA as an adequate indicator of measuring commercial bank profitability: Haron (2004), Hassan and Bashir (2003), Bashir (2001), Demirgüç-Kunt and Huizinga (1998), Naceur (2003), Alkassim (2005), and Alrashdan (2002). Among the internal factors to be adopted in this study and operationalised are: liquidity ratio, capital structure, deposit structure, expenditure structure, efficiency, asset quality and bank size. External determinants of profitability are Gross domestic products (GDP) growth measuring economic growth, interest rate and inflation. These factors that are not under management control (Rasia, 2010). Among the widely discussed external variables to be used in this research are economic growth, inflation and real interest rate. The main objective is to see how the profitability of commercial banks responds to changes in these factors.

First and foremost, liquidity ratio is measured by the liquid assets over total assets. It measures the ability of banks to meet short-term obligation or commitments when they fall due. Banking regulators consider liquidity as

a major concern for banks since a shortage can trigger bank failure. Various studies used different measures for liquidity including Bashir (2001), Hassan and Bashir (2003), and Alkassim (2005). Indeed, Guru et al. (1999) and Molyneux and Thornton (1992) found that inverse relationship exists between the level of liquidity and profitability. Notwithstanding, Kosmidou et al. (2005) and Bourke (1989), found a direct correlation between liquidity and bank profits. The mixed result requires further empirical work.

Hypothesis 1: There is a direct association between liquidity and profitability.

The capital ratio as a proxy for capital structure is also utilized as a safety indicator. Alkassim (2005) confirms an inverse effect of capital on profitability of commercial banks. Hassan and Bashir (2003) and Haron (2004) find a strong and direct association between capital and return on assets. Bashir (2001) had earlier years confirmed this position and supported by Athanasoglou et al. (2008), who note that capital is essential in explaining bank profitability. The study therefore expects a direct correlationship between the amount of capital and the bank's profitability.

Hypotheis 2: There is a direct association between the capital structure and profitability.

The customers' deposit over total assets is widely used as a deposit structure. Heggested (1977), Smirlock (1985) and Alkassim (2005) confirmed that demand deposits are positively related to bank profitability but an inverse with time and saving deposit. Demirgüç-Kunt and Huizinga (1998) empirically tested this relationship and concluded that that commercial Banks that depend hugely on deposits as their main sources of funds were less profitable because of the inherent expenditure in attracting such deposit. Thus, the study hypothesizes the following relationship:

Hypothesize 3: There is a direct association between deposit structure and bank profitability.

Overhead as a proxy for expenditure structure variable represents the banks entire overhead over total assets and is a good measure of management efficiency. Bashir (2001) and Hassan and Bashir (2003) confirm relationship between overhead expenses and bank's profitability. Stienherr and Huveneers (1994), Demirgüç-Kunt and Huizinga (1998) and Haron (2004) findings revealed commercial bank's profitability would respond positively to variations in operating costs since these overheads are later on transferred to their customers (both depositors and lenders). Alrashdan (2002) however, contradicts these findings and affirms an inverse association between interest cost and return on assets as a profitability measurement. This study hypothesizes a negative relationship since best managers are judged based on their ability to control operating cost.

Hypothesize 4: There is a negative relationship between expenditure structure and bank profitability

Non-interest income which includes foreign exchange profit, guarantee fees, commission, fees and service charges have been used as a proxy measure of bank efficiency. Bolda and Verma (2006) analysis indicated that contingencies and spread, operating expenses, non-interest income, provision and have significant relationship with net profit. This study hypothesizes a direct association between efficiency and bank profitability.

Hypothesis 5: There is a positive relationship between efficiency and bank profitability.

Provision for bad loans to advances measures the credit quality of the bank. The relationship between the quality of assets and bank profitability has not been underestimated by many researchers. Among the studies are DeYoung and Rice (2004), Athanasoglou et al. (2008), Alexiou and Sofoklis (2009) and Chiorazzo et al. (2008). Kosmidou (2008), confirm that poor asset quality can have adverse impact on bank profitability which clearly supports the risk return hypothesis. Thakor (1987) and Miller and Noulas (1997) also suggest future performance responds largely to the level of loan loss provisions i.e. unpaid loans decreases profitability. Consequently, the study exhibits the following hypothesis:

Hypothesis 6: There is a negative association between assets quality and bank profitability.

