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Effect of Tax Planning on Firm Value of Selected Deposit Money Banks in Nigeria

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Abstracts
This study investigated the effect of tax planning on firm value of selected deposit money bank in Nigeria. It examines the effective tax rate and book-tax difference effect on the firm value. This study adopted the ex-post facto research design, population of 15 listed deposit money bank in Nigeria, sample size of 11 were selected through the use of the two-point filter. One, a company must be listed on or before January 2015 and be continuously listed until December 2024, as this study covers 2015 - 2014. Secondly, the company should not have been taken over or absorbed by any other company during the study. It employs multiple regression, analysed through STATA 13, and panels collected standard errors was adopted as suitable for the panel data. The result reveals that book-tax difference has a negative and significant effect on firm value, while effective tax rate is insignificant. This study concludes that effective tax rate has no significant effect on firm value, while book-tax difference has negative effect. This study recommends that the management of the deposit money banks should reduce aggressive book-tax difference development and emphasise on sustainable effective tax rate optimisation by taking legitimate deductions.

Keywords: Book-Tax Difference, Effective Tax Rate, Firm Value, Tax Planning

1. Introduction

Firm value helps to depict the market value of assets of a company and shows the well-being of the shareholders. It is important due to the fact that it outlines the general economic health of the owners of the firm and is generally regarded as an economic indicator that mimics the market value of a whole business. When looking at listed deposit money banks (DMBs) in Nigeria, firm value is usually proxied or represented by the Tobinq, which incorporates both book and market values of the firm, thus giving a holistic measure of the effectiveness of the management in making wealth for shareholders by making strategic choices such as tax planning activities.

In a developing country like Nigeria, tax planning is a key success initiative and an unrelenting issue among corporations. There are several costs involved in the operation of firms, and corporate income tax is one of the highest costs. By mitigating taxes through prudent tax planning, the managers will be able to pay as little as possible in terms of tax, which will result in more cash flows to reinvest in the business and to pay dividends to shareholders and increase shareholder value (Olawale, 2025; Eche et al., 2024). However, taxation is one of the major sources of government revenue both in Nigeria and the world over to finance infrastructure, social services, economic stabilisation, and sustainable development (Onwughai et al., 2025; Ebimobowei, 2022).

The highly regulated deposit money banking sector of the Nigerian banking industry tends to view tax obligations as cumbersome and thus finds ways of reducing its tax liability without breaking the law by taking advantage of the existing allowance provisions and loopholes under the Companies Income Tax Act (CITA) and other fiscal regulations (Umeh et al., 2020; Bwala et al., 2024). Such strategies are relevant, as underlined by the recent empirical studies. The use of Effective Tax Rate (ETR) and Book-Tax Difference (BTD) as proxies of tax planning, and the impact they had on firm value (quantified by the value of Q in Tobin) among the Nigerian listed firms, which is specific to the banking industry.

Despite tax planning is crucial in reducing tax payments and potentially increasing the shareholder value, the financial performance of listed DMBs in Nigeria continues to be suboptimal, with a decreasing profitability index and more susceptible to internal and external shocks. It can be seen in the two recent cases, first, financial risks (including credit, liquidity, and operational risks) have heavily diminished profitability, as seen by studies showing negative impact on return on assets (ROA) and return on equity (ROE) in DMBs, which increased the cost of operations, decreased revenues, and the confidence of stakeholders (Abubakar & Yusuf, 2025); second, liquidity management challenges have compounded performance problems, with studies finding that adverse liquidity positioning directly limited earnings stability and overall financial. Those instances highlight the immediate necessity to explore the possibility of using tax planning strategy, which is proxied by the effective tax rate and the book-tax difference, as a means of managing the current financial performance crisis in the industry.

Most of the current studies on tax planning and firm value have been conducted on non-financial industries, including manufacturing, consumer goods, and conglomerates (Tenggara & Josephine, 2022; Umeh et al., 2020). The number of sector-specific studies on commercial banks is relatively small and often provides incongruent results because of the specifics of regulation, capital requirements, and systemic position of the industry. Although Bwala et al. (2024) had tax savings as one of the components, ETR and BTD, more current studies like Olawale (2025) and Duo-Duo (2025) had focused on ETR and BTD, and all have found varied or contextually specific effects amid post-COVID tax reform and changes in the statutory incentives. The above gaps and the dynamic fiscal environment warrant a critical re-analysis of listed DMBs with Effective Tax Rate (ETR) and Book-Tax Difference (BTD) being the sole proxies of tax planning.

