

**A framework for estimating real-world bank
valuations: A quantitative approach to
identifying acquisition opportunities**

by

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ABSTRACT

The evaluation of bank acquisition targets often relies on tangible book value (TBV) as a primary valuation metric. However, TBV may not adequately reflect a bank's true operational performance, profitability, or credit quality. This research aims to develop and apply a framework for estimating real-world bank valuations by adjusting TBV using performance-based metrics. The objective is to identify community banks that may be over- or undervalued relative to their intrinsic financial condition and, in doing so, enhance the acquisition screening process for banks, investors, and strategic buyers.

This study utilizes FFIEC Call Report data collected from 4,299 U.S. banks over a three-year period (2022–2024), with historical data from 2016–2018 used to evaluate long-term loan growth trends. Financial information was obtained from a range of reporting schedules, including balance sheet data, income statements, loan quality, capital adequacy, and other relevant fields. Ten financial performance metrics were incorporated into a weighted scoring model to calculate an adjusted TBV and a valuation premium or discount for each institution. The metrics include return on equity, net interest margin, efficiency ratio, net charge-off rate, nonperforming loan ratio, leverage ratio, risk buffer ratio, loan-to-deposit ratio, loan compound annual growth rate, and loan concentration.

A regression model was constructed to determine the degree to which these financial variables explain valuation premiums or discounts. The results show an adjusted R-squared value of 0.5064, confirming that over half of the variation in bank valuation premiums or discounts can be attributed to financial performance characteristics.

Profitability, efficiency, and credit quality were found to be statistically significant drivers of valuation, while excess capital levels and generalized asset growth were not. Net interest margin showed the strongest positive relationship with valuation premium, while nonperforming loans and inefficiency were associated with valuation discounts.

The findings indicate that traditional tangible book value is a poor standalone measure of bank value. By contrast, the adjusted TBV model introduced in this study provides a more accurate and meaningful assessment of intrinsic value and acquisition suitability. This framework offers a practical tool for narrowing the acquisition target universe and improving pre-due diligence decision-making by identifying undervalued institutions with strong financial fundamentals.

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CHAPTER I: INTRODUCTION

The accurate valuation of financial institutions remains a persistent challenge in both academic research and real-world mergers and acquisitions. Unlike traditional operating companies, banks operate within unique regulatory, accounting, and economic frameworks that complicate standard valuation techniques. Tangible book value (TBV) is a widely used baseline in bank valuation due to its transparency and comparability, yet it fails to account for critical performance variables such as profitability, efficiency, risk exposure, and capital utilization. This disconnect can lead to mispriced acquisitions and overlooked opportunities.

Community banks in particular present a compelling case for refined valuation methods. These institutions often lack analyst coverage and are traded or acquired at significant discounts or premiums that are not always justified by raw asset size or TBV multiples. As consolidation accelerates and regional banks pursue growth through acquisition, it is increasingly important to develop a more accurate, performance-adjusted valuation framework to guide decision-making.

This study introduces a methodology for calculating Adjusted Tangible Book Value using a weighted combination of ten key financial ratios, each selected for its demonstrated relevance to bank performance and valuation. These ratios spanning profitability, efficiency, credit quality, capital strength, liquidity, growth, and loan concentration are applied to each institution's data, sourced from FFIEC Call Reports. Banks that outperform on high-impact metrics are adjusted upward, while underperformance on critical ratios leads to downward valuation adjustments.

By converting financial performance into valuation impact, the model provides a practical tool for identifying undervalued acquisition targets and benchmarking peer institutions. The research further validates this model through regression analysis, showing that the Adjusted Tangible Book Value framework explains more than half of the variation in bank valuation premiums and discounts. This stands in contrast to traditional TBV, which alone fails to capture the full picture of operational and risk-adjusted value.

The remainder of this thesis is structured as follows: Chapter II reviews relevant literature and conceptual foundations for bank valuation, Chapter III outlines the model and methodology, Chapter IV presents the dataset and statistical results, and Chapter V interprets findings and discusses implications for acquirers, investors, and bank management. The goal is to provide a transparent, replicable, and data-driven valuation framework that improves acquisition screening and promotes more efficient capital deployment across the banking sector.

CHAPTER II: LITERATURE REVIEW

2.1 Structural Foundations of Bank Valuation

Valuing a financial institution differs fundamentally from valuing a non-financial firm because banks operate within a regulated system in which asset composition, capital levels, funding mix, and risk transmission are structurally constrained. Traditional corporate valuation frameworks assume managerial discretion over capital structure, asset mix, and revenue diversification. Banks, however, must operate inside a regulatory infrastructure that dictates minimum capital ratios, permissible activities, reserve requirements, limits on leverage, and defined supervisory intervention when performance deteriorates. These structural characteristics shape how value is created, sustained, and measured.

The regulatory framework is central to bank valuation because regulation controls downside risk and limits strategic optionality. Capital and asset quality are not discretionary; banks must comply with Prompt Corrective Action rules and Basel capital standards. When capital deteriorates, regulators can mandate corrective steps, restrict dividend payments, or force divestiture of assets (Rezaee 2004, 415-416). Prompt Corrective Action rules also link capital to valuation outcomes: institutions with falling capital ratios experience increasing constraints on risk taking and growth options, reducing future earnings and thus firm value. These regulatory triggers differentiate banks from other firms where financial distress does not immediately lead to supervisory intervention or loss of operating autonomy.

Unlike non-financial firms where revenue generation precedes balance-sheet financing decisions, banks generate earnings because of their balance sheets. Loans,

securities, deposit structure, and loss reserves determine revenue and risk. Rezaee shows that accurate valuation begins with constructing a “clean” balance sheet—removing problem assets, recognizing loan losses, and adjusting earnings forecasts only after those corrections (Rezaee 2004, 417). Table 2.1 demonstrates that cleanup costs reduce franchise value: a bank valued at \$94 million on a clean basis falls to \$69 million once \$25 million of cleanup costs are recognized (Rezaee 2004, 417).

Table 2.1 Illustration of the Impact on Value as a Result of Balance Sheet “Cleanup” costs (\$000,000)

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Available cash flow*	\$10.0	\$10.5	\$11.0	\$11.5	\$12.2	\$13.0	\$13.8	\$14.8	\$16.0	\$17.2
Discount rate	14%	14%	14%	14%	14%	14%	14%	14%	14%	14%
Capitalization rate on year 10 cash flow	—	—	—	—	—	—	—	—	—	11%
Sum of present values of cash flow	\$57.8									
Present value of capitalized value of year 10 cash flow	\$42.2									
“Clean” value**	\$94.0									
“Cleanup” costs	(\$25.0)									
Value considering cost to “cleanup”	<u>\$69.0</u>									

*Based on a clean balance sheet that reflects the results of cleanup, such as realizing losses on an investment portfolio, taking loan losses, and so on.

**The value had the buyer acquired the clean balance sheet.

Source: Exhibit 18.2. Illustration of the Impact on Value as a Result of Balance Sheet “Cleanup” Costs (\$000,000). Reproduced from *Financial Institutions, Valuations, Mergers, and Acquisitions: The Fair Value Approach* (2nd ed., p. 417), by Z. Rezaee, 2004. © 2004 John Wiley & Sons.

Valuation must differentiate between economic earnings and temporary distortions caused by leverage or low capital. Highly leveraged banks often show depressed earnings due to interest burden; valuation must remove leverage effects and value the entity on a debt-free basis, then subtract debt to determine equity value (Rezaee 2004, 421). Similarly, banks with insufficient capital require modeled valuation adjustments. If an acquisition requires capital injection, that capital becomes trapped and unavailable to the owner until exit even though it enhances earnings (Rezaee 2004, 418-419). Table 2.2 illustrates that

injecting \$6 million increases earning assets from \$160 million to \$166 million, changing future income and valuation (Rezaee 2004, 418).

Table 2.2 Reflecting Capital Injections in Starting Balance Sheet (\$000,000)

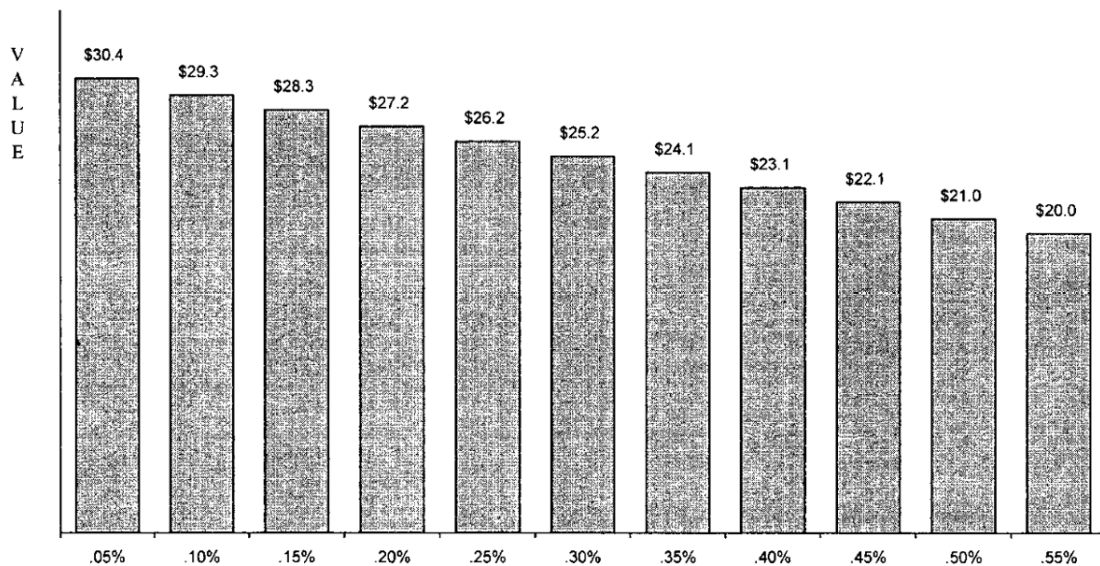
	Acquired Balance Sheet	Capital Injection	Starting Balance Sheet
Assets			
Cash and Due Froms	\$ 10		\$ 10
Securities & Fed Funds	20	+5	25
Total Loans	130		130
(Loan Loss Reserves)	(10)		(10)
Net Loans	120		120
Premises & Fixed Assets	5	+1	6
Other Real Estate Owned	3		3
Other Assets	2		2
Total Assets	<u>\$160</u>	+6	<u>\$166</u>
Liabilities & Equity			
Noninterest-bearing Deposits	\$ 25		\$ 25
Interest-bearing Deposits	115		115
Total Deposits	140		140
Other Liabilities	17		17
Equity	3	+6	9
Total Liabilities & Equity	<u>\$160</u>	+6	<u>\$166</u>

Source: Exhibit 18.3. Reflecting Capital Injections in Starting Balance Sheet (\$000,000). *Reproduced from Financial Institutions, Valuations, Mergers, and Acquisitions: The Fair Value Approach* (2nd ed., p. 418), by Z. Rezaee, 2004. © 2004 John Wiley & Sons.

Loan losses are the most uncertain component of bank valuation. Unlike other operating expenses, loan losses are influenced by borrower behavior and macroeconomic cycles and can materially change franchise value. Rezaee isolates problem loans into separate line items—one for identified problem credits and one for normal expected losses to measure valuation impact (Rezaee 2004, 419). Sensitivity analysis shows that for every 0.05% increase in net charge-offs, valuation declines by approximately \$1.0–\$1.1 million

Figure 2.1 (Rezaee 2004, 420). This demonstrates why valuation cannot treat loan losses as a generic expense.

Figure 2.1 Impact on Estimated Value of Example Bank with Varying Assumptions of Loan Losses* (\$ Millions)



Net Charge-offs Each Year, As a Percent of Total Loans (with constant 1% reserve for loan losses)

*From data in Chapter 14.