The size of a firm can be measured using assets, sales and employees. The study uses employees as a measure of size. Haron (2004) and Hassan and Bashir (2003) find opposite results between size and profitability. Whiles the former finds a direct relationship, the later confirms a negative relationship. The study hypothesizes an inverse relationship between profitability and the number of employees. The negative sign would indicate that the rate of increase in profitability responds to a variation in the number of employees.

Hypothesis 7: There is a negative relationship between number of employees and bank profitability.

Gross domestic products (GDP) which is used as a proxy for economic growth and a good measure of total economic activity within a country. Economic growth is expected to have a direct impact on bank profitability (Athanasoglou et al., 2008; DemirgucKunt & Huizinga, 1999). Athanasoglou et al. (2008) and Calza et al. (2003) have shown that when economic conditions is improved, it affects the liquidity position of borrowers and

demand for household which affects the profitability of the bank. In contrast, poor economic conditions have the tendency of worsening quality of loan portfolio thereby reducing bank profitability. Thus, the study hypothesizes a positive relationship.

Hypothesis 8: There is a positive relationship between economic growth and bank profitability.

Another variable which is not under the management control is inflation. This is measured by the percentage increase in consumer price index. Haron and Azmi (2004) and Staikouras and Wood (2003) confirmed that inflation impact positively on profitability. Bourke (1989) and Molyneux and Thornton (1992) empirically tested Revell (1979) findings which suggested that bank profitability responds positively to variations in inflation. Heggested (1977) indicates no relationship between inflation and a bank's profitability. The effect of inflation on bank profitability depends on whether inflation is anticipated or unanticipated (Perry, 1992)

Hypothesis 9: There is a positive relationship between inflation and bank profitability

Studies by Bourke (1989), Claeys and Vander Vennet (2008), DemirgucKunt and Huizinga (1999), Garcıa-Herrero et al. (2009) and Molyneux and Thornton (1992). Avkiran (2009) notes that, interest rates negatively affect commercial bank profitability. The study formulates two hypotheses.

Hypothesis 10a: There is a positive relationship between interest rates and bank profitability.

Hypothesis 10b: There is a inverse relationship between interest rates and bank profitability.

3. Data and Methodology

Internal variables both financial and non-financial were collected from the financial statements of the sampled commercial banks operating in Ghana compiled by Ghana Association of Bankers over the period 1997–2014. The macroeconomic variables are retrieved from Ghana Statistical Service (GSS) and Bank of Ghana (BOG) respectively. Dependable variable, independent variables and expected signs are displayed in Table 1.

Table 1. Dependable variables, Independent variables and expected signs

Variables	Definition	Hypothesized relationship
Dependable Variables		
ROA	Return on assets	N/A
Independable Variables		
Internal factors		
LIQ	Liquidity	+
CTA	Capital/Total assets	+
DEPTA	Deposits/Total assets	+
OVTA	Overhead/Total assets	-
NOIITA	Non-interest income/Total assets	+
NPLTA	Non-performing loans/Total Loans	-
NEMP	Number of employees	-
External factors		
GDPG	Gross Domestic Product Growth	+
INFL	Inflation	+
IRR	Real Interest Rate	-/+

Note. The data for the calculation of internal factors were obtained from the financial statements of a sample of commercial banks operating in Ghana compiled by Ghana Association of Bankers over the period 1997–2014 The macroeconomic variables are retrieved from Ghana Statistical Service (GSS) and Bank of Ghana (BOG) respectively.

3.1 Econometric Specification

To estimate the determinants of bank profitability of Ghanaian banks, the model employed is specified as follows:

$$ROA_{it} = \beta_0 + \beta_1 LIQ_{it} + \beta_2 CTA_{it} + \beta_3 DEPTA_{it} + \beta_4 OVTA_{it} + \beta_5 NOIITA_{it} + \beta_6 NPLTA_{it} + \beta_7 NEMP_{it} + \beta_8 GDPG_{it} + \beta_9 NFL_{it} + \beta_{10} RIR_{it} + \varepsilon_{it}$$

Where ROA is return on assets, LIQ is Liquidity ratio, CTA is capital to total assets ratio, DEPTA is deposits to total assets ratio, OVTA is overhead to total assets ratio, NOIITA is non-interest income to total assets ratio,