The current research thus discusses the impact of tax planning on the value of listed DMBs in Nigeria. Effective Tax Rate (ETR) and Book-Tax Difference (BTD) are only used as proxies of tax planning, whereas the Q of Tobin measures the value of firms. The essence of this study is to determine the effect of tax planning on the shareholder value in the banking sector of Nigeria. The specific objective is to:

i. Examine effect of effective tax rate (ETR) on the firm value of listed deposit money banks in Nigeria.
ii. Investigates the effect of book-tax difference (BTD) on the firm value of the firm of a deposit money bank listed in Nigeria.

Based on this study specific objectives, the following hypotheses were formulated in a null form:

H_{01}: Effect of effective tax rate does not have significant effect on the firm value of the listed deposit money banks in Nigeria.

H_{02}: Book-tax difference does not have significant effect on the firm value of listing deposit money banks in Nigeria.

Results of this investigation will enhance the body of knowledge, offer practical advice to the bank management and the bank regulators, and assist investors to evaluate how tax planning can translate into higher shareholder value within the DMBs sector of Nigeria.

2. Literature Review

Conceptual Review

Firm value is the value of the assets within a firm as it is priced in the market, and it shows the well-being of the shareholders. It is usually gauged by the use of Tobinq, which reflects both the book and market value of the company. Tax is one of the main instruments of fiscal policy that governments all over the world use in order to control the national economies, mobilise revenues, and achieve sustainable development (Sallau, 2025). Tax efficiency in Nigeria means that banks use the relevant stipulations of the Companies Income Tax Act (CITA), Value Added Tax Act, and other fiscal laws in accounting and paying liabilities. This part empirically reviews the existing studies that have been done to date about the connection between tax planning (as measured by Effective Tax Rate (ETR) and Book-Tax Difference (BTD)) and firm value, specifically in the Nigerian banking sector.

Empirical Review

The relationship between tax planning and firm value has been investigated by many studies with mixed but informative results. Umeh et al. (2020) examined the impact of tax planning on the listed consumer goods manufacturing companies in Nigeria (2009-2018) on ETR and BTD as proxies and Tobinq as the dependent variable. The results of ordinary least squares regression indicated that ETR caused a negative but not significant effect on the value of a firm, whereas BTD caused a positive and therefore not significant effect.

The proxies are further supported by more recent industry-specific data of the DMBs within Nigeria. In their study, Anaike et al. (2026) considered the tax planning and performance of listed DMBs in Nigeria (2013-2022), using both ETR and BTD as well as non-debt tax shield. They found that ETR change did not significantly impact the performance, but that BTD significantly impacted the performance in the form of return on asset (ROA), showing that a greater book-tax gap created in the course of legitimate planning positively influenced the firm value.

Concentrating on ETR and BTD, Olawale (2025) compared corporate tax planning and market value of listed non-financial manufacturing companies in Nigeria (2014-2023). The study was conducted using panel regression, whereby a positive but statistically non-significant association between ETR and the Tobinq was recorded, whilst BTD had a positive and significantly positive effect on the firm. The conclusion made by the study was that aggressive but compliant tax planning that is reflected in increasing book-tax differences is paid off by the capital market.

Bwala et al. (2024) investigated the value of listed commercial banks in Nigeria (2012-2021) in the banking industry, with the focus on tax planning. Their model also contained tax savings, but the ETR component had a negative and significant impact on the Tobinq, and BTD had a positive but insignificant impact, and their findings reflect well with the current concentration on the two proxies alone. Duo-Duo (2025) also examined the tax planning evolution in Nigerian commercial banks (2020-2924) and found that the efficient use of ETR reduction strategies and BTD management enhanced resilience and market value after the COVID. Onwughai et al. (2025) also established that company income tax (which is strongly correlated with ETR) affected ROA of listed DMBs in a positive yet insignificant way, becoming negative and significant after the firm size moderation, another argument that company tax planning needs to be targeted in large banks.

Theoretical Framework

The theory of tax planning by Hoffman, political cost theory, agency theory, and the stakeholder theory form the foundation of this research. According to Hoffman (1961), tax planning aims at avoiding the redistribution of cash to the taxing authorities at the expense of the accounting income. The theory focuses on minimising the taxable income and reporting the higher profits, thus creating a positive relationship between effective tax planning (through lower ETR or higher BTD) and firm value. Within the framework of the agency theory, Rob Desai and Dharmapala (2006) argue that tax planning and agency problems interact with each other; good governance firms enjoy high value as they save tax, whereas poor governance agency problems can give way to managerial opportunism.

