Journal of
Risk and Financial Management

MDPI

Article

Reevaluating Bank Price-to-Book Ratios: An In-Depth Analysis of Equity Components across Economic Cycles

Fernando García Martínez [1,*], Juan Domínguez Jiménez [2] and Ricardo Queralt Sánchez de las Matas [3]

[1] Bank of Spain, 28014 Madrid, Spain
[2] Finance and Accounting Department, School of Business, Economics and Law, CUNEF Universidad—Campus Almansa, 28040 Madrid, Spain; juan.dominguez@cunef.edu
[3] Quantitative Methods Department, School of Business, Economics and Law, CUNEF Universidad—Campus Almansa, 28040 Madrid, Spain; ricardo.queralt@cunef.edu
* Correspondence: fernando.garciamartinez@bde.es

Abstract: This study explores the evolution of price-to-book (P/B) ratios among European banks from 2005 to 2020, a period where most banks in different countries had a P/B ratio below 1. By dissecting banks' accounting equity into investor contributions and earnings-derived components, this research aims to evaluate how each component of equity affects these ratios and investigates whether their dynamics shifted during the period. We address a gap in prior research that has not extensively examined how individual equity components affect the overall P/B ratio. This aspect is crucial, especially in scenarios where the increase of specific components compensates for declines in others, thereby stabilizing total equity values. Our methodology involves regression analyses using a panel data model with random effects. The findings reveal that earnings-related equity components significantly influence P/B ratios. In contrast, investor contributions, which strengthen the solvency of the entity, appear to have a minimal impact. Additionally, our analysis highlights a significant quadratic relationship between the P/B ratios and both the profit or loss reported on Income Statements and distributed dividends.

Keywords: price-to-book ratios; equity components; regulatory capital; financial stability

Citation: Martínez, Fernando García, Juan Domínguez Jiménez, and Ricardo Queralt Sánchez de las Matas. 2024. Reevaluating Bank Price-to-Book Ratios: An In-Depth Analysis of Equity Components across Economic Cycles. *Journal of Risk and Financial Management* 17: 363. https://doi.org/10.3390/jrfm17080363

Academic Editor: Thanasis Stengos

Received: 26 June 2024
Revised: 25 July 2024
Accepted: 7 August 2024
Published: 15 August 2024

1. Introduction

The 2008 financial crisis had a profound effect on global banking stocks, leading to a sustained decrease in banks' price-to-book (P/B) ratios, often dipping below the critical 1.0 threshold. This level indicates that banks are valued at less than their net assets. The repercussions of this financial downturn extended into the early stages of the COVID-19 pandemic, further stressing the banking sector.

According to the discounted cash flow theory, understanding a bank's market value requires analyzing investor expectations about future cash flows and the risks[1] associated with them. These expectations are influenced by a complex array of factors, including available financial data. The Conceptual Framework for Financial Reporting (IASB 2018) states that while general-purpose financial reports do not directly determine an entity's market value, they provide essential information that helps investors and creditors assess the value of the entity. The significant impact of accounting on bank price variations is well-documented (Leong et al. 2023).

Equity, defined as the residual interest in the assets of an entity after deducting liabilities, can be classified into two types of components, which are contributions and retained earnings (IASB 2018). Considering these two components, our study distinguishes the following:

1. Investor contributions:
    - SC (Share Capital): the original purchase price or par value of common shares.

- SP (Share Premium): the amount paid over the par value by investors at issuance.
- TS (Treasury Stock): shares that have been repurchased and are held by the company.
- EHS (Equity Hybrid Securities): contracts that combine a non-derivative (host) component with an embedded derivative, as defined by International Financial Reporting Standards (IFRS 9).
- MI (Minority Interest): the portion of net assets in subsidiaries that are not owned by the parent company.

2. Earnings-derived components:
   - YNI (Year Net Income): the annual profit or loss after taxes, as reported on the Income Statement.
   - RE (Reserves): primarily consists of retained earnings, excluding Year Net Income.
   - YOCI (Year Other Comprehensive Income): annual profit or loss after taxes reported in the Comprehensive Income statement, excluding Year Net Income.
   - AOCI (Accumulated Other Comprehensive Income): the cumulative total of Other Comprehensive Income, excluding Year Net Income.

Our research advances the existing literature by examining how each component of bank equity influences P/B ratios across various economic cycles. Previous studies have not thoroughly investigated the individual effects of these components on the overall P/B ratio, especially in situations where certain values may increase to compensate for declines in others, thereby stabilizing total equity. Our findings provide deeper insights into how investors value different types of financial data.

To enhance the robustness of our analysis, we corroborated our results with data on various components of regulatory capital. Under the Basel Framework, banks are required to maintain a minimum level of regulatory capital, a critical measure to ensure their financial solvency and stability. This capital is primarily designed to absorb unexpected losses. We chose to corroborate the information about regulatory capital, like other studies (Sharma et al. 2023; Jordan et al. 2011), due to the distinction between expected losses, used to calculate equity, and unexpected losses, used to calculate regulatory capital, emphasizing the complementary nature of regulatory and financial data.

We analyzed multiple components of regulatory capital, unlike previous research that has typically focused on a single component. This approach is particularly important as we have observed that, over the years, increases in some components have compensated for decreases in others. The components we considered include:

- CET1 (Common Equity Tier 1): this category includes accounting equity adjusted for deductions such as some intangible assets.
- AT1 (Additional Tier 1): these instruments blend debt and equity characteristics and possess loss-absorbing capabilities. They are triggered when the issuing bank's capital falls below a specified threshold, such as in the case of contingent convertible bonds (CoCos).
- T2 (Tier 2): these are subordinated debt instruments.
- DP (Dividend Perspective): this component includes the value of distributed dividends, used to analyze the effects of the reduction in regulatory capital.

