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Why do U.S. banks hold excess capital beyond regulatory requirements, and what are the implications for financial stability after the 2008 financial crisis and 2017 BASEL III CET1 requirements?

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Data Mapping and Conceptual Modeling

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Working Title

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Introduction

The 2008 financial crisis significantly altered how U.S. banks manage capital, prompting many to hold levels of capital far exceeding regulatory minimums. While the Basel III framework and stress-testing mechanisms mandate stricter capital requirements, banks often maintain additional buffers beyond these regulations. This phenomenon raises several critical questions: What drives banks to accumulate excess capital? Are these decisions influenced primarily by regulatory constraints, market pressures, or risk management considerations? Furthermore, what are the broader implications of these capital buffers for financial stability?

This research investigates the determinants of excess capital holdings in U.S. banks and explores the impact of these decisions on financial stability. By analyzing financial and market data for approximately 10 U.S. banks (prelim results have 4 bank data), this study aims to identify key predictors of excess capital retention and assess whether these capital surpluses contribute to systemic resilience or inefficiencies in capital allocation.

Methods

Data Collection

This study leverages data from Bloomberg Terminal, regulatory filings (10-K and 10-Q reports), Federal Reserve publications, and external macroeconomic sources (World Bank, IMF, FDIC). The dataset consists of approximately top 10 U.S. banks ensuring robustness and representation across different asset sizes and business models.

Variable Selection and Conceptual Model

The analysis models **excess capital ratio** (actual capital minus regulatory minimum) as the dependent variable.(Drehmann, et. al., 2020) The excess capital ratio is calculated as:

$$\text{CET1 Ratio} = \frac{\text{CET1 Capital}}{\text{Risk-Weighted Assets (RWA)}}$$

The chosen banks have CET1 reported in theri financial statements on Bloomberg Terminal which I have extracted and used for my analysis. Most banks do not showcase the RWA specifically. (Federal Reserve Board, 2023)

This analysis employs a simple linear regression model to examine the impact of various financial and risk-related factors on the dependent variable. The preliminary model includes the independent variables mentioned in Appendix, with plans to expand the dataset for the final analysis.

Early Results

Regulatory requirements according to BASEL III have been set to 4.5% since 2017. Looking at the CET1 ratios of the banks we can see that they have been holding excess capital. (Basel Committee on Banking Supervision, 2017)