Source: Exhibit 18.4. Impact on Estimated Value of Example Bank with Varying Assumptions of Loan Losses* (\$ Millions). *Reproduced from Financial Institutions, Valuations, Mergers, and Acquisitions: The Fair Value Approach* (2nd ed., p. 420), by Z. Rezaee, 2004. © 2004 John Wiley & Sons.

Due to structural and regulatory constraints, bank valuation methods must:

1. Start with balance sheet driven earnings reconstruction rather than top line growth.
2. Separate normal earnings from one time cleanup or capital requirements.
3. Quantify loan loss uncertainty and isolate it from recurring earnings.
4. Evaluate the bank's capacity to generate future franchise value, not merely its book value.

The structural foundation of bank valuation is the intersection of regulated capital, constrained balance sheet composition, and risk adjusted earnings forecasting. As Rezaee summarizes, in complex situations the appraiser must adjust the balance sheet first then forecast earnings because “valuation accuracy depends on cleaning the bank before valuing it” (Rezaee 2004, 417).

2.2 Use of Tangible Book Value in Banking Acquisitions

Tangible Book Value (TBV) has become a foundational metric in the valuation of financial institutions, particularly in bank acquisition contexts. Its focus on net tangible assets offers a conservative and stable estimate of a bank’s value, especially when earnings are volatile or not yet stabilized post-merger.

Tangible Book Value is defined as total equity minus goodwill and other intangible assets. It is especially relevant in banking, where tangible assets such as loan portfolios and deposit bases form the core of value creation. This metric allows acquirers to assess how much they are paying above a bank’s net tangible worth. It is useful in determining whether a deal is expected to create value or dilute existing equity.

TBV becomes even more useful when evaluating banks that face heightened credit risk or have inconsistent income. In these situations, TBV helps analysts avoid relying on unstable earnings metrics and instead grounds their analysis in the verifiable, physical net asset base. It also helps distinguish whether a book value premium is due to a strategic rationale, such as market expansion, or lacks financial justification. The unique nature of the banking industry, which includes regulatory capital rules and asset transparency, reinforces TBV’s value as a core valuation benchmark. This view is supported by academic analysis which explains that traditional discounted cash flow or price-to-earnings

approaches often miss key elements of bank value (Dayag and Trinidad 2019, 51, 53) (Umeorah, et al. 2024, 35).

Empirical analysis has helped clarify the drivers of variation in tangible book value (TBV) multiples among U.S. regional banks. A detailed study of 78 institutions across multiple periods showed that profitability, credit quality, capitalization, and broader market factors all significantly influence TBV-based valuations. Banks with higher return on equity (ROE) and stronger capital buffers tend to command higher multiples, while banks with elevated levels of non-performing loans (NPLs) generally trade at a discount. These findings align with the theoretical expectation that TBV multiples should reflect the market's confidence in a bank's ability to generate earnings while managing risk effectively (Umeorah, et al. 2024, 34-46).

The study tested three types of panel regression models: fixed effects, random effects, and pooled ordinary least squares (OLS). The fixed effects model produced the best fit, highlighting consistent relationships between ROE and TBV multiples, and a significant negative coefficient for NPLs. The results from the alternative models reinforced these findings, although some differences were observed in the magnitude and significance of the estimates. The authors conducted diagnostic testing to validate the model structure, including Hausman and F-tests, confirming that the fixed effects approach was statistically appropriate. This robust methodology demonstrates the extent to which internal bank performance and external macroeconomic forces jointly affect market-based valuation metrics (Umeorah, et al. 2024, 34-46).

Table 2.3 Summary of selected independent variables and applicable notations

Class	Metric	Notation	Definition and Expected Impact on P/TBV
Profitability	Return on Equity	ROE	ROE, given as net income divided by average total equity. Higher ROE indicates strong profitability, which leads to higher P/TBV multiples as it reflects a bank's efficient use of equity to drive returns.
Asset Quality	Non-Performing Loans Ratio	NPL	NPL represents the proportion of default loans and directly affects asset quality. A higher NPL ratio signals deteriorating asset quality, which is expected to reduce the P/TBV multiple.
Capital	Tangible Common Equity / Total Assets	TCE/TA	TCE/TA shows the proportion of a bank's tangible assets financed by common equity. A higher TCE/TA ratio signals a robust capital base and financial stability, which are associated with a higher P/TBV multiple.
Liquidity	Loan to Deposit Ratio	LDR	LDR is a liquidity measure that compares total loans to total deposits. While a higher LDR can enhance profitability, excessive reliance on loans could increase liquidity risk, potentially lowering P/TBV multiple if the market perceives it negatively.
Leverage	Leverage Ratio	LEV	LEV measures the ratio of total debt to total equity. Higher leverage increases financial risk, resulting in lower P/TBV multiples if the market perceives the bank as over-leveraged.
Size	Total Consolidated Assets	LN_ASSETS	Total consolidated assets represent a proxy for Bank size, and larger banks typically benefit from economies of scale and greater market power. This could potentially lead to higher P/TBV multiples due to improved operational efficiency and lower risk.
Shareholder's Return	Dividend Yield	DIV_YIELD	Dividend yield measures the return on investment for shareholders through dividends. While higher dividend yields may attract investors, unsustainably high yields can signal limited growth prospects and may negatively affect P/TBV multiples.
Operational Efficiency	Revenue Per Staff	LN_REV_STAFF	Efficiency metric measures revenue per employee. Higher efficiency is expected to affect P/TBV multiple positively.

Source: Table 1. *Summary of selected independent variables and applicable notations*, p. 37, from Umeorah, S. C., Adelaja, A. O., Ayodele, O. F., Abikoye, B. E., & Azubuike, N. A. (2024). *Impact of select variables on tangible book value multiple of U.S. regional banks*. *Journal of Economics, Management and Trade*, 30(11), 33–49.

Table 2.4 Correlation matrix and multicollinearity

	ROE	NPL	LEV	TCE_ TA	DIV_ YIELD	LDR	LN_ ASSETS	LN_REV_ STAFF
ROE	1.00							
NPL	-0.36	1.00						
LEV	-0.10	0.07	1.00					
TCE_TA	-0.13	-0.12	0.52	1.00				
DIV_YIELD	-0.17	0.19	-0.14	-0.11	1.00			
LDR	-0.07	0.01	0.11	0.00	0.05	1.00		
LN_ASSETS	-0.01	-0.13	-0.05	0.30	-0.12	-0.04	1.00	
LN_REV_STAFF	0.28	-0.33	0.12	0.28	-0.19	-0.02	0.54	1.00
VIF	1.35	1.32	2.93	1.67	1.12	1.62	1.63	1.72
Tolerance Level	74.10%	75.60%	34.10%	59.80%	89.30%	61.90%	61.30%	58.00%

Source: Table 3. *Correlation matrix and multicollinearity*, p. 38, from Umeorah, S. C., Adelaja, A. O., Ayodele, O. F., Abikoye, B. E., & Azubuike, N. A. (2024). *Impact of select variables on tangible book value multiple of U.S. regional banks. Journal of Economics, Management and Trade*, 30(11), 33–49.

Table 2.5 Fixed effects regression model estimates

Variables	Estimate	Std. Error	t-value	Pr(> t)
(Intercept) [#]	NA	NA	NA	NA
ROE	0.023	0.003	8.161	5.9e-16 ***
LDR	0.242	0.101	2.381	0.017 *
NPL	-0.100	0.011	-9.115	< 2.2e-16 ***
LEV	-0.065	0.009	-7.136	1.4e-12 ***
TCE_TA	-0.005	0.008	-0.641	0.522
LN_REV_STAFF	0.172	0.060	2.865	0.004 **
DIV_YIELD	-0.165	0.008	-19.781	< 2.2e-16 ***
LN_ASSETS	-0.024	0.005	-4.756	2.1e-06 ***
as.factor(TIME)1	0.446	0.033	13.389	< 2.2e-16 ***
Model Statistics:				
R-Squared	51.5%			
Adj. R-Squared	48.8%			
Overall P-Value	< 2.22e ⁻¹⁶			

Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1.

[#] The intercept in a fixed effects model is not directly estimated by the model because the transformation removes individual-specific effects. Each bank has its own intercept, so a single overall intercept is omitted, as the model focuses on deviations from entity-specific means rather than a constant term

Source: Table 4. *Fixed effects regression model estimates*, p. 41, from Umeorah, S. C., Adelaja, A. O., Ayodele, O. F., Abikoye, B. E., & Azubuike, N. A. (2024). *Impact of select variables on tangible book value multiple of U.S. regional banks. Journal of Economics, Management and Trade*, 30(11), 33–49.

Table 2.6 Random effects regression model estimates

Variables	Estimate	Std. Error	t-value	Pr(> t)
(Intercept)	2.860	0.258	11.098	< 2.2e-16 ***
ROE	0.030	0.003	10.925	< 2.2e-16 ***
LDR	0.054	0.096	0.560	0.576
NPL	-0.090	0.011	-8.154	3.5e-16 ***
LEV	-0.065	0.009	-7.171	7.5e-13 ***
TCE_TA	0.007	0.008	0.919	0.358
LN_REV_STAFF	0.231	0.054	4.278	2.0e-05 ***
DIV_YIELD	-0.158	0.008	-19.189	< 2.2e-16 ***
LN_ASSETS	0.102	0.020	5.205	1.9e-07 ***
as.factor(TIME)1	0.505	0.032	15.587	< 2.2e-16 ***
Model Statistics:				
R-Squared	49.2%			
Adj. R-Squared	48.9%			
Overall P-Value	< 2.22e-16			

Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Source: Table 5. *Random effects regression model estimates*, p. 41, from Umeorah, S. C., Adelaja, A. O., Ayodele, O. F., Abikoye, B. E., & Azubuike, N. A. (2024). *Impact of select variables on tangible book value multiple of U.S. regional banks. Journal of Economics, Management and Trade*, 30(11), 33–49.

Table 2.7 Pooled OLS regression model estimates

Variables	Estimate	Std. Error	t-value	Pr(> t)
(Intercept)	2.201	0.245	8.999	< 2.2e-16 ***
ROE	0.052	0.003	18.050	< 2.2e-16 ***
LDR	-0.448	0.083	-5.410	7.1e-08 ***
NPL	-0.064	0.012	-5.157	2.8e-07 ***
LEV	-0.091	0.009	-9.863	< 2.2e-16 ***
TCE_TA	0.070	0.007	9.760	< 2.2e-16 ***
LN_REV_STAFF	0.251	0.049	5.098	3.8e-07 ***
DIV_YIELD	-0.106	0.008	-12.695	< 2.2e-16 ***
LN_ASSETS	0.148	0.011	13.773	< 2.2e-16 ***
as.factor(TIME)1	0.593	0.036	16.267	< 2.2e-16 ***
Model Statistics:				
R-Squared	48.5%			
Adj. R-Squared	48.3%			
Overall P-Value	< 2.22e-16			

Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Source: Table 6. *Pooled OLS regression model estimates*, p. 42, from Umeorah, S. C., Adelaja, A. O., Ayodele, O. F., Abikoye, B. E., & Azubuike, N. A. (2024). *Impact of select variables on tangible book value multiple of U.S. regional banks. Journal of Economics, Management and Trade*, 30(11), 33–49.