We reveal that earnings-related components significantly impact the P/B ratio, whether they are reported in the Income Statement, Other Comprehensive Income, or on previous years' Balance Sheets. In contrast, investor contributions, though crucial for strengthening the solvency of the entity, have minimal effect on the P/B ratios. Our analysis indicates a pronounced quadratic influence from the profit or loss reported on the Income Statement and from distributed dividends. Notably, these influential factors have remained consistent over the years, even as regulatory efforts to enhance bank solvency have intensified in response to financial crises. These findings are supported by data on regulatory capital.

This research contributes to a deeper understanding of how investors interpret financial information and whether all types of financial data are valued equally by investors.

Our study spans the years 2005 to 2020, a period during which the P/B ratio of banks was below 1 in many countries. A P/B ratio under 1 often indicates potential challenges in raising additional equity, which could impose operational constraints. Our analysis encompasses a variety of economies and bank sizes and employs regression models to interpret these influences. Specifically, we use a panel data model with random effects, which is well-suited for datasets encompassing diverse groups, as it accounts for potential commonalities among them.

2. Theoretical Underpinning and Hypotheses

The P/B ratio is a widely used indicator of a bank's future prospects (Richardson 2006). Following the 2008 financial crisis, the sustained decline in banks' P/B ratios prompted further investigation into this metric. Research suggests that the widening gap between accounting and market values of financial institutions can be attributed to several factors:

1. Undervaluation of intangible assets not reflected on balance sheets contributed to the undervaluation of banks (Grodzicki et al. 2019; Bogdanova et al. 2018; Calomiris and Nissim 2014; Zéghal and Maaloul 2011).
2. Higher regulatory requirements and stricter supervisory approaches, while enhancing stability, increased long-term operational costs. This financial strain impacted banks' profitability (He et al. 2024; Chen et al. 2022; García-Olalla and Luna 2021; Balasubramnian et al. 2019; Vickers 2019; Ferretti et al. 2018; Chousakos and Gorton 2017; Uwuigbe et al. 2016; Bertsatos and Sakellaris 2016; Sarin and Summers 2016; Aiyar et al. 2015; Demirguc-Kunt et al. 2013; Jordan et al. 2011; Handorf 2011; Soewarno and Utami 2010; Abuzayed et al. 2009).
3. Macroeconomic factors significantly influenced future earnings expectations of banks, particularly in a low-interest-rate environment (Ercegovac et al. 2020; Claessens et al. 2018; Altavilla et al. 2018; Borio et al. 2017).

During financial crises, underestimations of financial asset losses due to imperfect accounting standards and banks' reluctance to write down book values were observed (Huizinga and Laeven 2012; Goh et al. 2015; Wagner 2009; Kolev 2019). The European Central Bank (2012) emphasized the need for recognizing losses from non-performing assets and enhancing transparency to improve P/B ratios.

The market value of a listed bank, like that of any other listed company, can be explained by various theories. One of these is the discounted cash flow theory, which suggests that a company's value (including banks) is equal to the present value of the future cash flows it is expected to generate. Information about bank equity can be used by investors to assess the prospects of a bank's future cash flows.

Post-2008 crisis observations revealed a decrease in equity components related to retained earnings, offset by an increase in shareholder proceeds (Handorf 2011). More shareholder proceeds in banks can contribute to financial stability by reducing the risk of costly banking crises, but lending may become more expensive if banks are required to finance their assets with more equity (Andersen and Juelsrud 2024). There can be a decrease in the market-to-book value after issuing capital (He et al. 2024). The question to answer is: are investors undervaluing their contributions to bank equity because they believe the bank is less profitable and will have lower future cash flows, despite the bank's increased stability?

We posit our primary hypothesis for empirical examination. H1: the market does not uniformly value all information regarding the distinct components of a bank's equity. This hypothesis is grounded in the observation that some components of equity may increase and offset others that decrease, leading to fluctuations in the P/B ratio even when total equity remains relatively stable. Our aim is to investigate the extent to which these variations influence market valuations and whether certain equity components are weighted more heavily by investors in their assessment of a bank.

Given the well-documented relationship between the P/B ratio and regulatory capital (Chousakos and Gorton 2017; Baker and Wurgler 2015; Jordan et al. 2011), we aim to validate our previous hypothesis concerning equity components by analyzing regulatory capital.

Researchers such as Aiyar et al. (2015) argue that raising minimum capital requirements entails significant social costs, including reduced bank profitability, depressed share prices, and constrained loan supply, even though these measures are necessary to mitigate the severe impacts of banking crises. Guerrieri and Modugno (2024) found that banks with a higher stressed capital minimum compared to the previous stress test cycle systematically experienced an increase in their stock prices. Nonetheless, some studies indicate that shareholder contributions to bank capital are limited, while shareholder payout policies, including share buybacks, remain significant (Graeff and Biondi 2017).

In the aftermath of the 2008 crisis, enhanced solvency regulations (Basel III) led to an uneven increase in certain capital components (Krishnan and He 2022). Despite this increased capital aimed at strengthening financial stability, many banks have not seen a corresponding rise in their P/B ratios. Some authors suggest that intensified banking competition is positively associated with upward earnings management but not with upward capital management (Casciello et al. 2024). The literature indicates that higher capital requirements for banks might result in a socially costly crowding out of deposits by equity (Arping 2019; Belkhir et al. 2021). Additionally, capital requirements can lead banks to excessively cut back on lending (Gersbach and Hahn 2010). Banks with low capital have an incentive to issue more loans during economic contractions to support their weaker borrowers and thereby avoid loan loss recognition and write-offs on their capital (Dursun-de Neef and Schandlbauer 2021).

At the onset of the COVID-19 crisis, regulators recommended restrictions on dividends to preserve regulatory capital and ensure systemic stability. These restrictions led to further declines in bank share prices. In Europe, Andreeva et al. (2023) documented a causal negative impact on bank share prices, noting a decrease of approximately 7% within two weeks of the announcement. This finding aligns with previous research demonstrating a relationship between dividend reductions and P/B ratios (Agrawal et al. 1996; Burdekin and Yang 2013; Marangu and Jagongo 2014; Calomiris and Nissim 2014; Bertsatos and Sakellaris 2016; Duke et al. 2015). Additionally, Gambacorta et al. (2023) found that banks with a low P/B ratio are more likely to pay out dividends, particularly those with a P/B ratio below the threshold of 0.7.