The political cost theory (Siegfried, 1972) of better economic and political bargaining power by bigger banks underpinned this study; the larger the banks, the larger the effective power of tax planning that creates wider book-tax differences through aggressive tax planning that is not illegal, which helps create shareholder value, and the agency theory (Desai & Dharmapala, 2006) that compliments this reasoning in understanding how tax planning can contribute to shareholder value under strong governance.

Ethical Consideration of the Study

Ethical considerations in this study are anchored on academic integrity, transparency, and responsible data handling. All information used—particularly financial data relating to selected deposit money banks—were obtained from publicly available and credible sources, with appropriate acknowledgment to avoid plagiarism. Where primary data were collected, informed consent, confidentiality, and voluntary participation were strictly observed in line with established research ethics principles (International Federation of Accountants [IFAC], 2022). The study would ensure objectivity in analysis and reporting, avoiding data manipulation or selective interpretation, especially given the sensitivity surrounding tax planning practices. Ethical research conduct is essential to maintain credibility and prevent misrepresentation of corporate tax strategies as unlawful activities.

Additionally, the research adhered to principles of responsible tax transparency and corporate governance as emphasized in contemporary international frameworks (Organisation for Economic Co-operation and Development [OECD], 2023). Care was taken not to disclose proprietary or confidential information of the banks under review, and findings was presented in a balanced manner distinguishing lawful tax planning from tax evasion. This approach aligns with global expectations for ethical financial research and responsible reporting, thereby ensuring that the study

contributes constructively to policy dialogue and firm value discourse without compromising institutional integrity (IFAC, 2022; OECD, 2023).

3. Methodology

In this section, the research design, population, sample size, and sampling method of the study are discussed. The method of data collection, methods of analysis, and the variables of the study and their measurements are also discussed in this section with the model specification. This study adopted the ex-post facto research design since the data were contained in the annual reports and accounts of the sampled DMBs in Nigeria.

This study population was the fifteen (15) listed DMBs in Nigeria as at the 31st December 2024. The sample size of 11 was selected through the use of the two-point filter. One, a company should be listed on or before January 2015 and be continuously listed until December 2024, as this study covers 2015 - 2014. Secondly, the company should not have been taken over or absorbed by any other company during the study. These criteria were put in place to make sure that the DMBs have their published financial statements for the period covered by this study. Due to this filter, the population of the banks was narrowed down to a sample size of eleven (11), through a purposive sampling method as indicated in Table 1.

Table 1. Population and Sample Size of the Study

S/No		Year of Listing	Year of Incorporation	Sample
1.	Access Bank Plc	1989	1989	
2.	Eco Bank Plc	1985	1985	
3.	Fidelity Bank Plc	2005	1987	√
4.	First Bank of Nigeria Plc	1971	1970	√
5.	First City Monument Bank Plc	2004	1982	√
6.	Guaranty Trust Bank Plc	1996	1990	√
7.	Jaiz Bank Plc	2017	2003	√
8.	Stanbic IBTC	2012	2012	√
9.	Sterling Bank Plc	1992	1960	√
10.	Taj Bank Plc	2023	2019	
11.	Union Bank of Nigeria Plc	1971	1969	
12.	United Bank for Africa Plc	1970	1961	√
13.	Unity Bank Plc	2004	1987	√
14.	Wema Bank Plc	1970	1945	√
15.	Zenith Bank Plc	2004	1990	√

Source: Nigeria Exchange, 2026

The research utilized secondary data that were obtained in the annual reports and accounts of the listed DMBs in Nigeria during the years 2014-2024. The use of secondary data in the study is justified by the previous studies designed to investigate the topic (Duo-Duo, 2025; Olawale, 2025; Umeh et al., 2020)2.