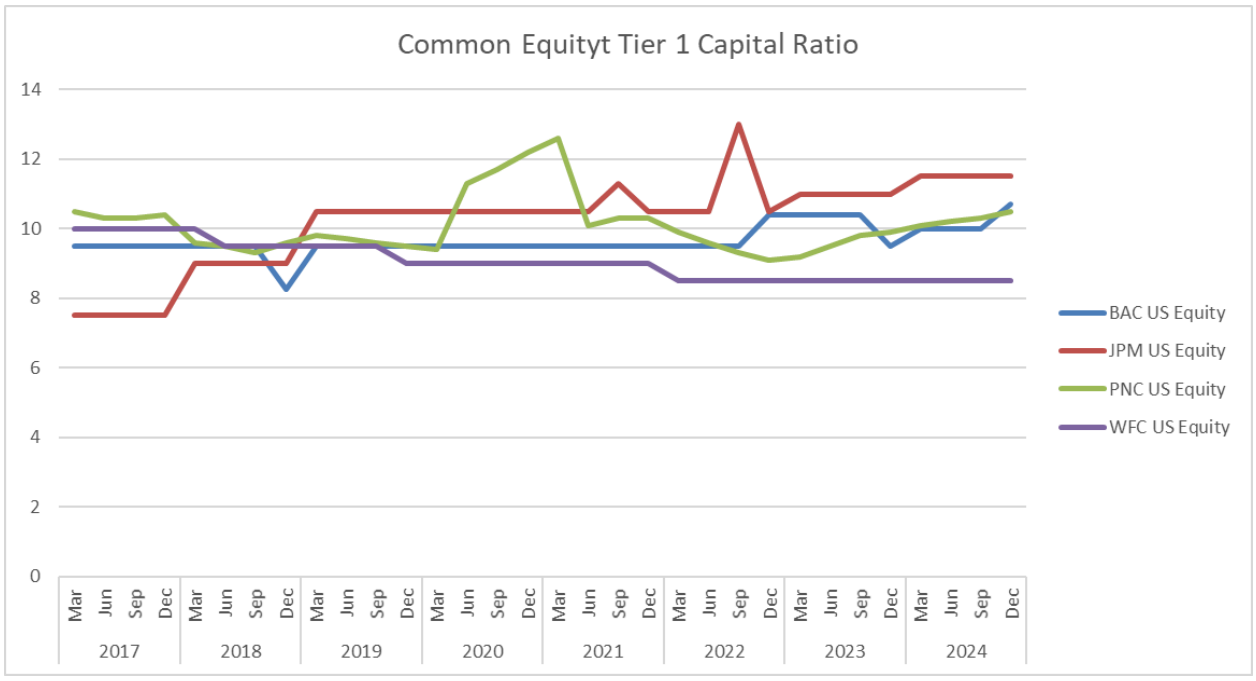

Fig 1: Excess CET1 ratio than requirement

The preliminary analysis aimed to understand the key factors influencing capital adequacy, specifically the CET1 ratio, which reflects a bank's financial strength and ability to absorb losses. In the initial regression model, the results indicate that while several financial metrics were included, only a few showed a meaningful relationship with CET1. Profitability, measured in terms of return on assets, emerged as a significant positive predictor, suggesting that banks with higher profitability tend to maintain stronger capital buffers. On the other hand, the proportion of total loans to total deposits displayed a negative association with CET1, implying

that banks with aggressive lending relative to their deposit base may be at greater risk of lower capital adequacy. Other factors, such as market valuation and short-term stock price volatility, did not appear to have a statistically significant impact, suggesting that broader financial stability metrics might be more relevant than short-term market fluctuations in determining capital adequacy. However, the overall explanatory power of this model remained moderate, capturing only about 35% of the variation in CET1, indicating that additional complexities might need to be accounted for.

To refine the analysis, a second model was introduced, incorporating non-linear relationships and interactions between financial variables. This approach significantly improved the model's ability to explain CET1 variations, nearly doubling the explanatory power. The results reveal that the effect of a bank's lending strategy on its capital adequacy is not simply linear; at a certain point, increasing loans relative to deposits can have an increasingly negative effect, possibly due to heightened credit risk or liquidity constraints. Similarly, the total asset size of a bank displayed a strong nonlinear relationship, suggesting that economies of scale and risk diversification benefits play a crucial role in capital management. Additionally, the interaction between asset size and lending activity was highly significant, reinforcing the idea that a bank's lending decisions cannot be evaluated in isolation but must be considered within the broader context of its balance sheet size. These findings emphasize that capital adequacy is influenced by a complex interplay of profitability, lending strategy, and balance sheet management rather than by any single factor in isolation. Moving forward, further refinements may explore how external factors such as macroeconomic conditions and regulatory policies influence these dynamics to provide a more comprehensive understanding of capital adequacy determinants. (Both models results can be found in the appendix)

The relationship between Return on Assets (ROA) and Common Equity Tier 1 (CET1) ratios is crucial for understanding the financial health of banks. This analysis is significant because it explores how well-capitalized banks, as indicated by their CET1 ratios, influence their ability to generate profits, as captured by ROA. CET1 ratios reflect a bank's core capital strength and resilience to financial shocks, while ROA measures how effectively a bank utilizes its assets to generate profit. This study contributes to the existing literature by examining the connection between capital adequacy and profitability, offering new insights that can influence decision-making at various levels within the banking industry. (Drehmann, et. al., 2020)