This situation indicates that higher solvency levels do not necessarily lead to higher market valuations. This raises a question: do investors prefer high current returns without considering the long-term future of the entity?

We propose a hypothesis to explore how European markets weigh these competing factors. H2: European financial markets place greater value on information regarding bank dividend distributions than on data related to their solvency. This hypothesis aims to investigate the relative importance of solvency metrics in influencing the market valuations of banks and to confirm that investors do not assess equity components equally.

Bank heterogeneity stems from differences in cultural context and size across countries. Studies highlight the varied applications of financial regulations internationally (Guermazi and Halioui 2020), the importance of considering bank size in regulatory analyses (Saunders and Willison 2021; Gharaibeh and Jaradat 2021), and the correlation between increased capital in banks and higher dividends (Belloni et al. 2021). We aim to investigate whether the market valuation of banks' equity and capital components is consistent across different countries and whether this valuation is influenced by the bank's size.

Additionally, due to the high variability in values, studies suggest that non-linear models sometimes provide a better fit than linear models (Das and Lev 1994; Pesaran and Timmermann 1995). Our study will test its hypotheses using both linear and non-linear models.

3. Materials and Methods

Our study began with a dataset comprising 67 European banking groups listed in the S&P Europe BMI Banks–Industry Group–Index. These banks represent 14 European countries, with financial data spanning from 2005 to 2020. This period was selected to cover the years during which the P/B ratio transitioned from being greater than 1 to less than 1 and maintained this lower value for most European banks.

We excluded post-2020 data and analyzed the results both with and without the year 2020 to determine its impact on our findings. The enduring impact of the COVID-19 crisis on the financial sector is undeniable, extending well beyond the pandemic's eventual waning. Numerous studies have examined the specific effects of the COVID-19 epidemic on the performance, profitability, and stability of the banking sector (Shabir et al. 2023; Augeraud-Véron and Boungou 2023; Xiazi and Shabir 2022; Demir and Danisman 2021). Additionally, research has explored the systemic integration between countries' banking markets during these years (Tabak et al. 2022). This crisis prompted unprecedented interventions, which produced diverse market reactions (O'Donnell et al. 2024), reactions that we consider incomparable to those of previous years without such interventions.

The financial data, sourced annually from SNL Financial and curated by S&P Capital IQ Pro, ensured consistency by excluding banks not listed throughout the entire analysis period. This resulted in a reduced sample of 46 banking groups. The breakdown of these groups by country is provided in the Appendix A.

For this analysis, we specifically utilized consolidated information, differing from methodologies employed in prior studies (DeYoung and Roland 2001; Chiorazzo et al. 2008; Macit and Topaloglu 2012). This decision was driven by the fact that banks conduct a substantial portion of their operations through other group entities, making the assessment of their contributions more accurately reflected in the consolidated accounting and regulatory information of the group. Moreover, individual accounting information varies across different countries, posing challenges for meaningful comparisons.

Our study did not expand the sample to include non-European countries, such as US banks, to maintain homogeneity within the dataset. Non-European banks operate under distinct accounting and regulatory frameworks, which would introduce heterogeneity and complicate comparative analyses. 3 Our decision is supported by analysis of the different behavior of P/B ratios in non-European countries following the financial crisis illustrated in the Section 4.

Extensive research documents the influence of financial information on capital market indicators (Kothari 2001). Previous studies have primarily focused on identifying information that impacts market prices, often measured by the coefficient of determination (adjusted R^2) in regressions linking market prices and relevant information (Collins et al. 1997; Dontoh et al. 2007). Initially, our observations were treated as a time series due to the varying years in the dataset. The dependent variable selected for analysis is denoted as P/Bj, representing P/B ratio: the price per share as a multiple of the book value per share. Four categories of independent variables were utilized: those related to equity, regulatory capital, historical price-to-book ratios, and dummy variables.

Variables linked to reported equity include SC_j (Share Capital to Equity), SP_j (Share Premium to Equity), YNI_j (Year Net Income to Equity), RE_j (Retained Earnings to Equity), $YOCI_t$ (Year Other Comprehensive Income to Equity), $AOCI_j$ (Accumulated Other Comprehensive Income to Equity), TS_j (Treasury Stock to Equity), EHS_j (Equity Hybrid Securities to Equity), and MI_j (Minority Interest to Equity). These variables were constructed using book values from Balance Sheets and the Statement of Comprehensive Income of banks, without any adjustments. We believe unadjusted values are prevalent in the market and easily accessible to investors, contrary to adjusted values found in financial statement notes. Some studies replace book values with fair values, which have been found to impact banks' share prices (Giner and Mora 2020; Liao et al. 2020; Fiechter and Novotny-Farkas 2017; Siekkinen 2016; Drago et al. 2013).

Variables related to regulatory capital are defined as $CET1_j$ (Common Equity Tier 1 to total regulatory capital), $AT1_j$ (Additional Tier 1 to total regulatory capital), $T2_j$ (Tier 2 to total regulatory capital), DP_j (Dividend distributions from the last period). Studies suggest that listed banks often maintain stable dividends, irrespective of economic cycles (Belloni et al. 2021). The last variable is employed to analyze the regulatory capital reduction.

Another variable, $LagPB_j$, representing the bank's price-to-book ratio in the previous year, is included to examine whether past ratios contribute to explaining current ratios.

These variables are supplemented by two sets of dummy variables: "Country", indicating the bank's listing country, and "Quartile", classifying banks based on asset volume quartiles.