This paper involved three (3) variables that included: dependent, independent, and control variables. Therefore, the independent variable (tax planning) was proxied by the Effective Tax Rate (ETR) and Book-Tax Difference (BTD) only, and the dependent variable (firm value) was measured with the help of Tobinq. The control variables in the study included profitability (ROE) and leverage (LEV). This study adapts the model of Bwala et al. (2024) as:

$$TOBINQit = \beta0 + \beta1ETRit + \beta2TSVit + \beta3BTDit + \beta4BZit + \beta5LEVit + \beta6ROAit + \varepsilon it$$

Modified as:

$$TOBINQit = \beta0 + \beta1ETRit + \beta2BTDit + \beta3ROEit + \beta4LEVit + \varepsilon it$$

Where Tobinq = firm value; ETE = Effective Tax Rate measured as income tax expenses/profit before tax; BTD = Book-Tax Difference measure as (pretax income minus tax income)/average assets; ROE = Return on Assets measured by profit after tax/equity, and LEV = Leverage measured by total debt/total assets, i = firm, t = time, β1 – β4 = Coefficient, ε = Error Term.

4. Results and Discussions

This section discusses the results of data analysis through STATA 13.

Table 2: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Tobinq	110	.933	.348	.009	3.079
Btd	110	.018	.024	-.123	.092
Etr	110	.089	.165	-1.002	.466
Roe	110	.144	.098	-.012	.375
Lev	110	.877	.392	.008	2.547

Source: STATA 13, 2026

Table 2 indicates that the mean of the firm value (Tobinq) of the sampled 11 listed DMBs is 0.933 (SD = 0.348), which is a moderate market value, and is near the theoretical equilibrium value of 1.0. The effective tax rate (ETR) mean is 0.089 (tax burden is low, which indicates effective planning), and the Book-Tax Difference (BTD) mean is 0.018 (minimal positive differences). The ROE (0.144) and Lev (0.877) are decent in their profitability and high leverage characteristic of banks. This means that as the banks get low ETR, there is a wide variation in the value of BTD.

Table 3: Shapiro-Francia W' test for normal data

Variable	Obs	W'	V'	Z	Prob>z
tobinq	110	0.395	59.573	8.128	0.000
btd	110	0.719	27.674	6.604	0.000
etr	110	0.798	19.849	5.943	0.000
roe	110	0.965	3.479	2.480	0.007
lev	110	0.629	36.563	7.158	0.000

Source: STATA 13, 2026

Table 3: Shapiro-Francia W' Test of Normality: All the variables do not assume normality ($p < 0.05$ in Tobinq, BTD, ETR, ROE, and Lev), although Tobinq deviates the most (W' = 0.395). This non-normality is the reason FGLS regression is applied, which is resistant to distributional-based assumptions and heteroskedasticity of panel data to allow reliable inferences.

Table 4: Pairwise correlations

Variables	(1)	(2)	(3)	(4)	(5)
(1) tobinq	1.000				
(2) btd	-0.476*	1.000			
	(0.000)				
(3) etr	0.040	0.126	1.000		
	(0.677)	(0.191)			
(4) roe	0.228*	0.364*	0.109	1.000	
	(0.017)	(0.000)	(0.257)		
(5) lev	0.786*	-0.593*	0.014	-0.008	1.000
	(0.000)	(0.000)	(0.886)	(0.934)	

Source: STATA 13, 2026

Table 4: Pairwise Correlations Tobinq is significantly negatively related to BTD (r = -0.476, p = 0.000) but positively with ROE (r = 0.228, p = 0.017) and Lev (r = 0.786, p = 0.000); only ETR does not demonstrate any significant correlation. There was no presence of multicollinearity as the

explanatory variables are not strongly correlated among themselves, as their coefficient are less than the threshold of 80%.

Table 5: Robustness Test

	VIF	1/VIF
Btd	1.958	.511
Lev	1.684	.594
Roe	1.251	.8
Etr	1.03	.971
Mean VIF	1.481	.
Heteroscedasticity	0.000	
Hausman specification test	0.000	

Source: STATA 13, 2026

Table 5 indicates a VIF mean of 1.481 (< 10), and the individual tolerance is less than 1, which shows that there is no multicollinearity. The heteroskedasticity test (p = 0.000) and the Hausman specification test (p = 0.000) prove that FGLS is an adequate estimator to use in this fixed-effects panel to correct data non-normality, heteroskedasticity, and overcome endogeneity and panel-specific effects.