To improve pricing decisions, Umeorah recalculated the regression model using robust standard errors. While some variable significance levels changed slightly, the overall model fit improved and provided a more reliable basis for analysis. These findings support

the idea that TBV multiples are best used in combination with other tools such as market comparables, strategic fit evaluations, and scenario analysis (Umeorah, et al. 2024, 46)

Table 2.8 Fixed effects model estimates using robust standard errors

Variable	Estimate	Std. Error	t value	Pr(> t)
ROE	0.023	0.006	3.563	3.8e-04 ***
LDR	0.242	0.225	1.074	0.283
NPL	-0.100	0.016	-6.375	2.3e-10 ***
LEV	-0.065	0.017	-3.805	1.47e-04 ***
TCE_TA	-0.005	0.011	-0.465	0.642
LN_REV_STAFF	0.172	0.074	2.328	0.020*
DIV_YIELD	-0.165	0.016	-10.108	2.2e-16 ***
LN_ASSETS	-0.024	0.005	-5.211	2.1e-07 ***
as.factor(TIME)1	0.446	0.051	8.682	2.2e-16 ***

Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Source: Table 9. *Fixed effects model estimates using robust standard errors*, p. 44, from Umeorah, S. C., Adelaja, A. O., Ayodele, O. F., Abikoye, B. E., & Azubuike, N. A. (2024). *Impact of select variables on tangible book value multiple of U.S. regional banks. Journal of Economics, Management and Trade*, 30(11), 33–49.

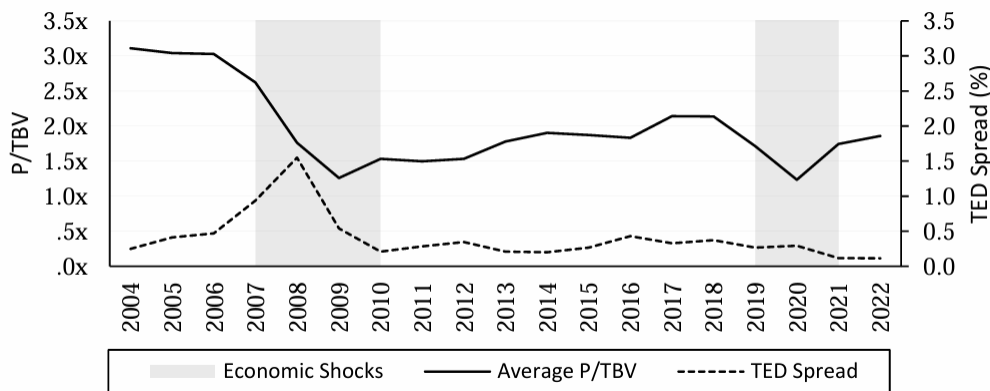
Tangible book value multiples are often used in acquisition settings as a starting benchmark for evaluating potential purchase prices. However, interpreting these multiples in practice requires careful consideration of both quantitative and qualitative factors. A higher TBV multiple may reflect expectations for post-merger synergies, earnings growth, or strong credit performance. Conversely, a lower multiple could signal heightened risk, poor asset quality, or a lack of market confidence in the institution's future prospects. Analysts must also consider external factors such as interest rate trends, regulatory outlook, and regional economic conditions that may shape investor sentiment and valuation floors.

However, caution is advised when interpreting these multiples. Academic research notes that metrics like TBV cannot capture qualitative elements such as the strength of management, customer loyalty, or the mix of income sources. These factors are critical in determining long-term value but are not always visible in financial statements. Ignoring

them can lead to overpaying for underperforming institutions or missing valuable acquisition opportunities (Dayag and Trinidad 2019, 54); (Umeorah, et al. 2024, 46).

Historical context reinforces these empirical findings. As shown in Figure 2.2, TBV multiples for regional banks have not remained static over time but have fluctuated in response to economic shocks and broader market sentiment. Notably, the years preceding the 2008 financial crisis saw elevated valuation multiples, reflecting widespread investor optimism, easy credit conditions, and strong earnings performance. In contrast, periods following the crisis exhibited more conservative valuations as risk aversion increased and regulatory scrutiny intensified. These cyclical valuation patterns suggest that TBV multiples are not only shaped by firm-level fundamentals but are also influenced by macroeconomic volatility, policy shifts, and investor expectations about the banking sector's resilience.

Figure 2.2 Historical valuation levels of regional banks and the impact of economic shocks, highlighting higher valuations in the pre-financial crisis period



Source: Fig 2. *Historical valuation levels of regional banks and the impact of economic shocks, highlighting higher valuations in the pre-financial crisis period*, p. 46, from Umeorah, S. C., Adelaja, A. O., Ayodele, O. F., Abikoye, B. E., & Azubuike, N. A. (2024). *Impact of select variables on tangible book value multiple of U.S. regional banks*. *Journal of Economics, Management and Trade*, 30(11), 33–49.

The work of Stanley Chidozie Umeorah served as an important reference point for identifying which financial variables are most relevant in explaining differences in tangible book value multiples among U.S. banks. Umeorah's research empirically examines the relationship between key financial performance indicators such as profitability, efficiency, asset quality, and growth and bank valuation outcomes.

Based on these findings, this framework incorporates several of the same categories of variables, including profitability (Return on Equity), earnings performance (Net Interest Margin), operational efficiency (Efficiency Ratio), and asset quality (Nonperforming Loans Ratio). These variables were selected because prior research, including Umeorah's, demonstrates that they are consistently associated with differences in valuation across banks.

However, the weighting structure and trigger-based adjustment methodology used in this study were independently developed. Rather than directly adopting coefficients or prescribed weights from prior research, this model translates empirically supported relationships into a simplified and interpretable framework designed for practical applications. The weights assigned to each variable reflect both the relative importance suggested in the literature and the need to maintain usability for decision-makers.

In this way, Umeorah's work provided directional guidance on variable relevance, while the final model design including weighting, triggers, and adjustment structure represents an original contribution of this study.

2.3 Financial Analysis and Performance Benchmarking for Banks

Accurate evaluation of bank performance requires a multidimensional approach that integrates profitability, efficiency, credit risk, and capital adequacy. These metrics

serve as foundational elements for peer comparisons, regulatory assessments, and acquisition screening. When applied consistently, financial benchmarking allows stakeholders to identify undervalued institutions, monitor internal trends, and compare performance across institutions of similar size, strategy, and market footprint

Efficiency is one of the most telling indicators of operational health, particularly for community and regional banks. The efficiency ratio, which compares non-interest expenses to total operating income, provides a reliable measure of cost control relative to revenue generation. When used in combination with variables such as return on assets, capital-to-assets, and overhead levels, efficiency ratios effectively differentiate well-managed institutions from underperformers. Empirical research shows that banks with stronger efficiency ratios consistently outperform their peers in profitability and asset quality metrics, reinforcing the relevance of this measure in performance diagnostics and comparative valuation (Hays, De Lurgio and Gilbert 2009).

Profitability ratios such as return on average assets and return on equity (ROE) remain essential in financial benchmarking. These indicators not only capture core earnings strength but also signal an institution's ability to generate shareholder value. In valuation modeling, higher ROE and return on average assets figures are strongly associated with elevated tangible book value multiples, reflecting market confidence in a bank's income-generating capacity. These return-based indicators also correlate positively with acquisition premiums, especially when supported by strong operational discipline and stable credit performance (Umeorah, et al. 2024).

Credit risk and asset quality are fundamental parts of any benchmarking framework. Nonperforming loan ratios offer a forward-looking perspective on the health of

a bank's loan portfolio and its ability to support future growth. Recent studies show that low Nonperforming loan ratios, when combined with strong capital buffers and appropriate institutional scale, contribute significantly to long-term bank performance and market valuation. This is particularly important in mergers and acquisition scenarios, where acquirers seek institutions that offer both clean balance sheets and growth potential (Arhinful, et al. 2025).

Together, efficiency, profitability, and credit quality indicators form the backbone of performance benchmarking in the banking sector. These metrics are not only independently useful but also mutually reinforcing, offering a more complete picture of institutional health. Their integration into acquisition models, peer assessments, and internal planning tools enables banks and stakeholders to evaluate risk-adjusted performance and strategic positioning across diverse operating environments.

2.4 Strategic Valuation Applications in Bank Mergers and Acquisitions

Strategic valuation plays a central role in bank mergers and acquisitions by aligning financial modeling with organizational objectives such as expanding market presence, improving efficiency, and enhancing competitive positioning. In this context, valuation is not simply a technical exercise, but a forward-looking process tied to anticipated synergies and integration potential. Critical strategic considerations include compatibility of business models, credit risk profiles, customer bases, and regulatory positioning. These factors influence whether the transaction will result in long-term value creation, and accordingly, valuation techniques are often adapted to reflect anticipated earnings improvements or cost savings (Rezaee 2004).

In the banking sector, specific challenges such as regulatory capital constraints, deposit stability, and balance sheet structure require the valuation process to consider more than just standalone financial metrics. When acquiring a depository institution, for example, strategic value may be found in core deposit bases, lending concentration, or geographic coverage. These aspects can influence the discount rate, the risk premium, and ultimately the valuation multiple assigned to the target. Due diligence therefore becomes not just an audit of historical performance but a means of validating assumptions about future strategic alignment, market conditions, and integration feasibility (Rezaee 2004).

Beyond strategic fit, valuation also requires disciplined use of control premiums and synergy assumptions. Acquiring banks often pay a premium over market value, but this must be justified by quantified benefits such as branch consolidation, personnel reductions, or improved technology integration. These premiums are influenced by the relative efficiency and performance of the buyer versus the target. Moreover, scenario analysis is essential to account for risks such as regulatory pushback, delays in integration, or cultural misalignment between the merging entities. Strategic valuation must balance optimism with rigor, ensuring that premiums reflect real, achievable value (Massari, Gianfrate and Zanetti 2014).

One of the most common tools used in mergers and acquisition valuation is market based benchmarking. The use of price to tangible book value and price-to-earnings multiples remains widespread, particularly when adjusted for key performance variables like return on equity or loan performance. These benchmarks are used both to screen acquisition targets and to test pricing reasonableness in formal offers. A premium price to tangible book value multiple may be justified for banks with niche lending operations,

above-peer net interest margins, or high-quality loan portfolios. However, reliance on multiples alone is insufficient without understanding the underlying drivers of those valuations (Massari, Gianfrate and Zanetti 2014).

Once a deal is complete, the strategic valuation assumptions must be validated through post-merger performance tracking. Metrics such as post-integration return on assets, cost-to-income ratio, and capital adequacy can indicate whether the expected value is being realized. Empirical studies have shown that banks with strong pre-merger efficiency metrics tend to produce better post-merger outcomes. On the other hand, overpayment for perceived synergies that do not materialize can lead to shareholder value destruction. Thus, strategic valuation must remain dynamic, supported by milestone reviews that assess whether forecasted benefits are achieved (Apreku-Djan, Asamoah and Quartey 2022).

2.5 Current Challenges, Innovations, and Gaps in Bank Valuation Research

Despite the growing sophistication of bank valuation methods, persistent challenges continue to hinder precision and reliability. One core issue lies in the applicability of traditional valuation models to the unique characteristics of banking institutions. Deev (2011) notes that while asset-based, market-based, income-based, and contingent claim approaches each offer theoretical rigor, they often fall short in capturing the regulatory complexity, dual-role balance sheet structure, and risk-sensitive business models of modern banks. For instance, asset-based methods fail to account for long-term performance, while market approaches are limited by the availability of suitable comparables. Even income-based approaches, though flexible, rely heavily on subjective forecasts of future cash flows

and cost of capital assumptions, leading to substantial valuation variance depending on input selection (Deev 2011, 35-42).

Another significant gap is the inconsistency in how performance metrics influence valuation outcomes. While numerous studies rely on standard financial indicators such as return on equity, net interest margin, and efficiency ratios, their explanatory power can be diluted by regional or institutional variability. (2024, 34-46) Umeorah identified key determinants of tangible book value multiples and found that capital adequacy and loan concentration ratios exhibited statistically significant correlations with valuation, yet these effects varied across time periods and bank size categories. This highlights the need for dynamic, rather than static, models that can account for structural shifts in bank operations and market expectations.