The P/B used in our analysis are taken 30 days post-financial year-end, coinciding with when banks typically provide market information on their financial and prudential status. Independent variable values are measured at financial year-end, except for DP_j and $LagPB_j$, which incorporate figures from the preceding financial year.

4. Results

4.1. Descriptive Statistics and Other Considerations

Descriptive statistics in Table 1 confirm the minimal variability of the Dividend Perspective when not restricted in distribution, supporting our choice to estimate future dividends based on the previous year's distribution. Moreover, annual earnings exhibit stability, with Income Statement figures surpassing those from Other Comprehensive Income. Notably, the mean P/B ratio slightly exceeds 1, while the median falls below, indicating variations across countries and years.

Table 1. Descriptive statistics of the variables.

Variable	Mean	StdDesv	Min	Q1	Median	Q3	Max
PB	1.070	0.660	0.008	0.597	0.926	1.420	3.982
SC	0.160	0.208	0.003	0.050	0.085	0.180	1.593
TS	−0.013	0.070	−0.998	−0.005	−0.000	0.000	0.001
SP	0.167	0.180	−0.006	0.000	0.092	0.298	0.757
YNI	0.068	0.093	−0.531	0.038	0.074	0.119	0.265
RE	0.546	0.263	−0.630	0.373	0.552	0.736	1.816
YOCI	−0.002	0.045	−0.356	−0.015	0.000	0.011	0.351
AOCI	−0.006	0.091	−0.895	−0.020	0.003	0.025	0.318
EHS	0.039	0.071	0.000	0.000	0.000	0.069	0.646
MI	0.042	0.064	−0.001	0.000	0.009	0.059	0.420
DP	0.037	0.046	0.000	0.010	0.027	0.053	0.619
CET1	0.740	0.139	0.242	0.644	0.753	0.831	1.000
AT1	0.072	0.060	0.000	0.003	0.075	0.109	0.418
T2	0.189	0.111	0.000	0.112	0.168	0.271	0.542

Figure 1 depicts the correlation among the independent variables and the dependent variable. Notably, two variables stand out for their significant positive correlation with the price-to-book ratio: earnings for the financial year, as recorded in the Income Statement, and the Dividend Perspective. Conversely, investor contributions, whether through share purchases or hybrid instruments, exhibit the most notable negative correlation with the price-to-book ratio.

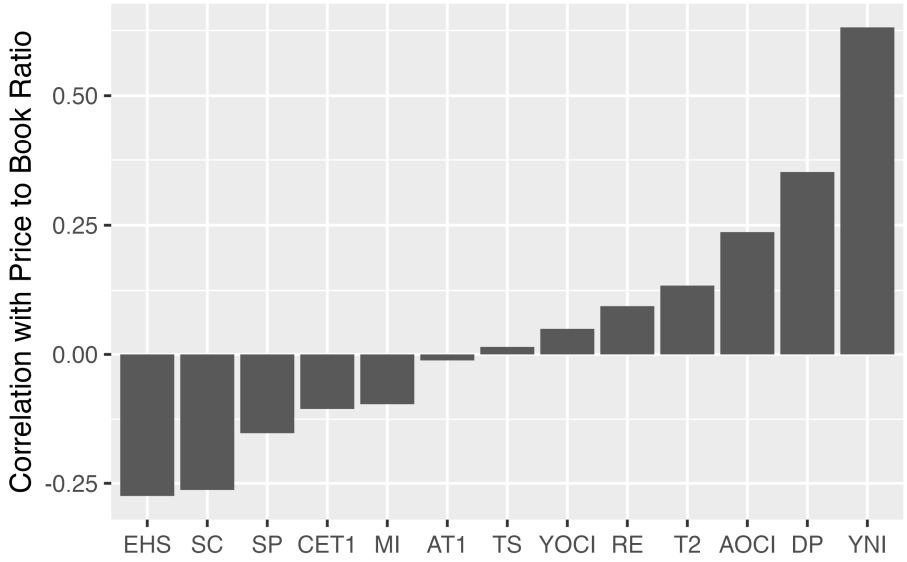

Figure 1. Correlation among the independent variables and the dependent variable.

The low correlations between variables, as depicted in the Figure 2, indicate a minimal risk of multicollinearity.