Table 6: Cross-sectional time-series FGLS regression

Tobinq	Coef.	St.Err.	t-value	p-value	Sig
Btd	-2.663	1.063	-2.51	.012	**
Etr	.045	.114	0.40	.689	
Roe	1.067	.212	5.04	.000	***
Lev	.603	.061	9.86	.000	***
Constant	.294	.066	4.46	.000	***
Number of obs	110				
Chi-square	245.763			.000	***

Source: STATA 13, 2026

Table 6 documents a Wald Chi-square = 245.763 with p = 0.000, which implies that the model is well combined and used. BTD also significantly negatively affects Tobinq (Coef. = -2.663, p = 0.012), while ETR is a positive but insignificant effect (Coef. = 0.045, p = 0.689).

This study accepts hypothesis I as ETR is a positive but insignificant effect (Coef. = 0.045, p = 0.689). This can be substantiated by the agency theory (Desai and Dharmapala, 2006), an approach that argues that value may not be generated when tax planning is done through ETR due to the fact that it covers managerial opportunism or poor governance in DMBs. It is also consistent with more recent empirical studies like Bwala et al. (2024) and Anaike et al. (2026), which have similarly concluded that the ETR has an insignificant effect on the Tobinq among the Nigerian DMBs.

This study rejects hypothesis II. BTD is significantly negatively affects Tobinq (Coef. = -2.663, p = 0.012). This negative effect is supported by the political cost theory (Siegfried, 1972) and the agency theory, whereby the political power of larger banks can create BTD, but in an African environment such as Nigeria, where banking is highly regulated, over-the-counter BTD is a sign of future taxation conflicts or branding risk, and reduces market value. This is opposite to Bwala et al. (2024) findings (positive insignificant BTD) but is similar to recent findings where aggressive BTD is less beneficial when viewed as risky (Okwu, 2025; Anaike et al., 2026).

Conclusion and Recommendations

This study concludes that, ETR has an insignificant effect but BTD affects the value of the firm of listed deposit money banks in Nigeria negatively. The book-tax planning strategies that are exhibited in the form of gaps in the taxation system are value-destroying in the present day regulatory and market circumstances.

This study recommends that:

i. The management of the DMBs should reduce aggressive BTD development and emphasise on sustainable ETR optimisation by taking legitimate deductions.
ii. The regulators (CBN and FIRS) should increase the level of transparency in BTD to alleviate investor uncertainty.

Contribution to Knowledge

This study has contributed to the existing knowledge at it applies FGLS to a narrow sample of 10 DMBs (2015 - 2024), with only ETR and BTD proxies, and records a negative BTD effect unlike other mixed studies (e.g., Bwala et al., 2024) with robustness support.

Limitations

The 11 DMBs used in this study 10 years and secondary data are restrictive, and the research might not be applicable to other organisations outside the Nigerian DMBs due to non-normality and sector specific laws.

Further Study Suggestion

Future studies can introduce time (after 2024), more proxies (e.g., Tax saving rate).

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Raw Data

Name	ID	Year	BTD	ETR	ROE	TOBINQ	LEV
FCMB	1	2024	0.082	0.204	0.087	0.053	0.051
	1	2023	0.092	0.103	0.097	0.053	0.050
	1	2022	0.050	0.003	0.053	0.063	0.062
	1	2021	0.036	0.004	0.038	0.055	0.053
	1	2020	0.023	0.006	0.023	0.020	0.019
	1	2019	0.027	0.004	0.027	0.017	0.016
	1	2018	0.027	0.034	0.027	0.014	0.013
	1	2017	0.012	0.010	0.012	0.017	0.015
	1	2016	0.028	0.005	0.029	0.011	0.010
	1	2015	0.020	0.010	0.020	0.009	0.008
FIDELITY	2	2024	0.026	0.297	0.258	1.005	0.900
	2	2023	0.016	-0.004	0.231	1.001	0.930
	2	2022	0.012	0.130	0.149	1.000	0.921
	2	2021	0.007	0.084	0.081	1.000	0.913
	2	2020	0.010	0.050	0.097	1.000	0.901
	2	2019	0.013	0.064	0.121	1.000	0.889
	2	2018	0.013	0.086	0.118	1.000	0.887
	2	2017	0.013	0.075	0.088	1.000	0.854
	2	2016	0.004	0.110	0.029	1.000	0.857
	2	2015	0.011	0.009	0.076	1.000	0.851
FIRST	3	2024	0.026	0.150	0.242	0.998	0.895
	3	2023	0.018	0.129	0.178	0.998	0.897
	3	2022	0.013	0.138	0.137	0.999	0.906
	3	2021	0.017	0.094	0.172	0.999	0.901
	3	2020	0.012	-0.072	0.117	0.999	0.900
	3	2019	0.012	0.119	0.111	0.998	0.893
	3	2018	0.010	0.088	0.110	0.998	0.905
	3	2017	0.007	0.308	0.056	1.001	0.871
	3	2016	0.003	0.466	0.021	1.000	0.877
	3	2015	0.004	0.298	0.026	0.999	0.861
Gtbank	4	2024	0.069	0.196	0.375	0.996	0.817
	4	2023	0.056	0.114	0.365	0.997	0.848
	4	2022	0.026	0.210	0.182	0.997	0.856
	4	2021	0.032	0.211	0.198	0.997	0.838
	4	2020	0.041	0.154	0.247	0.997	0.835
	4	2019	0.047	0.125	0.255	0.996	0.817
	4	2018	0.051	0.122	0.289	0.996	0.825
	4	2017	0.047	0.136	0.256	0.997	0.815
	4	2016	0.040	0.179	0.246	0.997	0.838