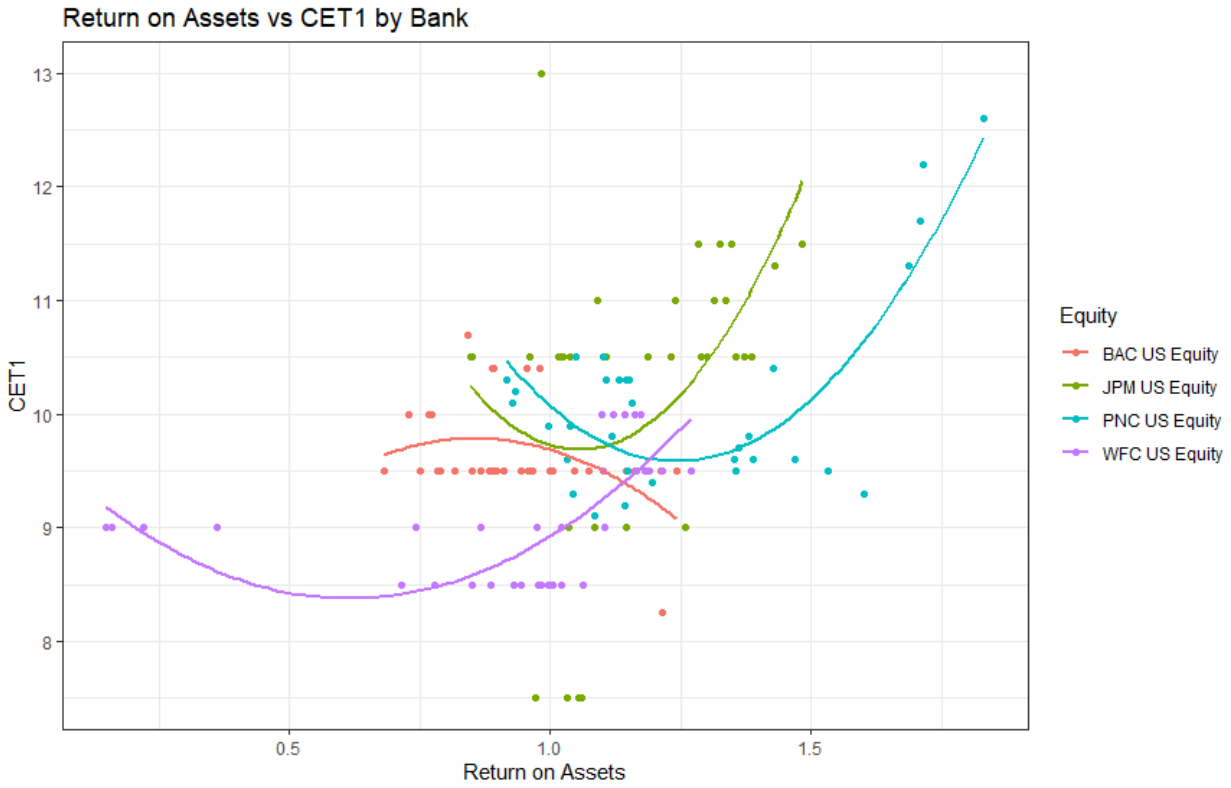

Fig 2: ROA and CET 1 relationship for the 4 banks

Discussion

The results from the regression analysis suggest that several key financial indicators, such as the loan-to-deposit ratio, return on assets, and non-performing loans to total loans, have a significant impact on CET1 ratios across the banks analyzed. These findings indicate that banks with higher profitability and lower levels of non-performing loans tend to maintain stronger capital buffers. However, not all variables were significant, and certain macroeconomic factors, such as market volatility, did not show a notable effect on CET1 ratios. Moving forward, further analysis could explore the role of external economic conditions in shaping capital adequacy, and additional models could incorporate lagged effects to account for delayed responses to changes in these financial metrics. Additionally, refining the model to address any potential issues with multicollinearity and expanding the dataset to include more banks or additional time periods could provide a more robust understanding of the dynamics influencing CET1.

References:

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GitHub Repository

Appendix:

Variables:

- **CET1 (Common Equity Tier 1 Ratio):** Measures a bank's core equity capital against its total risk-weighted assets, indicating financial stability and regulatory compliance.
- **PX_TO_BOOK_RATIO (Price-to-Book Ratio):** Reflects market valuation relative to book value, which can influence investment attractiveness and capital allocation.
- **VOLATILITY_30D (30-Day Volatility):** Captures short-term price fluctuations, potentially affecting investor sentiment and risk assessment.
- **TOT_LOAN_TO_TOT_DPST (Total Loan-to-Total Deposit Ratio):** A key indicator of liquidity risk and lending aggressiveness.
- **BS_TOT_ASSET (Total Assets):** Represents the scale of the institution and its potential for growth and risk exposure.

- **RETURN_COM_EQY (Return on Common Equity):** Evaluates profitability relative to shareholders' equity, crucial for assessing financial performance.
- **RETURN_ON_ASSET (Return on Assets):** Measures efficiency in utilizing assets to generate earnings.
- **NPLS_TO_TOTAL_LOANS (Non-Performing Loans to Total Loans Ratio):** Indicates credit risk and asset quality.
- **GROWTH_IN_TOT_LOAN (Total Loan Growth):** A proxy for expansion strategy and credit demand.
- **NON_INT_INC (Non-Interest Income):** Represents revenue diversification beyond traditional lending activities.
- **DVD_PAYOUT_RATIO (Dividend Payout Ratio):** Shows the proportion of earnings distributed as dividends, affecting investor returns and capital retention.

These variables were selected based on their theoretical and empirical relevance to financial performance and risk assessment. The final model will incorporate additional factors to enhance predictive power and robustness mentioned in Fig 3.