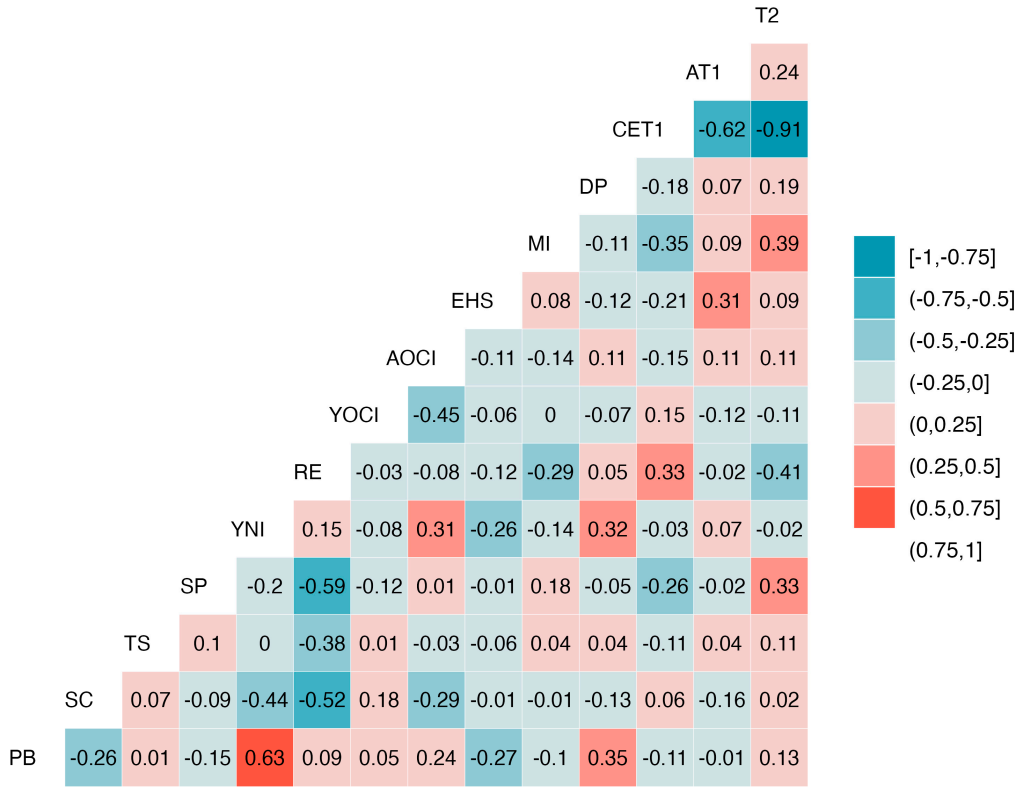

Figure 2. Correlation of all variables.

This study aims to explore the factors influencing P/B ratio by considering the outlined independent variables. Initially, we attempted to integrate equity and regulatory capital variables into a unified regression model. However, due to concerns regarding multicollinearity, such integration was unfeasible. Issues arose such as the equivalence between the sums of certain variables and the linear relationships among them, like CET1 being a linear combination of equity variables.

Consequently, we adopted two distinct regression models. The first model elucidates the P/B ratio using equity-related variables. The second model focuses on the relationship of the P/B ratio with the regulatory variables, aiming to confirm the results obtained with the first model.

Table 2 presents the performance of the price-to-book ratio across different years. Notably, the ratio dipped below 1 in 2008 and has remained below that threshold since. The onset of the COVID-19 crisis mirrored values akin to those witnessed during the 2008 crisis.

Table 2. Variation of the price-to-book ratio over the years.

Variable	Year	Mean	StdDesv	Min	Q1	Median	Q3	Max
PB	2005	2.161	0.540	0.950	1.846	2.143	2.513	3.814
PB	2006	2.260	0.583	1.030	1.890	2.190	2.700	3.982
PB	2007	1.555	0.442	0.750	1.235	1.494	1.825	2.653
PB	2008	0.705	0.368	0.121	0.424	0.687	0.865	1.878
PB	2009	0.979	0.487	0.150	0.607	0.972	1.170	2.890
PB	2010	0.962	0.418	0.050	0.584	1.007	1.281	1.939
PB	2011	0.659	0.385	0.030	0.338	0.663	0.888	1.490
PB	2012	0.748	0.402	0.030	0.524	0.690	0.886	1.723
PB	2013	0.943	0.448	0.030	0.648	0.885	1.190	1.864
PB	2014	0.966	0.497	0.008	0.636	0.900	1.220	2.243
PB	2015	0.883	0.466	0.028	0.550	0.738	1.200	2.100
PB	2016	0.936	0.516	0.025	0.609	0.845	1.269	1.982
PB	2017	0.988	0.494	0.017	0.680	0.951	1.230	1.963
PB	2018	0.819	0.424	0.133	0.518	0.740	1.058	1.952
PB	2019	0.818	0.418	0.214	0.598	0.670	1.100	2.075
PB	2020	0.744	0.488	0.160	0.460	0.590	0.950	2.310

Table 3 compares the P/B ratio of our sample with other indexes. This table illustrates a significant drop in the P/B ratio in 2008, coinciding with the financial crisis, which severely impacted the banking sector. Although there has been a gradual recovery in the subsequent years, notable fluctuations remain. European banks, in particular, tend to recover differently compared to banks in other countries.

Table 3. Price-to-book ratio comparison.

Variable	Year	Our Sample—European Banks	S&P Global 1200—Banks	MSCI World Banks Index	S&P US 500—Banks	S&P US 600—Banks	MSCI Europe Banks Index
PB	2005	2.161	N/A	2.130	1.968	2.073	2.100
PB	2006	2.260	N/A	2.250	2.069	1.928	2.170
PB	2007	1.555	N/A	1.670	1.331	1.326	1.620
PB	2008	0.705	N/A	0.840	1.018	1.084	0.660
PB	2009	0.979	1.130	1.210	1.133	0.967	1.070
PB	2010	0.962	1.116	1.120	1.251	1.139	0.880
PB	2011	0.659	0.856	0.850	1.029	1.051	0.600
PB	2012	0.748	1.042	1.030	1.146	1.152	0.760
PB	2013	0.943	1.190	1.210	1.434	1.625	0.960
PB	2014	0.966	1.088	1.090	1.131	1.512	0.910
PB	2015	0.883	0.995	1.010	1.058	1.467	0.830
PB	2016	0.936	1.019	1.050	1.191	1.891	0.840
PB	2017	0.988	1.175	1.220	1.393	1.667	0.940

Table 3. *Cont.*

Variable	Year	Our Sample—European Banks	S&P Global 1200—Banks	MSCI World Banks Index	S&P US 500—Banks	S&P US 600—Banks	MSCI Europe Banks Index
PB	2018	0.819	0.928	0.950	1.138	1.352	0.710
PB	2019	0.818	1.041	1.090	1.424	1.327	0.740
PB	2020	0.744	0.856	0.890	1.127	1.093	0.560

Table 4 shows a country-by-country breakdown of the P/B ratio and showcases the diverse financial landscapes within which financial institutions operate. This variance likely reflects the differing economic conditions and market sentiments prevalent in each country. Such a detailed analysis can provide insights into how regional factors influence financial metrics.

Table 4. Price-to-book ratio by country.