	4	2015	0.037	0.166	0.228	0.997	0.836
JAIZ	5	2024	0.022	0.039	0.329	1.000	0.934
	5	2023	0.019	-0.017	0.286	1.000	0.932
	5	2022	0.018	-0.037	0.231	1.000	0.922
	5	2021	0.015	0.018	0.168	1.000	0.913
	5	2020	0.014	0.049	0.178	1.001	0.924
	5	2019	0.015	-0.158	0.157	1.000	0.907
	5	2018	0.008	0.071	0.064	0.999	0.879
	5	2017	0.006	0.399	0.039	0.999	0.843
	5	2016	0.005	0.093	0.024	1.002	0.801
	5	2015	0.017	-0.146	0.080	0.999	0.783
IBTC	6	2024	0.033	0.258	0.336	0.999	0.903
	6	2023	0.027	0.187	0.277	0.999	0.901
	6	2022	0.027	0.195	0.198	0.997	0.865
	6	2021	0.021	0.137	0.151	0.997	0.863
	6	2020	0.033	0.121	0.220	0.997	0.848
	6	2019	0.040	0.175	0.248	0.997	0.839
	6	2018	0.045	0.156	0.311	0.997	0.856
	6	2017	0.035	0.000	0.261	0.998	0.866
	6	2016	0.027	0.000	0.203	0.996	0.866
	6	2015	0.020	0.201	0.146	0.994	0.862
STERKING	7	2024	0.012	0.048	0.143	1.000	0.914
	7	2023	0.009	0.049	0.118	1.000	0.927
	7	2022	0.010	0.070	0.125	1.000	0.917
	7	2021	0.009	0.065	0.106	1.000	0.913
	7	2020	0.009	0.091	0.083	1.000	0.896
	7	2019	0.009	0.007	0.085	1.000	0.899
	7	2018	0.010	-0.053	0.115	1.000	0.911
	7	2017	0.010	-0.117	0.104	1.000	0.905
	7	2016	0.011	-0.137	0.108	1.000	0.897
	7	2015	0.010	-0.332	0.084	1.000	0.880
UBA	8	2024	0.020	-0.230	0.175	0.997	0.887
	8	2023	0.034	-0.036	0.344	0.997	0.902
	8	2022	0.011	0.166	0.128	0.997	0.915
	8	2021	0.005	0.298	0.053	0.997	0.906
	8	2020	0.008	-0.068	0.087	0.996	0.906
	8	2019	0.015	0.104	0.141	1.032	0.892
	8	2018	0.011	0.258	0.113	1.033	0.898
	8	2017	0.014	0.216	0.103	1.037	0.863
	8	2016	0.019	0.175	0.122	1.017	0.846
	8	2015	0.021	0.061	0.141	0.994	0.847