NPLTA is non-performing loans to total assets ratio, NEMP is number of employees, GDPG is the economic growth INFL is inflation and RIR is real interest rate, β_0 is a constant term and ε_{it} is the error term. The index i represent banks and t indexes the time period in years. Data for the study were drawn mainly from the annual audited financial reports of banks prepared by Ghana Association of Bankers for the period, 1997-2014. To ensure efficient, reliable, unbiased, consistent and precise prediction of the model to be estimated, unit roots tests, heteroscedasticity, multicollinearity are carried out. It is appropriate to carry out a unit root test in panel datasets to avoid spurious regression estimates which relates to the occurrence of unrelated regressions. Panel stationary test is conducted by the Fisher-type tests (based on Augmented Dickey-Fuller (DF) tests) that are appropriate for unbalanced panel datasets (Baltagi, 2005). The problem of heteroscedasticity occurs when variance of the error terms differ across observations. The problem can be solved by using robust standard errors. The robust standard errors relax OLS assumption that errors are both independent and identically distributed. Multicollinearity exists when two or more independent variables are correlated in a regression model. Although OLS estimators are best, linear, unbiased and efficient, their variances and covariance may be large. The t-ratio of one or more coefficients become statistically insignificant whilst the R-squared tends to be very high (Gujarati, 1995). The afore-mentioned consequences make regression estimates less precise and reliable. Several ways can be used to detect the presence of multicollinearity. This includes auxiliary regressions, correlation matrix, eigenvalues and condition index. But this study will apply the variance inflation factor (VIF). Results of unit roots tests, heteroscedasticity, multicollinearity, Breusch and Pagan Lagrangian Multiplier Test and Hausman specification tests are presented in the appendix. Tables 2 present the results of the summary statistics.

Table 2. Variable definition and summary statistics

Variables	Definition	Mean	Standard Deviation	Min	Max
ROA	Return on assets	2.608694	5.767586	-67.7897	48.21884
LIQ	Liquidity	17.46109	14.06965	0.001	152.657
CTA	Capital/Total assets	15.33563	14.49943	0.0008	188.7808
DEPTA	Deposits/Total assets	69.11076	25.54647	0.001	384.4936
OVTA	Overhead/Total assets	-6.01134	3.050571	-23.5068	-0.003
NOIITA	Non-interest income/Total assets	5.097528	4.287268	0.0034	62.19448
NPLTA	Non-performing loans/Total Loans	-1.40907	1.583744	-14.4331	1.453306
NEMP	number of employees	513.0337	519.5996	11	2875
GDPG	Gross Domestic Product Growth	6.765928	2.924786	3.7	15.00889
INFL	Inflation	15.90951	7.694838	8.58	40.5
RIR	Real Interest Rate	18.01074	4.819101	12.5	27

Source: Author's estimate (2015) using STATA 13.

4. Empirical Results

The results of the study are displayed in Table 3. Econometrics theory has highly recommended RE estimation technique for panel datasets that are not balanced since its results are more efficient than FE estimates as confirmed by the Hausman test. This section therefore compares results of both the RE and Pooled OLS estimations.

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Table 3. Fixed effects, random effects and pooled OLS regression results for all sample banks

Variable	FE Model		RE Model		Pooled OLS	
Dependent variable=ROA	Coeff	P.Value	Coeff	P.Value	Coeff	P.Value
Internal Factors						
LIQ	0.004317	0.884	0.016049	0.576	0.019494	0.492
DEPTA	-0.02121	0.121	-0.01809	0.176	-0.01638	0.212
OVTA	-0.17374	0.119	-0.06882	0.512	-0.06049	0.564
NOIITA	0.369336	0.004***	0.256492	0.042**	0.225998	0.071*
CTA	0.065008	0.003***	0.088737	0.000***	0.094263	0.000***
NPLTL	-0.08482	0.657	0.121667	0.506	0.156942	0.381
NEMP	0.000175	0.883	-0.00016	0.827	-0.00823	0.886
External Factors						
GDPG	0.195235	0.145	0.193133	0.094*	0.18126	0.085*
INFL	-0.01834	0.729	-0.00695	0.999	0.006727	0.904
RIR	0.12337	0.274	0.11996	0.292	0.105198	0.365
CONS	1.932238	0.456	2.298459	0.384	2.260029	0.395
No. of Observations					323	
Group Banks	29		29		29	
R-squared	0.2816				0.3564	
Adj R-squared					0.3231	
F-Statistics	Prob > F					
F(16,281)=10.24	0.000					
Wald Statistics			Prob > chi2			
Wald chi2(16)=162.76			0.000			
F-Statistics					Prob > F	
F(16, 309)=10.69					0.000	

Note. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Source: Author's estimate (2015) using STATA 13.