In addition, performance benchmarking practices have not kept pace with changes in the banking environment. As technology and regulation evolve, so must the metrics used to evaluate bank efficiency and risk-adjusted returns. Traditional efficiency ratios, while widely applied, can obscure differences in performance across asset sizes or risk profiles. Their analysis revealed that smaller community banks, despite similar input-output ratios, often achieve divergent profitability outcomes, suggesting that benchmarking tools must adjust for contextual factors such as geographic scope, service offerings, and operational models (Dayag and Trinidad 2019, 44-54)

These gaps underscore the need for new valuation frameworks that blend traditional financial analysis with more adaptive, real-time indicators. Innovations such as scenario-based stress testing, machine learning-driven forecasts, and hybrid models that integrate regulatory constraints with behavioral risk profiles may enhance predictive accuracy and

strategic relevance. However, academic literature has yet to consolidate these approaches into standardized methodologies, leaving practitioners to rely on fragmented insights and custom-built models. Continued empirical research and interdisciplinary collaboration are essential to bridge the divide between valuation theory and the evolving realities of the banking sector.

CHAPTER III: MODEL & METHODOLOGY

3.1 Research Design

Tangible Book Value is a widely used benchmark in bank valuation because it is based on audited balance sheet data. However, it does not fully capture a bank's operational performance, profitability, credit quality, or strategic position. To improve this measure, this study develops an Adjusted Tangible Book Value framework that enhances the traditional approach by integrating ten weighted financial performance indicators. The weights were selected from a combination industry bank owners and leadership of those banks as well as the literature review emphasizing the importance of each ratio. The blending of that expert information was used to influence the amount of each ratios weight. Ultimately this framework was designed to be adjusted based on what a specific bank is looking for and finds the most valuable for the weights to allow this to fit the needs of the bank and not force that bank to comply to something that doesn't fit the bank using this info.

This study employs a quantitative, research design to estimate intrinsic bank valuations and identify potential acquisition targets. The primary objective is to develop a framework that adjusts tangible book value (TBV) using key financial performance metrics, allowing for a more accurate assessment of bank value in the context of mergers and acquisitions. By quantifying valuation premiums or discounts relative to TBV, the model enables investors, strategic buyers, and financial institutions to narrow the field of viable acquisition candidates based on underlying fundamentals.

The research focuses on a cross-sectional dataset constructed by averaging annual financial variables for each U.S. bank over a three-year period (2022–2024). This approach mitigates short-term volatility and captures a more stable representation of institutional performance. Long-term loan growth rates are calculated using historical data from 2016 to 2018, further enriching the model with a forward-looking growth indicator.

The study utilizes FFIEC Call Report data from 4,299 banks, including institutions of various sizes and business models. No exclusions were applied based on asset size or charter type. The unit of analysis is the individual bank, and the primary outcome variable is the estimated valuation premium or discount relative to unadjusted TBV.

A predictive regression model serves as the core analytical tool, incorporating ten performance-based variables to explain variation in bank valuation outcomes. These include metrics of profitability, credit quality, capital adequacy, efficiency, and growth. All data processing, analysis, and model construction were conducted using Microsoft Excel, including the development of weighted scoring models, regression outputs, and summary statistics.

3.2 Data Sources and Sample Selection

This study uses a structured set of quantitative variables to estimate valuation premiums or discounts for U.S. banks. One dependent variable and ten independent variables are used to construct a predictive model and calculate an adjusted tangible book value (TBV) for each institution.

The dependent variable is the Valuation Premium or Discount, defined as the percentage difference between the bank's market valuation and its reported tangible book value. Since many community banks are not publicly traded, valuation was estimated

indirectly by adjusting TBV using financial performance scores derived from the independent variables. This adjustment represents a proxy for market-based valuation and enables comparison across institutions.

Ten independent variables were selected based on their relevance to bank performance, valuation literature, and practical application in mergers and acquisitions. Each variable was computed using three-year average values (2022–2024) to ensure stability and mitigate the effect of outliers. These variables were then incorporated into a weighted model for estimating intrinsic value, with weights assigned based on conceptual relevance and empirical testing. Variable definitions and measurement approaches are summarized below.

This study relies on quarterly financial data from the Federal Financial Institutions Examination Council (FFIEC) Consolidated Reports of Condition and Income (Call Reports), accessed via the FFIEC’s Central Data Repository Public Data Distribution platform. These reports provide standardized, regulator-verified financial statements for all U.S. banks, supporting longitudinal and comparative analysis.

The dataset covers calendar years 2022 through 2024, with historical data from 2016–2018 incorporated to calculate long-term loan compound annual growth rates. The sample includes 4,299 commercial banks reporting complete financial data across all required schedules. No institutions were excluded based on asset size, charter type, or geographic location. All banks were identified and filtered using unique identifiers available in Schedule POR (FDIC certificate number, bank name, and RSSD ID).

Table 3.1 Call report data sets utilized

Code	Report
POR	Bank info (name, FDIC cert, RSSD ID) – used for filtering
RC	Balance sheet
RI	Income Statement
RCCI	Loans
RCCII	Loans
RCN	Past Due & Nonaccrual Loans
RCRI	Capital Ratios (Tier 1, CET1, leverage, risk-weighted assets)
RCRII	Shows core capital ratios like CET1 and Total Risk-Based Capital
RCM	Equity & Intangibles
RIA	Changes in Equity Capital
RIE	Non-Interest Expense / Non-Interest Income Breakdown
RIBI	Charge-Offs and Recoveries on Loans and Leases

Source: Federal Financial Institutions Examination Council

The bank-level data set was constructed in Microsoft Excel. Each variable was calculated using FFIEC field-level data, averaged across 2022–2024, and cleaned for missing values or inconsistencies. Historical loan balances were pulled for 2016–2018 and 2022–2024 to determine long-term loan compound annual growth. The resulting panel data provided the foundation for scoring model development, valuation adjustments, and regression analysis.

3.3 What is Tangible Book Value, how is it constructed and what is it measuring?

Tangible book value (TBV) is a widely used benchmark in bank valuation because it is derived from regulator verified balance sheet information and provides a consistent, comparable measure of tangible common equity. In practical terms, TBV represents the portion of a bank’s common equity that is supported by tangible assets and is available to absorb losses after removing intangible items such as goodwill and other intangible assets. This makes TBV a foundational reference point for bank investors and acquirers because it

is grounded in standardized financial reporting and reduces the noise created by differences in acquisition accounting, franchise premiums, and other non-tangible balance sheet items. TBV is also appealing because it can be calculated for essentially all banks, including privately held community banks that do not have observable market prices, and it supports direct comparisons across institutions and time periods.

In general practice, TBV is constructed from a bank's reported balance sheet and supporting equity schedules. The starting point is total shareholders' equity, which is reported as total equity capital on the balance sheet. From that total, intangible assets are removed to isolate tangible common equity. The most common construction is total equity capital minus goodwill minus other intangible assets $TBV = \text{Total Equity Capital} - \text{Goodwill} - \text{Intangible Assets}$. This approach is used because goodwill and other intangible assets can represent acquisition premiums or accounting entries that do not provide loss absorbing capacity in the same way as tangible assets. Depending on the institution or the analyst, TBV may also be presented on a per share basis, calculated as tangible common equity divided by common shares outstanding, which allows valuation comparisons using a tangible book value per share multiple. In all cases, the inputs originate from standardized financial reporting. For regulated banks in the United States, the underlying equity and intangible asset balances are documented in regulator required filings and are subject to supervisory review, which increases consistency across institutions and reduces reliance on management defined adjustments.

TBV is often used as a starting point for pricing discussions in mergers and acquisitions because it anchors the valuation conversation to a measurable equity base and provides a common denominator for evaluating what a buyer is paying relative to the

seller's tangible capital position. If an acquirer is evaluating potential targets, TBV helps establish a baseline for what is being acquired from a capital perspective before considering the premium that might be paid for earnings capacity, franchise value, deposit base characteristics, or strategic fit. For this reason, TBV multiples are commonly referenced in bank transaction markets and investor analysis as a shorthand expression of pricing relative to tangible equity.

However, TBV is ultimately an accounting-based snapshot rather than a full representation of economic value. The metric describes what a bank has accumulated in tangible equity at a point in time, but it does not explain how effectively that equity base is being utilized to generate earnings, manage risk, and sustain performance through different operating environments. Two banks can report similar TBV yet have materially different earning power due to differences in net interest margin, fee income generation, funding structure, operating expense discipline, and balance sheet mix. Likewise, two banks with comparable TBV can face very different credit outcomes depending on underwriting standards, portfolio seasoning, concentration exposures, and loss experience. These differences influence the sustainability of future earnings and the likelihood that tangible equity will be preserved or eroded over time, which are the drivers that determine what an acquirer is willing to pay in a real-world transaction.

TBV also fails to incorporate the economic tradeoffs that management makes between risk, growth, and profitability. A bank can increase TBV through retained earnings while simultaneously pursuing strategies that depress margins, increase operating costs, or weaken credit quality. Conversely, a bank can have a modest TBV base yet generate superior returns through strong pricing discipline, efficient operations, and well managed

credit risk. In acquisition screening, these distinctions matter because the buyer is not purchasing a static equity number. The buyer is purchasing a stream of future economic benefits and assuming exposure to future losses. TBV captures the level of tangible capital that exists today, but it does not directly reflect the strength of a bank's earnings engine, the efficiency of its operating model, or the quality of its risk controls. For that reason, TBV can be a reliable accounting anchor while still being an incomplete proxy for intrinsic value.

This limitation is especially important for community banks, where market pricing signals are often unavailable and transaction pricing can vary significantly based on performance characteristics. In practice, banks with similar TBV can command very different valuation multiples because buyers pay premiums for sustained profitability, strong margins, efficient cost structures, and clean credit profiles, while applying discounts for weak earnings, operational inefficiency, elevated nonperforming assets, or persistent net charge offs. Liquidity and funding structure also influence perceived value because the ability to fund loan growth at reasonable cost affects margin stability and risk appetite. Portfolio composition and concentration further affect intrinsic value because dependence on a narrow set of loan categories can create earnings volatility and loss sensitivity, even when current performance appears acceptable. TBV, on its own, does not convert these operating realities into a valuation signal, which reduces its usefulness as a standalone tool for distinguishing strong acquisition candidates from banks that appear inexpensive for structural reasons.

3.4 Adjusted Tangible Book Value

While Tangible Book Value is a common metric used in evaluating banks, it fails to capture critical differences in performance, risk, and strategic positioning across institutions. To improve its utility for acquisition screening, this study introduces an Adjusted Tangible Book Value (ATBV) framework that integrates ten weighted financial metrics into a scoring system that modifies TBV based on real-world performance signals.

Each of the ten independent variables was assigned a weight based on its importance in valuation, with the total weight summing to 100 percent. These variables included Return on Equity, Net Interest Margin, Efficiency Ratio, Net Charge-Off Rate, Nonperforming Loans Ratio, Leverage Ratio, Risk Buffer Ratio, Loan to Deposit Ratio, Loan Compound Annual Growth Rate, and Loan Concentration Ratio.