Variable	Country	Mean	StdDesv	Min	Q1	Median	Q3	Max
PB	Austria	1.026	0.650	0.400	0.608	0.854	1.115	2.800
PB	Belgium	1.289	0.497	0.280	0.988	1.375	1.650	1.900
PB	Denmark	1.299	0.653	0.355	0.809	1.163	1.607	3.200
PB	Finland	1.282	0.435	0.714	0.965	1.210	1.410	2.345
PB	France	0.830	0.544	0.241	0.519	0.616	0.853	2.588
PB	Germany	0.614	0.447	0.076	0.290	0.503	0.776	1.717
PB	Ireland	0.576	0.804	0.030	0.050	0.165	0.657	2.420
PB	Italy	0.789	0.609	0.008	0.375	0.595	1.013	2.893
PB	Norway	1.137	0.415	0.429	0.880	1.082	1.243	2.537
PB	Portugal	0.823	0.848	0.025	0.291	0.517	0.859	2.726
PB	Spain	1.260	0.832	0.160	0.701	0.976	1.541	3.982
PB	Sweeden	1.510	0.555	0.224	1.288	1.523	1.723	2.869
PB	Switzerland	1.218	0.523	0.570	0.755	1.177	1.467	2.797
PB	UK	1.176	0.643	0.291	0.654	1.048	1.544	2.900

4.2. Modeling the Price-to-Book Ratio with the Equity

To examine the hypotheses, we conducted an analysis by modeling the P/B ratio utilizing variables associated with the equity components. Our approach, labeled as Equation (1), aimed to gauge the relationships between the P/B ratio and each individual equity component. This analysis employed linear regression techniques using cross-sectional data spanning the 2005–2020 period. The dependent variable in this model is the P/B ratio, while the independent variables comprise the relationships between each equity component and total equity, the preceding year's P/B ratio, and selected dummy variables.

The sum of all equity component variables equated to 1. As the model has a constant, we opted to exclude the variable MI_j, which exhibited minimal significance based on Table 1. Additionally, we excluded a dummy variable pertaining to the country Austria and another dummy variable representing size, specifically the first quartile. Equation (1) is

$$P/B_{jt} = \beta 0 + \beta 1 SC_{jt} + \beta 2 SP_{jt} + \beta 3 YNI_{jt} + \beta 4 RE_{jt} + \beta 5 YOCI_{jt} + \beta 6 AOCI_{jt} + \beta 7 TS_{jt} + \beta 8 EHS_{jt} + \beta 9 Country_{jt} + \beta 10 Quartile_{jt} + \beta 11 LagPB_{jt} + u_{jt} \quad (1)$$

The results obtained from Equation (1) are summarized in Table 5.

Table 5 summarizes the regression analysis outcomes for the P/B ratio across financial institutions, highlighting several key findings. Notably, Yearly Net Income (YNI) and Other Comprehensive Income (YOCI) significantly positively affect the price-to-book ratio, indicating that higher earnings and comprehensive income are associated with higher market valuation. The presence of country dummies and the significant impact of certain quartiles suggest that geographic and size-based factors also play crucial roles

in determining the price-to-book ratio. The linear regression, based on cross-sectional data, encompassed observations from 45 banks across a span of 16 years, totaling 720 data points. Upon the exclusion of one year's data (Lag(price_book)), the dataset was reduced to 675 observations.

Table 5. Equation (1) Summary.

	Equation (1)	**Equation (1)**
(Intercept)	0.995 *** (0.000)	0.167 (0.501)
Country dummies	Yes	Yes
SC	0.122 (0.710)	0.352 (0.221)
TS	0.583 (0.135)	0.633 * (0.059)
SP	0.128 (0.713)	0.423 (0.169)
YNI	2.787 *** (0.000)	1.487 *** (0.000)
RE	0.265 (0.410)	0.336 (0.234)
YOCI	1.440 *** (0.006)	2.545 *** (0.000)
AOCI	1.032 *** (0.009)	0.826 ** (0.015)
EHS	−0.515 (0.185)	0.081 (0.811)
quartile_TA2	−0.261 *** (0.000)	−0.124 *** (0.009)
quartile_TA3	−0.123 ** (0.029)	−0.067 (0.170)
quartile_TA4	−0.330 *** (0.000)	−0.172 *** (0.003)
Lag(price_book)		0.556 *** (0.000)
Num.Obs.	720	675
R^2	0.465	0.702
R^2 Adj.	0.447	0.690

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

However, this regression exhibited a notably poor goodness of fit, a trend that significantly improved upon the inclusion of the previous year's P/B ratio. This enhancement, coupled with the observed evolution of the P/B ratio over the years as outlined in Table 2, underscores dynamic behavior within the dataset, prompting a comprehensive analysis combining time series and cross-sectional approaches.

Recognizing the necessity to incorporate information on each variable across each year, we advocate for the inclusion of time series analysis alongside the cross-sectional approach, necessitating the use of an econometric panel data model. This methodology enables the delineation of distinct banking behaviors across different years. To address concerns regarding endogeneity and control for within-bank dynamics, we employ panel data estimations with fixed effects.

Figure 3 visually illustrates the behavior of independent variables concerning the dependent variable, with the primary objective being the identification of potential outliers within the linear models that may have contributed to the diminished goodness of fit observed in Equation (1).

Figure 3 shows outliers among the independent variables. The literature indicates that the incidence of outliers can be reduced with non-linear adjustments to the linear models (McMillan 2004; Ogwang 2021).