The highly significant Wald statistic and F statistic in the RE and pooled OLS models, respectively, confirm that the model employed and all the selected variables are correctly specified.

Commercial bank profitability responds positively to changes in Non-interest income to total assets ratio and is significant at 5 percent level per RE estimation. The result is consistent with Bolda and Verma (2006) and Canals (1993) analysis which indicated that financial variables have significant relationship with profitability. Although the positive relation still exists as regards the pooled OLS method of estimation, it is significant at 10 percent. The implication is that banks that reap higher non-interest income sources such as fee-based services enjoy higher profits. This contradicts earlier findings by Stiroh and Rumble (2006).

This study found a significant relationship between capital structure and profitability and this correspond and consistent with the findings reported by Bourke (1989), Molyneux and Thornton (1992), Stienherr and Huveneers (1994), Isik and Hassan (2003), Staikouras and Wood (2003), Goddard et al. (2004) Pasiouras & Kosmidou (2007) and Kosmidou (2008).The study also found that capital to assets ratio is significant and directly associated to bank profitability in Ghana, at 1 percent level of significance in both RE and pooled OLS estimations. This implies that well capitalized banks are likely to make higher profits, reinvest (if the profits are not paid out as dividends) and enjoy higher profits through the multiplier effect. A well capitalized bank provides additional strength to operate during financial crises and increased safety for depositors during unstable macroeconomic conditions.

The only external factor that was found to determine bank profitability was GDP growth. This measures the level of economic activities and it was at 10 percent level of significance. The implication is that, in periods where the country enjoys higher economic growth, banks enjoy higher profits. The results do not support the earlier work by Ben Naceur and Omran (2008) and supports the result of Demirguc-Kunt et al. (1998), Bikker et al. (2002), and Athanasoglou et al. (2005).

5. Discussions and Recommendations

The present study employed random effects (RE) models and Pooled OLS to explore the factors that determine

commercial banks profitability in Ghana. The model has been supported by Hausman specification test. This paper empirically investigates profitability determinants of the Ghanaian banking sector in the ongoing wave of consolidation spanning from 1997 to 2014 using panel data set of 323 observations.

Our study concludes that internal and external variables enhance commercial banks profitability. Findings from this provide empirical evidence to suggest that Non-interest income to total assets ratio as a proxy for management efficiency is positively associated with profitability of Ghanaian banks.

The study also revealed that better capitalized banks tend to be more profitable and often avoid bankruptcy. Therefore banks should be capitalization to prevent external shocks, retained earnings and be discouraged in giving out exorbitant bonuses.

Besides, that only exogenous variable (not under management control) that confirmed a positive relationship with profitability in Ghana by our study was economic growth. A strong and efficient banking system is function of a healthy economy, therefore a positive relationship of the exogenous variable with commercial banks profitability is in line with theory.

Determinants such as liquidity, deposit ratio, overhead, non-performing loans, inflation and real interest rate are insignificant in explaining banks' profitability in Ghana. This has been left unexplored and it deserves a new research.

The relevance of the study are as follows: profitable banks are able to offer more and new products and services, unusually high returns should prompt policymakers to introduce measures to help curb this, entry barriers should be reconsidered by regulators, banks should be well capitalized if they are to avoid going bankruptcy and robustness and stability of the banking sector should be a concerned to the supervision and regulatory departments of the bank of Ghana.

Given the key role that the financial sector plays in the expansion of the private productive, future research work should measure and access the impact of monetary policy of the Central Bank.