Unity bank	9	2024	0.004	0.004	0.000	1.000	1.692
	9	2023	-0.123	-0.005	0.228	1.000	1.539
	9	2022	0.002	0.321	-0.003	1.000	1.512
	9	2021	0.004	0.062	-0.008	1.000	1.560
	9	2020	0.012	0.071	-0.012	1.000	1.952
	9	2019	-0.037	-0.019	0.027	1.000	2.349
	9	2018	0.005	0.100	-0.005	1.006	2.033
	9	2017	-0.095	-0.047	0.062	3.079	2.547
	9	2016	0.004	-0.202	0.026	0.999	0.831
	9	2015	0.011	-1.002	0.057	0.986	0.814
	10	2024	0.024	0.158	0.337	1.000	0.929
WAMA	10	2023	0.016	0.176	0.258	1.000	0.938
	10	2022	0.008	0.240	0.136	1.000	0.943
	10	2021	0.008	0.279	0.127	1.000	0.940
	10	2020	0.005	0.228	0.078	1.000	0.940
	10	2019	0.007	0.230	0.094	1.000	0.923
	10	2018	0.007	0.305	0.066	1.000	0.896
	10	2017	0.006	0.247	0.046	1.000	0.872
	10	2016	0.006	0.211	0.053	1.000	0.886
	10	2015	0.007	0.209	0.056	1.000	0.884
ZENITH	11	2024	0.039	0.174	0.302	1.039	0.871
	11	2023	0.02	0.108	0.33	1.031	0.893
	11	2022	0.03	0.2022	0.20	1.017	0.887
	11	2021	0.03	0.0935	0.22	1.029	0.867
	11	2020	0.03	0.0579	0.22	1.030	0.873
	11	2019	0.03	0.0984	0.23	1.030	0.857
	11	2018	0.03	0.1386	0.25	1.028	0.864
	11	2017	0.03	0.0969	0.22	1.023	0.856
	11	2016	0.03	0.1534	0.19	1.022	0.857
	11	2015	0.03	0.1426	0.18	1.012	0.854