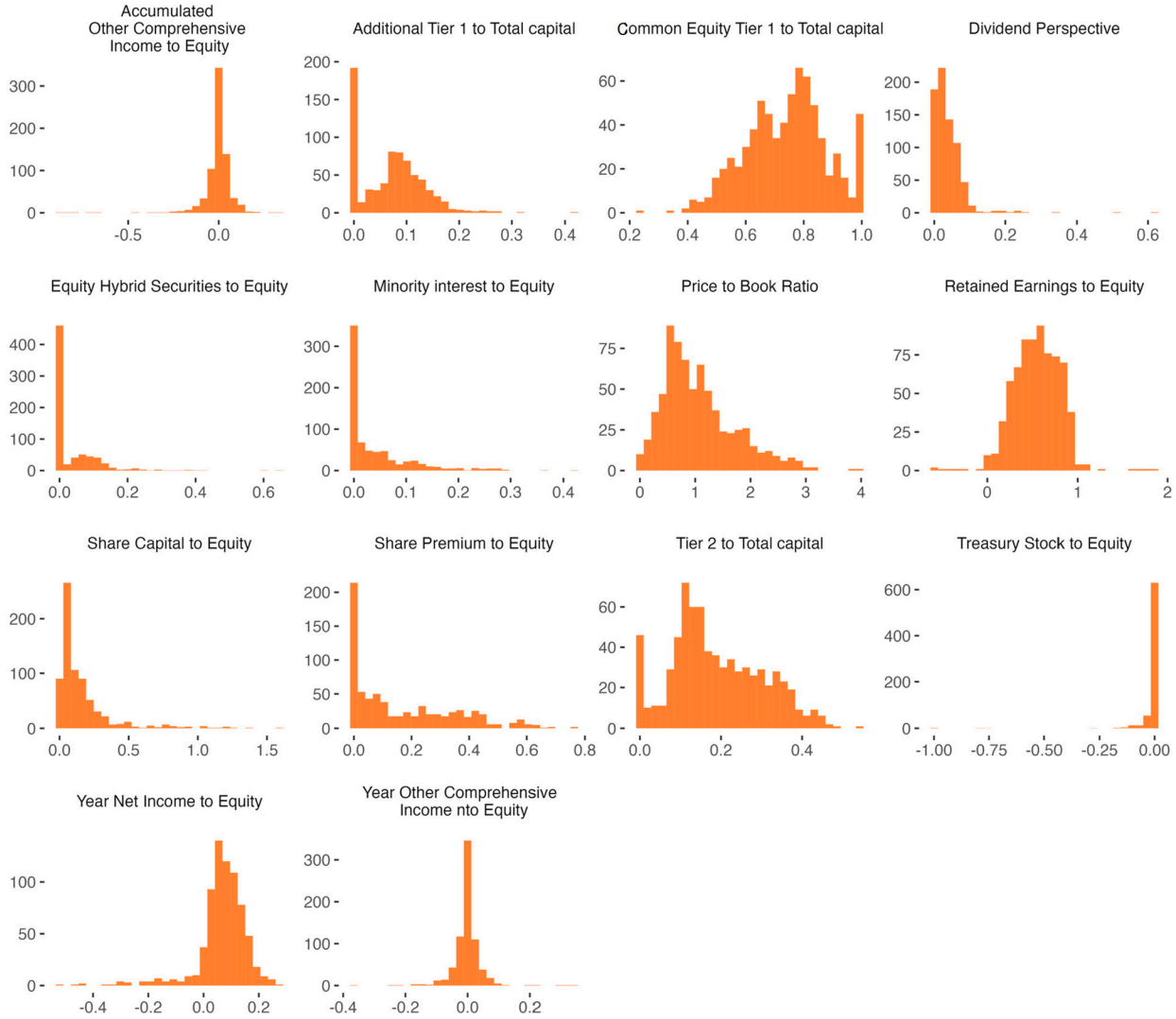

Figure 3. Behaviour of independent variables with respect to the dependent variable.

If we apply panel data to Equation (1), in addition to adding quadratic adjustments to the independent variables, we obtain the following Equation (2):

$$\begin{aligned} P/B_{jt} = {} & \beta 0 + \beta 1 SC_{jt} + \beta 2 SP_{jt} + \beta 3 YNI_{jt} + \beta 4 RE_{jt} + \beta 5 YOCI_{jt} + \beta 6 AOCI_{jt} + \beta 7 TS_{jt} + \beta 8 EHS_{jt} + \beta 9 Country_{jt} \\ & + \beta 10 Quartile_{jt} + \beta 11 LagPB_{jt} + \beta 12 SC_{jt}^2 + \beta 13 SP_{jt}^2 + \beta 14 YNI_{jt}^2 + \beta 15 RE_{jt}^2 + \beta 16 YOI_{jt}^2 \\ & + \beta 17 AOCI_{jt}^2 + \beta 18 TS_{jt}^2 + \beta 19 EHS_{jt}^2 + u_{jt} \end{aligned} \quad (2)$$

j = 1 to 46
t = 2005 to 2020

The results of Equation (2) are summarized in Table 6. We estimate a robust covariance matrix of parameters for a fixed effects or random effects panel model according to Arellano (1987).

Table 6. Results obtained with Equation (2).

	Equation (2)	**Equation (2)**
(Intercept)	0.282 (0.257)	0.179 (0.457)
Lag(price_book)	0.413 *** (0.000)	0.421 *** (0.000)
Country dummies	Yes	Yes
SC	−0.065 (0.853)	0.221 (0.428)
TS	0.811 (0.235)	0.632 * (0.050)
SP	1.043 ** (0.011)	1.034 ** (0.011)
YNI	2.430 *** (0.000)	2.483 *** (0.000)
RE	0.139 (0.685)	0.355 (0.191)
YOCI	2.253 *** (0.000)	2.409 *** (0.000)
AOCI	0.976 ** (0.010)	0.956 *** (0.003)
EHS	−0.552 (0.230)	0.009 (0.977)
quartile_TA2	−0.137 *** (0.003)	−0.139 *** (0.002)
quartile_TA3	−0.044 (0.354)	−0.051 (0.284)
quartile_TA4	−0.151 *** (0.007)	−0.153 *** (0.006)
SC2	0.160 (0.374)	
TS2	−0.024 (0.975)	
SP2	−1.231 *** (0.006)	−1.087 ** (0.015)
YNI2	6.109 *** (0.000)	5.992 *** (0.000)
RE2	0.168 (0.321)	
YOCI2	−1.367 (0.549)	
AOCI2	0.378 (0.535)	
EHS2	1.509 (0.101)	
Num.Obs.	675	675
R^2	0.733	0.731
R^2 Adj.	0.719	0.719

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

Equation (2) improves the goodness of fit compared to Equation (1)[2]. In Equation (2), we observed several significant linear coefficients. Year Net Income, Other Comprehensive Income, Accumulated Other Comprehensive Income, Treasury Stock, Share Premium, and the price-to-book ratio from the previous year displayed substantial positive linear coefficients. Notably, Year Net Income also exhibited a significant positive quadratic coefficient. Year Net Income has a direct relationship, but this relationship is not just linear but also bends upwards, indicating that the increase in the dependent variable accelerates as Year Net Income grows, illustrating a more complex, non-linear relationship between the two. The economic impact is high if we consider the size of this last coefficient and their practical implications: changes in Year Net Income affect the bank P/P ratio significantly.