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Appendix

Appendix A. Fisher unit root test of variables based on ADF

Variables	Inverse Chi sq.		Inverse Normal		Inverse Logit		Modified Inv. Chi sq	
	Statistic	prob	statistic	prob	statistic	prob	statistic	prob
ROA	325.4406	0.000	-9.1131	0.000	-16.4402	0.000	26.1194	0.000
LIQ	117.7524	0.000	-1.9877	0.000	-3.8028	0.0001	6.1346	0.000
DEPTA	96.2841	0.0004	-3.3179	0.0005	-3.3269	0.0006	4.0688	0.000
OVTA	180.8325	0.000	-6.9149	0.000	-9.1863	0.000	12.2045	0.000
NOIITA	210.8886	0.000	-8.1402	0.000	-10.8621	0.000	15.0966	0.000
CTA	105.0584	0.000	-3.9293	0.000	-4.2173	0.000	4.9131	0.000
NPLTA	159.5332	0.000	-6.1006	0.000	-7.214	0.000	10.1549	0.000
NEMP	113.7883	0.000	-4.8829	0.000	-5.4827	0.000	6.7145	0.000
GDPG	82.6942	0.0072	-3.4639	0.0003	-3.1949	0.0009	2.7611	0.0029
INFL	204.418	0.000	-6.605	0.000	-9.3628	0.000	14.474	0.000
RIR	62.2917	0.0449	-3.1094	0.0009	-2.8369	0.0027	1.6985	0.0447

Ho: All panels contain unit roots   **Ha**: At least one panel is stationary
Source: Author's estimate (2015)

Appendix B. Variance Inflation Factor (VIF) for the explanatory variables

Variable	VIF	1/VIF
RIR	4.5	0.2223
NOIITA	4.14	0.241659
INFL	2.63	0.380009
GDPG	2.3	0.435595
LIQ	2.29	0.436454
DEPTA	1.62	0.618367
CTA	1.49	0.669373
OVTA	1.48	0.677827
NEMP	1.28	0.781735
NPLTA	1.16	0.862701
Mean VIF	**2.93**	

Source: Author's estimate (2015) using STATA 13.

The mean VIF was 2.93, which is much lower than the threshold of 10. The VIF for individual variables was also below 10. This indicates that the explanatory variables included in the model were not substantially correlated with each other, indicating an absence of multcollinearity between the variables.

Appendix C. Hausman specification tests between FE and RE estimates

Variable	Coefficients			
	Fixed(FE)	Random(RE)	Difference(FE-RE)	sqrt(diag(v_FE-v_RE))
LIQ	0.004317	0.016049	-0.011732	0.007675
DEPTA	-0.02121	-0.01809	-0.0031201	0.0027425
OVTA	-0.17374	-0.06882	-0.1049235	0.0367821
NOIITA	0.369336	0.256492	0.1128444	0.0129501
CTA	0.065008	0.088737	-0.0237286	.
NPLTA	-0.08482	0.121667	-0.2064894	0.0537529
NEMP	0.000175	-0.00016	0.0003302	0.0009571
GDPG	0.195235	0.193133	0.0021024	.
INFL	-0.01834	-0.00695	-0.0182754	.
RIR	0.12337	0.11996	0.00341	.

FE = consistent under Ho and Ha; obtained from xtreg
RE= inconsistent under Ha, efficient under Ho; obtained from xtreg
Test: Ho: difference in coefficients not systematic
chi2(16) = (FE-RE)'[(V_FE-V_RE)^(-1)](FE-RE)
= 15.10
Prob>chi2 = 0.5170
(V_FE-V_RE is not positive definite)

Source: Author's estimate (2015) using STATA 13.

Thus, the Hausman specification test is carried out to inform whether RE estimation gives more consistent results, given the data used for this study. When Prob > chi2 = α, the null hypothesis is rejected. This reinforces the consistency of the RE in estimating the chosen model.

Appendix D. Breusch and pagan lagrangian multiplier test for random effects

Estimated results:		
	Variable	**sd = sqrt(Var)**
ROA	33.26504	5.767586
e	19.37337	4.401519
u	1.454848	1.206171
Test: Var(u) = 0		
chibar2(01) = 0.09		
Prob > chibar2 = 0.3810		

Source: Author's estimate (2015) using STATA 13.

This test compares RE estimates and Pooled Ordinary Least Squares (Pooled OLS) estimates for appropriateness. The test tests the hypothesis that Vat (u)=0, under the null hypothesis that Pooled OLS estimation has less variation in its residuals than RE estimation. The test failed to reject the null hypothesis that residuals from Pooled OLS have lower variance, although both RE estimates and Pooled OLS estimates are consistent and efficient.

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