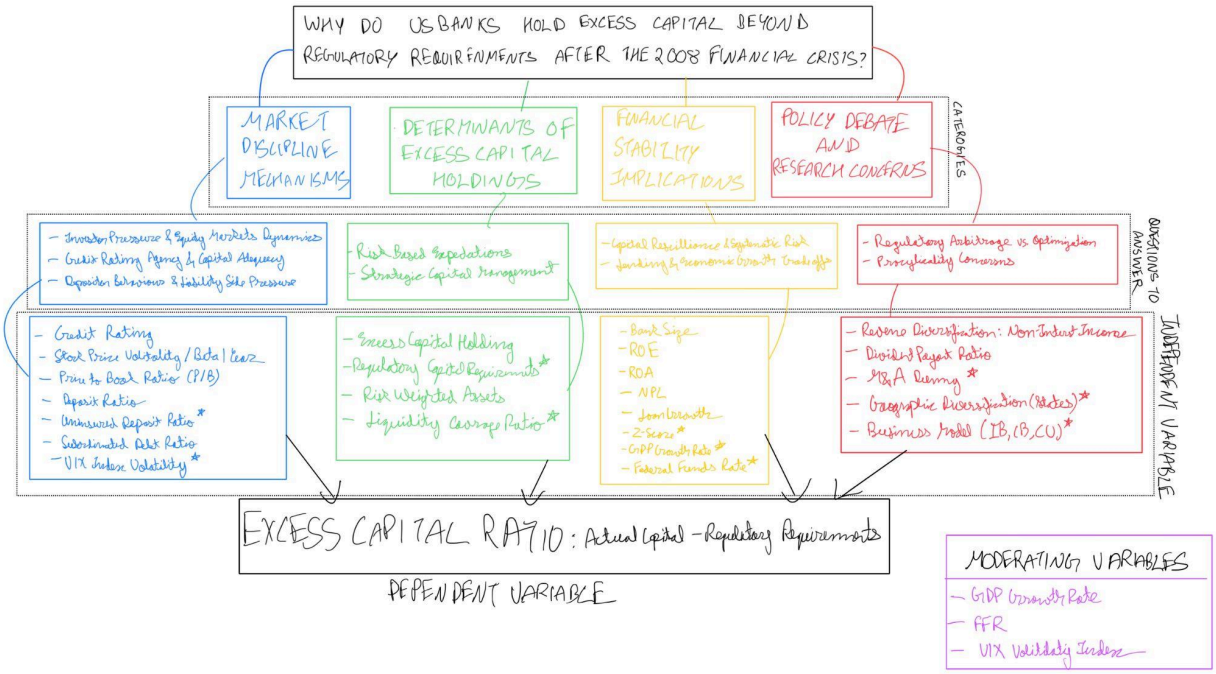

Fig 3: Model variables diagram

Model:

	Dependent variable:	
	CET1	
	(1)	(2)
PX_TO_BOOK_RATIO	0.207	-6.948
	(0.385)	(5.246)
VOLATILITY_30D	0.001	0.162
	(0.004)	(0.119)
TOT_LOAN_TO_TOT_DPST	-0.027*	-1.814***
	(0.014)	(0.368)
BS_TOT_ASSET	0.00000	-0.00002***
	(0.00000)	(0.00000)
RETURN_COM_EQY	0.031	0.083
	(0.062)	(0.251)
RETURN_ON_ASSET	1.482**	-1.769
	(0.697)	(3.446)
NPLS_TO_TOTAL_LOANS	0.902	-7.274**
	(0.550)	(2.789)
GROWTH_IN_TOT_LOAN	0.015	-0.015
	(0.014)	(0.016)
NON_INT_INC	-0.0001	0.0002*
	(0.00005)	(0.0001)
DVD_PAYOUT_RATIO	0.0003	0.007
	(0.0002)	(0.005)
I(PX_TO_BOOK_RATIO2)		0.972
		(0.848)
I(VOLATILITY_30D2)		0.0002
		(0.0001)
I(TOT_LOAN_TO_TOT_DPST2)		0.011***
		(0.002)
I(BS_TOT_ASSET2)		0.000***
		(0.000)
I(RETURN_COM_EQY2)		0.004
		(0.009)
I(RETURN_ON_ASSET2)		0.395
		(1.299)
I(NPLS_TO_TOTAL_LOANS2)		5.394***
		(1.956)
I(GROWTH_IN_TOT_LOAN2)		-0.002**
		(0.001)
I(NON_INT_INC2)		-0.000
		(0.000)
I(DVD_PAYOUT_RATIO2)		-0.00000
		(0.00000)
PX_TO_BOOK_RATIO:VOLATILITY_30D		-0.024

		(0.022)
PX_TO_BOOK_RATIO:TOT_LOAN_TO_TOT_DPST		0.072
		(0.050)
PX_TO_BOOK_RATIO:BS_TOT_ASSET		-0.00000
		(0.00000)
VOLATILITY_30D:TOT_LOAN_TO_TOT_DPST		-0.002
		(0.001)
VOLATILITY_30D:BS_TOT_ASSET		-0.00000
		(0.000)
TOT_LOAN_TO_TOT_DPST:BS_TOT_ASSET		0.00000***
		(0.00000)
Constant	8.518***	90.928***
	(1.373)	(17.545)
Observations	126	126
R^2	0.350	0.724
Adjusted R^2	0.294	0.651
Residual Std. Error	0.787 (df = 115)	0.553 (df = 99)
F Statistic	6.196*** (df = 10; 115)	9.964*** (df = 26; 99)
Note:		*p**p***p<0.01