Table 3.2 Independent Variables, formulas, definition, weights, and triggers

#	Variable Name	Formula	Definition	Weight	Positive Trigger	Negative Trigger
1	Return on Equity (ROE)	Net Income ÷ Average Equity	Measures profitability from shareholders' equity.	17%	12.00%	5.00%
2	Net Interest Margin (NIM)	(Interest Income – Interest Expense) ÷ Average Earning Assets	Captures the bank's efficiency in generating interest income from earning assets.	18%	3.50%	2.50%
3	Efficiency Ratio	Non-Interest Expense ÷ (Net Interest Income + Non-Interest Income)	Assesses cost-efficiency in generating revenue. A lower ratio indicates higher operational efficiency.	12%	60.00%	70.00%
4	Net Charge-Off Rate (NCO)	Net Charge-Offs ÷ Average Total Loans	Reflects asset quality by measuring the percentage of loans written off as uncollectible.	9%	0.25%	0.75%
5	Non-Performing Loans Ratio (NPL)	Non-Performing Loans ÷ Total Loans	Indicates the share of loans 90+ days past due or on nonaccrual status.	14%	0.75%	2.00%
6	Leverage Ratio	Tier 1 Capital ÷ Average Total Assets	Measures capital adequacy based on core capital relative to total assets.	6%	11.00%	8.00%
7	Risk Buffer Ratio	(Tier 1 Capital – Minimum Required Capital) ÷ Risk-Weighted Assets	A custom metric representing a bank's ability to absorb unexpected losses beyond regulatory minimums.	4%	12.00%	8.00%
8	Loan-to-Deposit Ratio (LDR)	Total Loans ÷ Total Deposits	Reflects liquidity and risk appetite by showing the proportion of deposits deployed into loans.	8%	75-85%	<70% or >90%
9	Loan Compound Annual Growth Rate (Loan CAGR)	CAGR of Year-End Loan Balances from 2016–2018 to 2022–2024	Measures long-term growth in lending activity using historical data from 2016–2018 and 2022–2024.	5%	6.00%	2.00%
10	Loan Concentration Ratio	Largest Loan Category ÷ Total Loans	Identifies risk exposure from dependence on specific loan categories (e.g., commercial real estate, agriculture).	7%	40.00%	55.00%

Each variable was evaluated using a structured trigger system consisting of a positive trigger, a neutral zone, and a negative trigger. For example, Return on Equity was assigned a weight of 17 percent. Banks with an ROE above 12 percent received a positive trigger, which applied a multiplier of 1.17 to that weight. ROE between 5 and 12 percent was considered neutral and received a standard multiplier of 1.0, meaning no adjustment was made. ROE below 5 percent triggered a negative adjustment, applying a multiplier of 0.83 to that weight. This structure was consistently applied across all ten variables, using tailored thresholds for each metric.

Return on Equity was weighted at 17 percent because it is a direct profitability signal that buyers and investors routinely evaluate when comparing banks with similar balance sheet sizes. In the FDIC Quarterly Banking Profile, community bank return on equity in 2023 was in the high single digits, so a 12 percent positive trigger is intended to represent performance meaningfully above the peer baseline and consistent with a bank that is converting equity into earnings at a stronger rate than most peers. A 5 percent negative trigger is intended to represent weak profitability relative to typical community bank results and to flag banks that are not earning an adequate return on capital, which commonly translates into discounted pricing or heightened scrutiny in acquisition screening (Federal Deposit Insurance Corporation (FDIC) 2023, 2024).

Net Interest Margin was weighted at 18 percent because spread income is a primary value driver for traditional community banks and tends to explain why two banks with similar tangible equity can produce very different earnings power. The 3.50 percent positive trigger was set above the reported community bank net interest margin level in the FDIC Quarterly Banking Profile, so it functions as a “better than peers” screen for core

earning power from the balance sheet. The 2.50 percent negative trigger was set well below that peer level to flag margin compression that is large enough to be economically meaningful, since sustained low margin often reflects unfavorable funding mix, weaker pricing power, or elevated liquidity costs (Federal Deposit Insurance Corporation (FDIC) 2023, 2024).

The Efficiency Ratio was weighted at 12 percent because operating discipline is one of the most controllable drivers of bank profitability, especially for community banks where revenue growth can be constrained by market size and competition. The 60 percent positive trigger was chosen because it is materially better than the community bank efficiency ratio reported in the FDIC Quarterly Banking Profile, and it is also a commonly cited performance target in bank management and analyst discussions, which makes it a practical threshold for identifying strong cost control. The 70 percent negative trigger was chosen as a clear “high cost” signal relative to typical peer performance, meaning the bank is consuming a larger share of revenue to run the franchise and is more likely to be valued at a discount unless offset by unusually strong margins or growth (Federal Deposit Insurance Corporation (FDIC) 2023, 2024).

Net Charge Off Rate was weighted at 9 percent because realized credit losses are a direct hit to earnings and capital, and they tend to matter more in valuation once they start rising above normal levels. The 0.25 percent positive trigger was set slightly above the community bank net charge off rate reported by the FDIC, so it functions as a screen for very clean, stable credit outcomes without requiring an unrealistically perfect loss rate. The 0.75 percent negative trigger was set far above typical community bank experience to identify banks where loss content is no longer “normal noise” and is more likely to reflect

underwriting issues, adverse concentration exposure, or stressed local conditions that buyers typically price conservatively (Federal Deposit Insurance Corporation (FDIC) 2023, 2024).

Nonperforming Loans Ratio was weighted at 14 percent because problem assets tend to predict future charge offs and also signal elevated risk that can constrain growth and increase regulatory attention. The 0.75 percent positive trigger was set above the community bank noncurrent loan rate reported by the FDIC, making it a realistic but still conservative threshold for strong asset quality. The 2.00 percent negative trigger was set at a level that is meaningfully higher than typical peer results and is usually associated with a problem credit cycle at the institution, which can drive valuation discounts through higher provisioning needs, management distraction, and uncertainty around ultimate loss content (Federal Deposit Insurance Corporation (FDIC) 2023, 2024).

The Leverage Ratio was weighted at 6 percent because capital adequacy matters in acquisition screening, but it usually functions more as a constraint and a risk control than as the main driver of valuation premiums once a bank is comfortably capitalized. The 11.00 percent positive trigger was set well above common regulatory minimum concepts, so it identifies banks with clearly strong core capital levels. The 8.00 percent negative trigger was set to flag banks that remain above basic minimum standards but have less capital flexibility than stronger peers, which can matter in stressed environments or for buyers who want a larger buffer to support growth or absorb credit migration (Loudis, Nguyen and Wix 2020).

The Risk Buffer Ratio was weighted at 4 percent because it is designed to capture excess loss absorbing capacity beyond minimum requirements, but it is intentionally a

smaller weight since the market often values capital strength through profitability and risk outcomes rather than rewarding “more capital” on its own once the bank is safe. The 12.00 percent positive trigger was selected to represent a clearly meaningful cushion and to differentiate banks that have ample capacity to absorb unexpected losses without impairing strategic options. The 8.00 percent negative trigger was selected to flag a thinner cushion where the bank may have less room to handle adverse credit migration or interest rate shocks, consistent with the general supervisory emphasis on monitoring concentration and risk buildup when buffers are limited. This ratio was ultimately selected due to wanting to consider Tier 1 Capital but many of the other ratios required information that different size banks didn’t always report. With a lot of research and trial and error looking through the call reports this ratio was selected.

Loan to Deposit Ratio was weighted at 8 percent because it captures a bank’s liquidity posture and balance sheet deployment, both of which affect earnings potential and risk. The 75 percent to 85 percent positive trigger range was centered around a practical “fully deployed but not stretched” posture that is commonly referenced in bank balance sheet management discussions, and it avoids rewarding either unusually low deployment or aggressive funding usage. The below 70 percent and above 90 percent negative triggers were selected to flag two different issues: below 70 percent can indicate underutilization of the funding base that may depress earnings power, while above 90 percent can indicate tighter liquidity and greater reliance on wholesale funding or rapid deposit repricing if conditions shift (DiSalvo and Johnston 2017).

Loan Compound Annual Growth Rate was weighed at 5 percent because growth can support franchise value and future earnings, but it is intentionally kept below

profitability and credit weights since growth that is not profitable or that weakens credit quality does not reliably translate into higher valuation. The 6.00 percent positive trigger was selected to represent sustained growth meaningfully above the community bank loan growth rates reported in the FDIC Quarterly Banking Profile over recent years, so it identifies banks that are expanding faster than peers on a multi-year basis. The 2.00 percent negative trigger was selected to flag low growth that is close to flat in real terms over time and may indicate competitive pressure, capacity limits, or a conservative posture that reduces future earnings momentum (Federal Deposit Insurance Corporation (FDIC) 2023, 2024). This ratio was ultimately selected due to wanting to consider compound annual growth but many of the other ratios required information that different size banks didn't always report. With a lot of research and trial and error looking through the call reports this ratio was selected .

Loan Concentration Ratio was weighted at 7 percent because concentration is a core source of downside risk in banking, and supervisors explicitly highlight that concentration can elevate an institution's risk profile and warrants closer monitoring. The 40.00 percent positive trigger was selected to reflect a practical diversification screen where no single category dominates the portfolio, which reduces the chance that one segment drives the bank's credit cycle. The 55.00 percent negative trigger was selected as a clear signal of reliance on a single loan category, consistent with the general supervisory principle that higher concentrations increase vulnerability to sector specific stress and can translate into more volatile credit outcomes and more conservative pricing by buyers (Office of the Comptroller of the Currency 2020).

The multipliers from each variable were then used to adjust the weighted score, and the result was a performance-based adjustment factor representing the bank's estimated overvaluation or undervaluation. This adjustment factor calculated as the sum product of the ten weighted multipliers produced the "Percentage Over or Under Valued" metric. This percentage was then multiplied by the bank's original Tangible Book Value to calculate an Adjusted Tangible Book Value.

By converting the relative performance signals from each bank into a single dollar-denominated adjustment, the model offers decision-makers a more practical and economically relevant estimate of valuation. For instance, if a bank's financial metrics resulted in an estimated 8 percent undervaluation, and its reported TBV was \$100 million, the ATBV would be \$108 million. This framework bridges the gap between raw book value and intrinsic value by embedding performance-based insights directly into the valuation estimate.

The valuation adjustment logic was implemented in Microsoft Excel using a consistent trigger-based multiplier structure for each of the ten independent variables. For each bank, Excel first calculates the raw ratio for a given variable using Call Report inputs. The ratio is then evaluated against two thresholds stored in fixed trigger cells. A positive trigger identifies performance that is strong enough to merit a premium, a negative trigger identifies performance weak enough to merit a discount, and values between the triggers remain neutral. This design keeps the adjustment rule consistent across every bank and every year because the trigger and weight inputs are locked with absolute cell references, so the same thresholds and weights are applied row by row without manual intervention.

Return on equity is one of the 10 variables as an example of how the formulas work. Excel compares the bank's return on equity to the positive trigger of 12.0 percent and the negative trigger of 5.0 percent. If return on equity exceeds 12.0 percent, Excel outputs a multiplier equal to one plus the weight, which produces 1.17 when the weight is 17 percent. If return on equity falls below 5.0 percent, Excel outputs a multiplier equal to one minus the weight, which produces 0.83. If return on equity is between 5.0 percent and 12.0 percent, Excel outputs 1.00, meaning return on equity does not change valuation for that bank. The practical interpretation is that the 17 percent weight is only activated when performance is clearly above or clearly below the defined trigger points, while average performance remains neutral and does not push value up or down.

The same three outcome multiplier logic is applied across all ten independent variables, each with its own weight and trigger thresholds. After Excel generates the ten multipliers for a given bank, they are combined using a SUMPRODUCT structure that applies the weights to the multipliers and produces a single valuation factor for that institution. Because the weights sum to 100 percent, the SUMPRODUCT result can be interpreted as the bank's overall percentage over or undervalued relative to tangible book value based on the weighted performance signals. That combined percentage factor is then applied to the bank's tangible book value to estimate adjusted tangible book value, converting the model output into a dollar denominated valuation that a decision maker can compare directly across banks.

CHAPTER IV: DATA ANALYSIS AND RESULTS

4.1 Dataset Overview, Processing, and Cleaning

This study utilizes FFIEC Call Report data from all reporting banks for calendar years 2022 through 2024, totaling 4,543 banks in the most recent year. To maintain relevance for acquisition analysis, only currently active banks were included; banks that had closed or merged prior to 2024 were excluded automatically. The dataset was further refined to remove institutions with missing or incomplete financial data necessary for the adjusted tangible book value model. A total of 231 banks were eliminated due to unavailable values in one or more of the key variables used for scoring.