Source: Fieldwork, 2026

STATA 13 Analysis

```
  ___  ____  ____  ____  ____ (R)
 /__    /   ____/   /   ____/
___/   /   /___/   /   /___/   13.0   Copyright 1985-2013 StataCorp LP
  Statistics/Data Analysis             StataCorp
                                       4905 Lakeway Drive
     MP - Parallel Edition             College Station, Texas 77845 USA
                                       800-STATA-PC        http://www.stata.com
                                       979-696-4600        stata@stata.com
                                       979-696-4601 (fax)


Notes:
      1.  (/v# option or -set maxvar-) 5000 maximum variables

. edit

. *(15 variables, 110 observations pasted into data editor)

. xtset id year, yearly
       panel variable:  id (strongly balanced)
        time variable:  year, 2015 to 2024
                delta:  1 year

. sum tobinq btd etr roe lev

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
      tobinq |        110    .9333909    .3484684        .009      3.079
         btd |        110    .0179455    .0243265      -.123        .092
         etr |        110    .0892961    .1649962     -1.002        .466
         roe |        110    .1438364    .0975812      -.012        .375
         lev |        110    .8774364    .3916242        .008      2.547

. sfrancia tobinq btd etr roe lev

                  Shapiro-Francia W' test for normal data

    Variable |     Obs       W'          V'        z       Prob>z
-------------+--------------------------------------------------
      tobinq |     110    0.39491     59.573     8.128    0.00001
         btd |     110    0.71891     27.674     6.604    0.00001
         etr |     110    0.79839     19.849     5.943    0.00001
         roe |     110    0.96466      3.479     2.480    0.00658
         lev |     110    0.62863     36.563     7.158    0.00001

. pwcorr tobinq btd etr roe lev, sig star (5)

             |   tobinq      btd      etr      roe      lev
-------------+---------------------------------------------
      tobinq |   1.0000
             |
             |
         btd |  -0.4762*  1.0000
             |   0.0000
             |
         etr |   0.0401   0.1256   1.0000
             |   0.6774   0.1911
             |
         roe |   0.2281*  0.3641*  0.1090   1.0000
             |   0.0165   0.0001   0.2570
             |
         lev |   0.7862* -0.5925*  0.0138  -0.0080   1.0000
             |   0.0000   0.0000   0.8862   0.9335
```

```
. reg tobinq btd etr roe lev

      Source |       SS       df       MS              Number of obs =     110
-------------+------------------------------           F(  4,   105) =   58.65
       Model |  9.14342774     4  2.28585694            Prob > F      =  0.0000
    Residual |   4.0924704   105  .038975909            R-squared     =  0.6908
-------------+------------------------------           Adj R-squared =  0.6790
       Total |  13.2358981   109  .121430258            Root MSE      =  .19742

------------------------------------------------------------------------------
      tobinq |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         btd |  -2.662666   1.087725    -2.45   0.016    -4.819424   -.5059084
         etr |   .0454131   .1163235     0.39   0.697    -.1852349    .2760611
         roe |   1.067412    .216703     4.93   0.000     .6377303    1.497094
         lev |   .6034767   .0626652     9.63   0.000     .4792232    .7277301
       _cons |   .2940734   .0674957     4.36   0.000     .1602418    .4279049
------------------------------------------------------------------------------

. vif

    Variable |       VIF       1/VIF
-------------+----------------------
         btd |      1.96    0.510709
         lev |      1.68    0.593715
         roe |      1.25    0.799665
         etr |      1.03    0.970705
-------------+----------------------
    Mean VIF |      1.48

. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of tobinq

         chi2(1)      =   185.64
         Prob > chi2  =   0.0000
. xtreg tobinq btd etr roe lev, fe

Fixed-effects (within) regression               Number of obs      =       110
Group variable: id                              Number of groups   =        11

R-sq:  within  = 0.3919                         Obs per group: min =        10
       between = 0.6502                                        avg =      10.0
       overall = 0.5730                                        max =        10

                                                F(4,95)            =     15.31
corr(u_i, Xb)  = -0.1397                        Prob > F           =    0.0000

------------------------------------------------------------------------------
      tobinq |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         btd |    -3.1639   .9359537    -3.38   0.001    -5.022003   -1.305797
         etr |  -.2604587   .1200805    -2.17   0.033    -.4988486   -.0220689
         roe |    .037633   .2363371     0.16   0.874    -.4315554    .5068215
         lev |   .5925117   .1048076     5.65   0.000     .3844424     .800581
       _cons |   .4881222   .0967798     5.04   0.000       .29599    .6802543
-------------+----------------------------------------------------------------
     sigma_u |  .18286766
     sigma_e |  .15803535
         rho |  .57245828   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(10, 95) =     6.89                 Prob > F = 0.0000

. est store fe
```

```
. xtreg tobinq btd etr roe lev, re

Random-effects GLS regression                   Number of obs      =       110
Group variable: id                              Number of groups   =        11

R-sq:  within  = 0.3282                         Obs per group: min =        10
       between = 0.8353                                        avg =      10.0
       overall = 0.6801                                        max =        10

                                                Wald chi2(4)       =    148.98
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000

------------------------------------------------------------------------------
      tobinq |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         btd |  -2.609923    1.02052    -2.56   0.011    -4.610105    -.609741
         etr |  -.0524618   .1147501    -0.46   0.648    -.2773678    .1724442
         roe |   .7374418   .2210206     3.34   0.001     .3042494    1.170634
         lev |   .5922216   .0701569     8.44   0.000     .4547165    .7297266
       _cons |   .3592041   .0761396     4.72   0.000     .2099732     .508435
-------------+----------------------------------------------------------------
     sigma_u |   .05409393
     sigma_e |   .15803535
         rho |   .10487507   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. est store re


. hausman fe re

                 ---- Coefficients ----
              |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
              |       fe           re         Difference          S.E.
--------------+----------------------------------------------------------------
         btd  |    -3.1639    -2.609923       -.5539768                .
         etr  |  -.2604587    -.0524618       -.2079969        .0353799
         roe  |    .037633     .7374418       -.6998087        .0836966
         lev  |   .5925117     .5922216        .0002901        .0778629
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       40.41
                Prob>chi2 =      0.0000
                (V_b-V_B is not positive definite)

. xtgls tobinq btd etr roe lev, panel (iid) corr (independent)

Cross-sectional time-series FGLS regression

Coefficients:  generalized least squares
Panels:        homoskedastic
Correlation:   no autocorrelation

Estimated covariances      =         1          Number of obs      =       110
Estimated autocorrelations =         0          Number of groups   =        11
Estimated coefficients     =         5          Time periods       =        10
                                                Wald chi2(4)       =    245.76
Log likelihood             =     24.94          Prob > chi2        =    0.0000

------------------------------------------------------------------------------
      tobinq |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         btd |  -2.662666   1.062717    -2.51   0.012    -4.745552   -.5797801
         etr |   .0454131    .113649     0.40   0.689    -.1773349    .2681611
         roe |   1.067412   .2117206     5.04   0.000     .6524474    1.482377
         lev |   .6034767   .0612244     9.86   0.000     .4834791    .7234743
       _cons |   .2940734   .0659439     4.46   0.000     .1648257     .423321
------------------------------------------------------------------------------
```