An additional 13 banks were excluded because they were newly established in 2023 or 2024 and lacked three full years of performance data, which was required for the average framework used in this study. Banks that were established before 2023 and had at least three years of data were retained, regardless of whether they had undergone prior mergers or charter changes.

The remaining dataset includes all eligible banks that filed call reports during the study period. No asset size filters or regional exclusions were applied. The analysis used 2022–2024 as the modeling window, with corresponding historical data from 2016–2018 used to calculate six-year compound annual growth rates for loans and deposits.

No winsorizing, outlier removal, or normalization techniques were applied to the data. All values were taken as reported and used in their raw form. The model’s weighted scoring framework was applied to each year’s data individually before being averaged

across the three-year period. This approach ensured consistency in metric weighting while preserving the year-over-year financial dynamics of each institution.

4.2 Descriptive Statistics

Table 4.1 presents summary statistics for the variables included in the adjusted tangible book value model. The sample consists of 4,299 banks, with each metric reflecting a three-year average from 2022 to 2024. These values were calculated after applying the positive and negative performance-based weighting adjustments across the ten independent variables.

The mean tangible book value for the sample was approximately \$118.0 million, while the mean adjusted tangible book value was \$169.3 million. This upward shift reflects the influence of banks that performed strongly against the weighted indicators. The average percentage over or under valued across all banks was 138 percent, with a wide range from -390 percent to +429 percent, suggesting significant dispersion in relative valuation once performance metrics were considered.

Return on equity had a mean of 11 percent and a standard deviation of 6 percent, with some institutions significantly outperforming or underperforming the sample average. Net interest margin was more stable, averaging 3.6 percent across the dataset. The efficiency ratio had a mean of 63 percent but exhibited a much wider range, from 10 percent to nearly 300 percent, likely due to outliers or classification inconsistencies in the call report data.

Credit quality indicators such as the net charge-off rate and the nonperforming loans ratio showed relatively low average values, at 0.01 percent and 0.62 percent

respectively. However, both metrics displayed highly skewed distributions with high kurtosis values, indicating that while most banks had low credit issues, a few institutions experienced severe credit deterioration.

Leverage and risk buffer ratios averaged 11 percent and 13 percent, respectively, signaling strong capital adequacy across the majority of institutions in the dataset. The loan-to-deposit ratio had a mean of 77 percent, which aligns closely with the model's preferred band of 75 to 85 percent. Finally, average loan growth measured by compound annual growth rate was 6 percent, and the loan concentration metric averaged 8 percent, indicating relatively diversified portfolios for most bank.

The correlation matrix in table 4.2 provides a detailed view of the linear relationships between all variables used in the adjusted tangible book value model. Unsurprisingly, tangible book value and adjusted tangible book value are highly correlated (0.97), confirming that the model is rooted in underlying book value while adjusting for fundamental performance metrics. The “percentage over or under valued” metric showed relatively weak correlations with tangible book value (0.05) and adjusted tangible book value (0.12), indicating that valuation adjustments were primarily driven by performance-based deviations rather than size or scale.

Return on equity displayed a modest positive correlation with the valuation adjustment metric (0.09), while net interest margin was slightly less correlated (0.04). Both relationships are directionally consistent with the expectation that higher profitability tends to lead to higher valuation multiples. The efficiency ratio, by contrast, was negatively

correlated with both return on equity (-0.21) and the percentage over or under valued (-0.62), reinforcing its role as a cost-efficiency indicator with strong influence on valuation.

Credit quality measures such as net charge-off rate and nonperforming loans ratio exhibited very low or negative correlations with the valuation metric (-0.04 and -0.01 , respectively), suggesting that while important for risk management, these factors may not drive valuation premiums unless they deviate substantially from normative levels. Capital adequacy metrics such as the leverage ratio and risk buffer ratio were weakly correlated with the adjusted valuation, at -0.03 and -0.06 respectively, which may reflect a limited marginal valuation benefit of capital strength in an already well-capitalized sector.

Loan-to-deposit ratio showed a slight positive relationship with adjusted valuation (0.12), while loan compound annual growth rate had a stronger positive correlation (0.16), supporting the idea that institutions demonstrating sustained lending expansion may be rewarded with valuation premiums. Loan concentration had the strongest correlation with the valuation metric (0.23), suggesting that diversification of loan portfolios is a meaningful contributor to perceived franchise value.

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Overall, the correlations illustrate that while some predictors are modestly interrelated, no pair of variables exhibits multicollinearity concerns that would impair the stability of regression results. The mix of profitability, risk, growth, and efficiency factors all contribute independently to the valuation framework without significant redundancy.

Table 4.1 Summary statistics

	<i>Tangible Book Value</i>	<i>Adjusted Tangible Book Value</i>	<i>Percent Over or Under Valued</i>	<i>1. Return on Equity (ROE)</i>	<i>2. Net Interest Margin</i>	<i>3. Efficiency Ratio</i>	<i>4. Net Charge Off Rate</i>	<i>5. Non performing Loans Ratio</i>	<i>6. Leverage Ratio</i>	<i>7. Risk Buffer Ratio</i>	<i>8. Loan to Deposit Ratio</i>	<i>9. Loan Compound Annual Growth Rate</i>	<i>10. Loan Concentration</i>
Mean	118034.80	169319.83	138%	0.11	0.03	0.69	0.00	0.01	0.11	0.13	0.77	0.08	0.08
Standard Deviation	385694.47	562408.02	39%	0.63	0.01	0.19	0.01	0.01	0.04	0.51	0.23	0.09	0.07
Minimum	-38997.67	-42664.22	48%	-35.54	0.00	0.12	-0.01	0.00	0.04	0.05	0.00	-0.31	-0.65
Maximum	9602333.33	11534936.29	263%	13.52	0.44	5.18	0.42	0.17	0.85	30.77	6.61	1.50	1.27

Table 4.2 Correlation matrix 3-year average data

	<i>Tangible book value</i>	<i>Adjusted Tangible book value</i>	<i>Percent Over or Under Valued</i>	<i>1. Return on Equity (ROE)</i>	<i>2. Net Interest Margin</i>	<i>3. Efficiency ratio</i>	<i>4. Net Charge-Off Rate</i>	<i>5. Nonperforming Loans Ratio</i>	<i>6. Leverage Ratio</i>	<i>7. Risk Buffer Ratio</i>	<i>8. Loan-to-Deposit Ratio</i>	<i>9. Loan Compound Annual Growth Rate</i>	<i>10. Loan Concentration</i>
Tangible Book Value	1.00												
Adjusted Tangible Book Value	0.97	1.00											
Percentage Over or Under Valued	0.05	0.12	1.00										
1. Return on Equity (ROE)	0.00	0.00	0.09	1.00									
2. Net Interest Margin	0.02	0.04	0.35	0.03	1.00								
3. Efficiency ratio	-0.11	-0.15	-0.62	-0.10	-0.21	1.00							
4. Net Charge-Off Rate	0.07	0.05	-0.04	0.01	0.27	-0.03	1.00						
5. Nonperforming Loans Ratio	0.06	0.03	-0.24	-0.02	0.13	0.14	0.22	1.00					
6. Leverage Ratio	0.00	-0.01	-0.10	0.02	0.07	-0.04	0.02	0.10	1.00				
7. Risk Buffer Ratio	0.00	0.00	-0.03	0.01	-0.04	0.00	0.00	0.02	0.31	1.00			
8. Loan-to-Deposit Ratio	0.12	0.11	0.09	-0.03	0.16	-0.05	-0.03	-0.01	0.15	0.10	1.00		
9. Loan Compound Annual Growth Rate	0.14	0.16	0.21	-0.01	0.06	-0.11	0.06	-0.09	-0.17	-0.05	0.29	1.00	
10. Loan Concentration	0.16	0.18	0.23	0.00	0.04	-0.13	0.06	-0.08	-0.27	-0.10	0.11	0.88	1.00

4.3 Regression and Correlation Results

To evaluate the explanatory power of the adjusted model and its components, two regression analyses were conducted using the same sample of 4,299 banks. Each model tested the relationship between key performance indicators and either tangible book value, adjusted tangible book value, or the derived percentage over or undervalued. The results are presented in Tables 4.3 and 4.4.

Table 4.3 presents the regression results for Percentage Over or Undervalued, the primary dependent variable developed for this study to capture the difference between adjusted tangible book value (ATBV) and reported tangible book value (TBV). The adjusted R-squared value of 0.506 indicates that just over 50 percent of the variation in adjusted valuations can be explained by the ten selected financial variables included in the model. These variables capture several key dimensions of bank performance, including profitability, operating efficiency, credit quality, capital structure, and lending characteristics. The results indicate that several profitability-related variables positively influence adjusted valuations. The coefficient for Return on Equity (ROE) is 0.016, meaning that a one-percentage-point increase in ROE increases the adjusted valuation relative to TBV by approximately 1.6 percentage points, holding other variables constant. Net Interest Margin has a coefficient of 10.138, indicating that a one-percentage-point increase in net interest margin increases the adjusted valuation relative to TBV by roughly 10.1 percentage points, highlighting the strong importance of core lending profitability in determining valuation premiums. Loan Concentration also shows a positive and statistically significant relationship with a coefficient of 0.562, implying that a one-unit increase in the loan concentration measure increases the adjusted valuation by approximately 0.56,

suggesting that banks with more focused lending strategies may achieve higher valuations when specialization is accompanied by strong performance. The Risk Buffer Ratio coefficient of 0.016 indicates that a one-percentage-point increase in capital buffer increases the adjusted valuation by about 1.6 percentage points, suggesting that stronger capitalization may contribute modestly to valuation premiums. Similarly, the Loan-to-Deposit Ratio coefficient of 0.035 suggests that a one-percentage-point increase in the loan-to-deposit ratio increases the adjusted valuation by approximately 3.5 percentage points, indicating that banks that deploy a larger share of deposits into earning assets may achieve slightly higher valuations.

Several variables associated with inefficiency and credit risk exhibit significant negative relationships with adjusted valuation. The Efficiency Ratio coefficient of -1.063 indicates that a one-percentage-point increase in the efficiency ratio reduces the adjusted valuation relative to TBV by approximately 1.06 percentage points, reflecting the negative impact of higher operating costs relative to revenue. Credit quality measures show the strongest negative effects in the model. The coefficient for the Net Charge-Off Rate is -4.908 , meaning that a one-percentage-point increase in the net charge-off rate reduces the adjusted valuation by approximately 4.9 percentage points, indicating that realized credit losses significantly reduce bank value. Similarly, the Nonperforming Loans Ratio coefficient of -6.374 indicates that a one-percentage-point increase in nonperforming loans reduces the adjusted valuation by approximately 6.37 percentage points, suggesting that deteriorating asset quality has a substantial negative impact on valuation. The Leverage Ratio coefficient of -1.018 indicates that a one-percentage-point increase in leverage reduces the adjusted valuation by approximately 1.02 percentage points, suggesting that

higher leverage levels may increase perceived financial risk and lead to valuation discounts. Finally, Loan Compound Annual Growth Rate has a coefficient of 0.027, meaning that a one-percentage-point increase in loan growth increases the adjusted valuation by approximately 2.7 percentage points; however, this coefficient is not statistically significant, indicating that loan growth alone does not consistently influence valuation across the sample of banks analyzed. Overall, the regression results suggest that profitability and efficient operations increase real-world bank valuations, while inefficiency, credit deterioration, and higher leverage contribute to valuation discounts relative to tangible book value.

Table 4.4 presents the regression results using traditional Tangible Book Value (TBV) as the dependent variable. The adjusted R^2 value of 0.05 indicates that only about five percent of the variation in tangible book value across the sample of banks is explained by the same set of financial variables used in the adjusted valuation model, suggesting that raw TBV largely reflects accumulated capital and balance sheet size rather than underlying financial performance. The coefficient for Return on Equity (ROE) is $-4,382.56$, meaning that a one-percentage-point increase in ROE is associated with a decrease in TBV of approximately \$4,383, holding other variables constant; however, this coefficient is not statistically significant, indicating that profitability does not meaningfully explain variation in TBV. The coefficient for Net Interest Margin is $-1,668,385.24$, indicating that a one-percentage-point increase in net interest margin is associated with a decrease in TBV of approximately \$1.67 million, holding other variables constant. Similarly, the Efficiency Ratio coefficient of $-213,944.32$ suggests that a one-percentage-point increase in the efficiency ratio reduces TBV by roughly \$213,944, indicating that higher operating costs

relative to revenue correspond with lower tangible capital levels. Credit quality variables display the opposite pattern. The coefficient for Net Charge-Off Rate is 2,801,982.68, meaning that a one-percentage-point increase in net charge-offs is associated with an increase in TBV of approximately \$2.80 million, while the Nonperforming Loans Ratio coefficient of 2,968,739.22 indicates that a one-percentage-point increase in nonperforming loans corresponds with an increase in TBV of roughly \$2.97 million. Although statistically significant, these positive relationships are economically counterintuitive and suggest that TBV is more closely related to balance sheet size than to credit performance. The coefficient for the Leverage Ratio is 108,471.44, implying that a one-percentage-point increase in leverage increases TBV by approximately \$108,471, though this relationship is not statistically significant. The Risk Buffer Ratio coefficient of -499.26 suggests that a one-percentage-point increase in the capital buffer reduces TBV by approximately \$499, but this effect is also statistically insignificant. The Loan-to-Deposit Ratio coefficient of 209,050.41 indicates that a one-percentage-point increase in the loan-to-deposit ratio increases TBV by approximately \$209,050, suggesting that banks deploying a larger share of deposits into loans tend to hold higher levels of tangible capital. The Loan Compound Annual Growth Rate coefficient of -454,345.45 implies that a one-percentage-point increase in loan growth is associated with a decrease in TBV of roughly \$454,345, potentially reflecting capital dilution during periods of rapid expansion. Finally, the Loan Concentration coefficient of 1,214,680.79 indicates that a one-unit increase in the loan concentration measure increases TBV by approximately \$1.21 million, suggesting that banks with more concentrated lending portfolios tend to have larger tangible capital bases. Overall, these results illustrate that traditional TBV does not consistently reflect the

operational and financial characteristics that drive economic value, reinforcing the need for the adjusted valuation framework developed in this study.

Together, these two regressions underscore the limitations of unadjusted TBV and demonstrate the superiority of the adjusted model in capturing intrinsic valuation differences. By isolating the percentage over or undervalued, analysts and acquirers can better screen for potential bank acquisition targets based on meaningful financial fundamentals rather than book value alone.

Table 4.3 Regression Results Explaining Adjusted Tangible Book Value Premium or Discount

VARIABLE	<i>Adjusted TBV</i>
	OLS
Return on Equity (ROE)	0.016** (-0.007)
Net Interest Margin	10.138*** (-0.421)
Efficiency Ratio	-1.063*** (-0.023)
Net Charge-Off Rate	-4.908*** (-0.571)
Nonperforming Loans Ratio	-6.374*** (-0.437)
Leverage Ratio	-1.018*** (-0.118)
Risk Buffer Ratio	0.016* (-0.009)
Loan-to-Deposit Ratio	0.035* (-0.02)
Loan Compound Annual Growth Rate	0.027 (-0.11)
Loan Concentration	0.562*** (-0.131)
Constant	1.860*** (-0.03)
Observations	4,299
R ²	0.508
Adjusted R ²	0.506
F-statistic	442.076

Notes: *** p < 0.01, ** p < 0.05, * p < 0.10. Standard errors are reported in parentheses. Model estimated using ordinary least squares (OLS).

Table 4.4 Tangible book value regression statistics (shows why TBV on its own isn't enough)

VARIABLE	TBV
	OLS
Return on Equity (ROE)	-4,382.56 (-9146.5)
Net Interest Margin	-1,668,385.24*** (-573530.16)
Efficiency Ratio	-213,944.32*** (-30974.95)
Net Charge-Off Rate	2,801,982.68*** (-778084.45)
Nonperforming Loans Ratio	2,968,739.22*** (-596385.25)
Leverage Ratio	108,471.44 (-161217.93)
Risk Buffer Ratio	-499.26 (-11960.67)
Loan-to-Deposit Ratio	209,050.41*** (-27488.76)
Loan Compound Annual Growth Rate	-454,345.45*** (-150486.34)
Loan Concentration	1,214,680.79*** (-178176.07)
Constant	57,495.57 (-41313.89)
Observations	4,299
R ²	0.06
Adjusted R ²	0.05
F-statistic	25.8

Notes: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Standard errors are reported in parentheses. Model estimated using ordinary least squares (OLS).

CHAPTER V: DISCUSSION AND CONCLUSION

5.1 Interpretation of Findings

The regression model explaining the percentage by which a bank is overvalued or undervalued, based on the ten selected financial ratios, demonstrated a strong overall fit. The model yielded an R-squared value of 0.51 and an adjusted R-squared of 0.506, indicating that approximately 51% of the variation in valuation outcomes is explained by the independent variables. The adjusted R-squared of 0.5064 confirms minimal shrinkage despite the number of predictors, underscoring the robustness and explanatory power of the model. A high F-statistic of 442.08 ($p < 0.001$) further confirms the model's statistical significance. This level of explanatory power is considered high for bank-level financial modeling, especially given the complexity and variability of institutional performance across a sample of 4,299 banks.

Several independent variables emerged as statistically significant predictors of valuation. Among the most influential was Net Interest Margin, with a large positive coefficient (10.14) and a highly significant p-value ($p < 0.01$). This confirms the central role of margin management in driving perceived bank value, consistent with market emphasis on core profitability. Efficiency Ratio exhibited a strong negative relationship (coefficient = -1.06), with high statistical significance. This suggests that higher operating efficiency (lower ratios) contribute positively to valuation.

Credit quality indicators, including Net Charge-Off Rate (coefficient = -4.91) and Nonperforming Loans Ratio (coefficient = -6.37), also demonstrated strong negative effects. These results confirm that asset quality is a major determinant of bank valuation, as institutions with higher credit losses tend to receive valuation discounts. Additionally, the

Leverage Ratio (coefficient = -1.02) was statistically significant, suggesting that highly leveraged banks may be penalized by the market or acquirers.

Other variables had modest or borderline effects. Return on Equity (ROE) had a positive coefficient (0.02) and was statistically significant ($p = 0.02$), indicating that stronger capital returns are associated with higher valuations, although the size of the effect is relatively small compared to net interest margin or credit metrics. Loan Concentration also showed a significant positive effect (coefficient = 0.56), implying that higher exposure to particular loan categories might reflect either specialization or strategic positioning rewarded in the model.

The remaining variables Risk Buffer Ratio, Loan-to-Deposit Ratio, and Loan Growth did not meet conventional thresholds for significance ($p > 0.05$), suggesting they may play more indirect or context-specific roles in valuation. Notably, Loan Growth had a negligible coefficient and a high p-value (0.80), indicating no consistent directional relationship with valuation in this model.

Overall, the findings validate the structure of the Adjusted Tangible Book Value model. Core profitability, cost efficiency, credit quality, and capital structure appear to be the most influential drivers of real-world valuation differences across the sample. This model provides a more nuanced understanding than raw TBV multiples alone and serves as a robust basis for identifying potentially undervalued acquisition targets.

Beyond statistical significance, it is also important to evaluate the economic significance of the regression coefficients to determine whether the estimated effects are meaningful in practice. Economic significance refers to both the magnitude and direction of the coefficients, indicating whether changes in the independent variables produce large or

small changes in the dependent variable and whether the signs align with economic expectations. In the adjusted valuation model, several variables demonstrate economically meaningful effects. The coefficients for Net Interest Margin (10.138), Nonperforming Loans Ratio (−6.374), and Net Charge-Off Rate (−4.908) are relatively large in magnitude, indicating that even small changes in these variables can generate substantial shifts in adjusted bank valuation. For example, a one-percentage-point increase in net interest margin increases the adjusted valuation relative to tangible book value by approximately ten percentage points, while similar increases in nonperforming loans or charge-offs reduce valuation by roughly six and five percentage points, respectively. These effects are economically significant and consistent with industry expectations, as profitability improvements increase value while credit deterioration reduces it. Other variables, including the Efficiency Ratio (−1.063) and Leverage Ratio (−1.018), have moderate coefficient sizes, indicating that operational efficiency and capital structure have meaningful but smaller impacts on valuation. In contrast, the coefficients for Return on Equity (0.016), Risk Buffer Ratio (0.016), and Loan-to-Deposit Ratio (0.035) are relatively small, suggesting that while these variables may be statistically significant, their individual economic impact on valuation is limited. Overall, the signs of the coefficients largely align with economic theory, with profitability and efficient operations increasing valuation while credit risk, higher leverage, and operational inefficiency reduce valuation. Taken together, the results indicate that the model not only identifies statistically significant relationships but also captures the economically meaningful drivers of bank valuation, particularly profitability and credit quality.

5.2 Valuation Rankings and Insights

The valuation rankings generated through the adjusted tangible book value model provide insight into how traditional accounting measures can differ significantly from performance-adjusted metrics. Across the sample of 4,299 banks, the average reported tangible book value (TBV) was \$118,034.80. However, when applying the weighted performance adjustments derived from the ten financial indicators in the model, the average adjusted tangible book value increased substantially to \$169,319.83. This 43.4% average uplift suggests that traditional TBV figures may materially undervalue well-performing institutions. The discrepancy underscores the model's practical value: it highlights banks whose financial fundamentals (e.g., interest margin management, cost control, credit quality) justify valuations materially above accounting book value. For acquirers or investors, these rankings provide a refined lens for identifying undervalued opportunities that may be obscured when relying on unadjusted TBV multiples alone. This also implies that acquisition pricing based purely on raw TBV may fail to reflect the operational performance or intrinsic value of the target, leading to suboptimal decision-making. Conversely, institutions with low adjusted tangible book value relative to TBV may appear overvalued once performance risks are fully considered. These insights demonstrate the real-world implications of using adjusted valuation metrics in strategic banking decisions.

5.3 Implications for Acquirers, Investors, and Bank Management

The results of this study have direct practical value for decision makers who screen bank acquisition opportunities, allocate capital to bank equities, or manage performance in community and regional banking organizations. A consistent theme across the adjusted valuation framework and the regression results is that tangible book value, while useful as a

standardized accounting anchor, does not by itself communicate how effectively a bank turns its balance sheet into earnings, how efficiently it produces revenue, or how much credit risk is embedded in the loan portfolio. In real world acquisition settings, buyers rarely evaluate a bank using a single balance sheet figure. They evaluate what that equity can earn, how stable those earnings are, and how much capital and liquidity flexibility exists to support future strategies. This study operationalizes that reality by translating core performance characteristics into an estimated premium or discount applied to tangible book value, which provides a more decision relevant starting point for screening than TBV alone.

For bank acquirers, the primary implication is improved screening efficiency and improved pricing discipline early in the process. Acquisition teams typically begin with a large universe of possible targets and quickly face constraints in time, staffing, and decision bandwidth. Even when advisory support is available, internal attention becomes the limiting factor. The adjusted tangible book value framework addresses this constraint by narrowing the field to banks whose fundamentals align with the characteristics that tend to matter in practice. Your model explicitly incorporates profitability, margin performance, efficiency, and credit quality, which are the same factors that typically influence whether a bank can support an acquisition premium and still produce an acceptable return for the buyer after integration. By converting these drivers into a single percentage premium or discount that can be applied to tangible book value, the framework gives an acquisition team a consistent method to prioritize outreach and to reduce the risk of spending resources on banks that appear attractive on book value but lack underlying performance strength.

The model also helps acquirers avoid a common problem in bank pricing discussions, which is confusing capital level with value creation. A bank can report strong tangible book value for reasons that do not translate into strong intrinsic value, including maintaining unusually high capital levels relative to peer norms or operating with lower asset utilization. Tangible book value captures the size of the equity base, but it does not indicate whether that equity is being used to generate attractive earnings. Your findings, including the emphasis on margin, efficiency, and credit quality as drivers of valuation outcomes, reinforce the practical reality that a buyer is ultimately purchasing a future earnings stream and a risk profile, not just an accounting balance. In that context, the adjusted valuation framework can serve as a guardrail against overpaying for institutions whose reported TBV looks strong, but whose operating performance suggests a lower valuation outcome when compared on intrinsic characteristics.

Another implication for acquirers is that the framework can inform how resources are deployed once a target moves from screening to active evaluation. In practice, due diligence is not just a compliance step. It is the process of validating whether the assumed earnings, risk, and integration benefits are real and sustainable. Because the adjusted valuation factor is driven by specific performance inputs, it naturally points diligence toward the area's most likely to change the buyer's view of intrinsic value. If a bank appears undervalued because of strong net interest margin and strong efficiency, diligence should focus on the sustainability of that spread, the funding mix, deposit pricing sensitivity, and the extent to which expense performance reflects structural advantages versus temporary conditions. If a bank screens poorly due to credit measures, diligence should deepen on underwriting standards, concentration risk within the portfolio, loss

history, and the quality of risk grading and problem loan identification. If a bank looks attractive based on growth metrics, diligence should test whether growth was achieved with acceptable pricing, acceptable credit terms, and stable funding. In other words, the model does not just rank banks, it provides a structured hypothesis for what is driving the valuation result and therefore what should be validated before an acquisition team commits to a transaction path.

The framework also supports better alignment between pricing discussions and integration planning. In real world banking combinations, post transaction value creation depends on a limited set of levers: maintaining or improving net interest margin, controlling operating costs, retaining and repricing deposits effectively, and avoiding unexpected credit deterioration. Your model's structure centers on these levers. As a result, it can be used not only to estimate a premium or discount but also to frame the integration agenda. If an acquiring bank is considering paying a premium for a high performing target, the integration plan must protect the elements that created that performance. If a target appears undervalued due to operational strength, the buyer's primary risk becomes disrupting those strengths. Conversely, if a buyer is attracted to a bank that screens as discounted due to inefficiency or credit weakness, the acquisition thesis must be explicit about how cost structure will be improved or how credit risk will be managed without eroding franchise value. The adjusted valuation approach encourages that discipline by tying valuation outcomes directly to identifiable operating drivers rather than leaving value creation as an abstract assumption.

For investors and analysts, the implication is a more structured way to interpret relative value across banks, especially when simple price to book comparisons are

misleading. In public markets, investors often use multiples to tangible books as a shorthand, but those multiples vary widely because they embed expectations about profitability, margin durability, efficiency, and credit risk. Community banks that are not publicly traded still face the same economic reality in acquisition pricing, even if their market value is not quoted daily. Your approach provides a method to translate observable financial characteristics from regulatory filings into an intrinsic premium or discount estimate that can support relative comparisons. It also encourages investors to anchor valuation conversations in the variables that actually drive bank performance, rather than relying on asset size, headline growth, or reported book values that may not reflect underlying earnings power. Because your model applies consistent measurement across a large bank universe using the same data source and the same time averaging approach, it can help investors identify banks where fundamentals appear stronger or weaker than what a book-based comparison alone would imply.

The model is also useful for investors because it reinforces an important concept in bank valuation: not all growth creates value. In banking, growth can be beneficial when it is achieved with disciplined pricing, controlled credit risk, and stable funding. Growth can destroy value when it is pursued through underpricing, weakened underwriting, or unstable deposits. Your research design incorporates a long-term growth measure and separates growth from other operating fundamentals, which helps emphasize that growth is one input among several, not a guarantee of higher valuation. This matters in real world investing because rapid balance sheet growth can look attractive in isolation, but if it leads to future credit costs or margin compression, valuation outcomes can worsen. A performance

adjusted framework that keeps growth in context supports better risk adjusted capital allocation decisions.

For bank management teams, the most important implication is that the framework translates day-to-day operating performance into a valuation lens that can support strategic planning, benchmarking, and board level discussions. Many management teams track ratios like ROE, net interest margin, efficiency ratio, and credit metrics because they reflect operational health and regulatory expectations. Your model adds a useful layer by showing how these variables collectively shape an implied premium or discount relative to tangible book value. That linkage can make strategic priorities more concrete. Improving net interest margin, reducing structural expense burden, and maintaining strong credit outcomes are not just operational goals. They are also value drivers that can influence how outsiders view the institution, including potential buyers, investors, and even counterparties. In that sense, the adjusted TBV framework can be used as a management dashboard for intrinsic value improvement rather than only an acquisition screening tool.

The framework can also improve internal accountability by encouraging management to think in tradeoffs that matter for value creation. Banks constantly face choices about capital levels, growth pace, portfolio mix, and funding strategy. Those choices influence profitability and risk, which then influence valuation outcomes. A bank that holds higher capital may lower certain risks but also may reduce return on equity if earnings do not rise proportionally. A bank that concentrates lending in a narrower set of categories may be able to build expertise and pricing power, but concentration can increase exposure to sector downturns. A bank that pushes loan to deposit ratios too high may boost near term earnings but weaken liquidity posture. By explicitly including capital, liquidity,

growth, and concentration alongside profitability, efficiency, and credit quality, your model reflects the reality that value is created by balancing these factors rather than optimizing any single metric in isolation. Management can use the model structure to communicate these tradeoffs and to monitor whether strategic decisions are improving intrinsic valuation or simply changing the balance sheet.

Another implication is that the model supports better use of finite resources in acquisition strategy, which is consistent with the economic principle you emphasized. In practice, identifying banks that are willing to be acquired often depends on timing, leadership priorities, shareholder considerations, and local market conditions. An acquirer cannot control those factors, but it can control how efficiently it uses internal resources to pursue the right conversations. The adjusted tangible book value framework helps ensure that early outreach is concentrated on banks that fit the acquirer's performance expectations and risk tolerance. This reduces the likelihood of pursuing discussions that fail because the target does not meet operational standards or because the implied value does not align with the buyer's return requirements. When corporate development teams, finance teams, and senior leadership are all limited in time and attention, a structured screening tool that reduces false positives is valuable in itself.

The framework also has implications for communication between buyers and sellers. Bank valuation discussions often become difficult when parties anchor to different reference points. Sellers may focus on tangible book value and a historical multiple narratives, while buyers focus on forward earnings, asset quality, and integration risk. A model that begins with TBV but then adjusts it using transparent performance triggers can create a more productive shared language. It does not eliminate negotiation, but it can

clarify why one bank may deserve a premium and another may justify a discount even if their TBV levels are similar. In real world negotiations, transparency about the drivers of value can reduce misunderstandings and help keep discussions anchored to objective performance indicators rather than purely to precedent multiples or general market sentiment.

5.4 Limitations of the Study

While this study provides a structured and data-driven approach to estimating intrinsic bank value through financial performance metrics, several limitations should be acknowledged. First, the analysis relies exclusively on FFIEC Call Report data, which, although standardized and widely used, may not capture intra-quarter developments, non-financial variables, or qualitative factors such as management expertise, regulatory issues, or reputational risk. This reliance on historical accounting data inherently limits the model's ability to reflect forward-looking elements or sudden strategic shifts.

The model leaves out any market-based inputs such as stock prices, trading volume, or analyst expectations. While this exclusion allows for a purely intrinsic valuation perspective, it also means that the model may diverge from real-world acquisition prices or market valuations, particularly in scenarios influenced by investor sentiment, scarcity premiums, or capital market activity. Additionally, the analysis applies a static regression framework to all institutions across time and geography. This assumes that the relationship between financial ratios and valuation remains consistent across diverse banking models, regional economies, and regulatory environments. In practice, however, the relative importance of metrics such as return on equity or leverage may vary depending on market cycles or the strategic positioning of a bank.

The largest limitation of the model is it cannot control for macroeconomic trends or regional variation, such as localized loan demand or housing market conditions, which may significantly affect bank performance and valuation. Strategic positioning, customer demographics, and operational complexity are also not accounted for, despite their potential to influence long-term growth or risk exposure. Lastly, the study omits qualitative and forward-looking considerations such as digital transformation, environmental and social governance factors, and management succession plans. While these elements are difficult to quantify, they are increasingly influential in acquisition decisions and investor evaluations.

Taken together, these limitations underscore that while the adjusted tangible book value model provides a useful and consistent measure of intrinsic value based on measurable financial characteristics, it should not be used in isolation. Rather, it is best applied as one component within a broader due diligence process that incorporates both quantitative and qualitative assessments when evaluating acquisition targets or investment opportunities.

5.5 Sensitivity and Robustness Checks

To evaluate the reliability of the regression model and the stability of its findings, sensitivity and robustness checks were conducted. These tests were designed to determine whether the valuation relationships observed remained consistent under reasonable changes to model structure, weighting assumptions, and variable definitions.

First, sensitivity testing was performed on the weighting and trigger structure used in the adjusted tangible book value model. Individual metric weights were increased and decreased within a reasonable range (e.g., ± 2 –5 percentage points), and trigger thresholds

were adjusted to test how sensitive valuation outputs were to these assumptions. The results indicated that while absolute valuation levels shifted modestly, the relative ranking of banks and the directional impact of key variables remained consistent, particularly for Net Interest Margin, Efficiency Ratio, and Nonperforming Loans Ratio. This suggests that the model is not overly dependent on any single weighting assumption.

Second, alternative regression specifications were tested by excluding or modifying selected financial ratios. These tests confirmed that the core predictors of valuation retained both their statistical significance and expected directional relationships, even when model composition changed. Coefficient magnitudes varied slightly across specifications, but no major instability was observed.

Third, multicollinearity diagnostics were conducted to ensure the independence of explanatory variables. Variables exhibiting excessively high correlation were identified and removed prior to final model estimation. These removals were limited to variables outside the final set of ten primary valuation metrics, ensuring that the conceptual structure of the model remained intact while improving statistical reliability.

Overall, the consistency of results across weighting adjustments, trigger modifications, and alternative model specifications provides strong evidence that the model's findings are robust and not driven by narrow assumptions or data artifacts.

5.6 Final Thoughts

This study set out to build a more accurate and actionable valuation framework for community and regional banks by integrating traditional tangible book value with weighted performance metrics. The findings confirm that valuation is not merely a function of balance sheet totals or capital levels but is instead driven by a bank's operational discipline,

credit management, and profitability. By creating an adjusted tangible book value model grounded in real-world performance data, this research offers a practical tool for acquirers, investors, and managers seeking to make informed decisions in an increasingly competitive and regulated financial environment.

Alternative valuation methods, such as a net present value model based on projected future income, were considered. However, net present value was not selected because the objective was to maintain a framework that is transparent and easily understood by management and decision-makers. A model that lacks credibility or is not well understood by its users is unlikely to be adopted in practice, regardless of its theoretical precision.

While no model can capture every nuance of bank valuation, especially in a dynamic industry affected by regulatory shifts and macroeconomic volatility, this framework adds clarity to the acquisition process. It moves beyond surface-level comparisons and toward a deeper understanding of what drives long-term value. The adjusted model highlights institutions that may be mispriced by the market and provides a structured method to quantify that misalignment using data already available in quarterly call reports. Ultimately, the research reinforces the idea that successful acquisition strategies and stronger investment decisions require more than intuition or basic multiples. They require tools that connect financial performance to real, measurable value.

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