Our analysis confirms that profitability significantly explains variations in the price-to-book ratio. However, investor contributions as guarantees for third parties do not display a similar explanatory power. Both financial year variables related to earnings, documented in both the Income Statement and Other Comprehensive Income, were statistically significant. Additionally, earnings from Other Comprehensive Income in prior years also showed significance. This finding may be attributed to the accounting practice under IFRS 9, where certain earnings recorded in Other Comprehensive Income from previous financial periods were recycled in the Income Statement in subsequent financial years.

Among variables related to shareholders' contributions, only Treasury Stock and Share Premium held significance. The market positively views shareholder remuneration through the repurchase of own shares, indicating a favorable perception. The Share Premium's positive perception could be due to its status as a reserve available for dividend distribution. Notably, major banks chose to make substantial payments by reimbursing Share Premiums.

The analysis categorized countries based on their impact on the P/B ratio: some, like Austria, had no significant effect, while others significantly affected it, showing diverse economic behaviors. Additionally, the size of a bank's assets influenced its P/B ratio, with larger banks and those in the second quartile facing more penalties, suggesting that larger asset volumes might not always be favorable in valuation metrics.

Equation (2) was run excluding data from the year 2020 to determine whether the onset of the COVID-19 crisis affected the results. The conclusions remained consistent. To further assess the robustness of Equation (2), we employed two complementary techniques: cross-validation and temporal stability assessment. Both methods confirmed the stability, consistency, and robustness of our model estimates[3].

4.3. Modeling the Price-to-Book Ratio with the Regulatory Capital

With the aim of validating our model, we turn to different data: those provided on the regulatory capital of banks. In Equation (3), utilizing panel data, the P/B ratio serves as the dependent variable, while the ratio of each capital component over total capital is considered an independent variable. To avoid multicollinearity, the least relevant variable, AT1, was excluded based on Table 1. Expected dividend, combining solvency-related variables and a factor reducing bank solvency, was also included as an independent variable. Additionally, we incorporated the P/B ratio from the previous year, the same dummy variables from Equation (2), and quadratic adjustments as independent variables in this regression analysis. To address concerns regarding endogeneity and control for within-bank dynamics, we employ panel data estimations with fixed effects. Equation (3) can be summarized as

$$P/B_{jt} = \beta 0 + \beta 1 CET1_{jt} + \beta 2 T2_{jt} + \beta 3 Country_{jt} + \beta 4 Quartile_{jt} + \beta 5 DP_{jt} + \beta 6 LagPB_{jt} + \beta 7 CET1_{jt}^2 + \beta 8 T2_{jt}^2 + \beta 9 DP_{jt}^2 + u_{jt} \quad (3)$$

j = 1 to 46
t = 2005 to 2020

Table 7 summarizes the results of Equation (3).

Table 7. Equation (3) Results.

	Equation (3)	**Equation (3)**	**Equation (3)**	**Equation (3)**
(Intercept)	−0.111 (0.722)	0.828 ** (0.013)	−0.336 (0.386)	1.089 * (0.082)
Country dummies	Yes	Yes	Yes	Yes
CET1	1.299 *** (0.000)	0.446 (0.167)	0.954 ** (0.010)	−2.870 * (0.100)
T2	0.948 ** (0.014)	0.568 (0.151)	1.771 *** (0.000)	0.444 (0.680)
DP		2.106 *** (0.000)	2.792 *** (0.000)	6.137 *** (0.000)
quartile_TA2		−0.330 *** (0.000)	−0.444 *** (0.000)	−0.387 *** (0.000)
quartile_TA3		−0.242 *** (0.000)	−0.381 *** (0.000)	−0.326 *** (0.000)
quartile_TA4		−0.441 *** (0.000)	−0.616 *** (0.000)	−0.557 *** (0.000)
Lag(price_book)			0.488 *** (0.000)	0.469 *** (0.000)
CET12				2.705 ** (0.030)
T22				2.520 (0.220)
DP2				−8.808 *** (0.000)
Num.Obs.	720	704	672	672
R^2	0.308	0.363	0.557	0.587
R^2 Adj.	0.293	0.346	0.543	0.573

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

As illustrated in Table 7, the explanatory power of the data in relation to the P/B ratio based on various capital components exhibited notably low goodness of fit. However, this improved considerably upon the inclusion of anticipated dividends, which contribute to a reduction in regulatory capital, and the consideration of the previous year's P/B ratio. Notably, performance variations were observed across different countries but remained consistent across banks of varying sizes.

CET1 displayed a significant non-linear relationship with the price-to-book ratio, while Tier 2 exhibited no significant relationship. The impact of dividends demonstrated a concave quadratic influence. The economic impact is high if we evaluate the size of this coefficient and its practical implications; changes in dividends affect the P/B ratio

significantly. We suggest a maximal effect around approximately 0.3, as visualized more explicitly in Figure 4. Notably, an increase in dividends did not linearly affect the P/B ratio; for instance, an increase from 0.10 to 0.11 in the dividend percentage did not have an equivalent impact compared to an increase from 0.15 to 0.16. The linear estimation tended to underestimate the effect of dividends, as evidenced by the disparity between the red curve and the blue line.

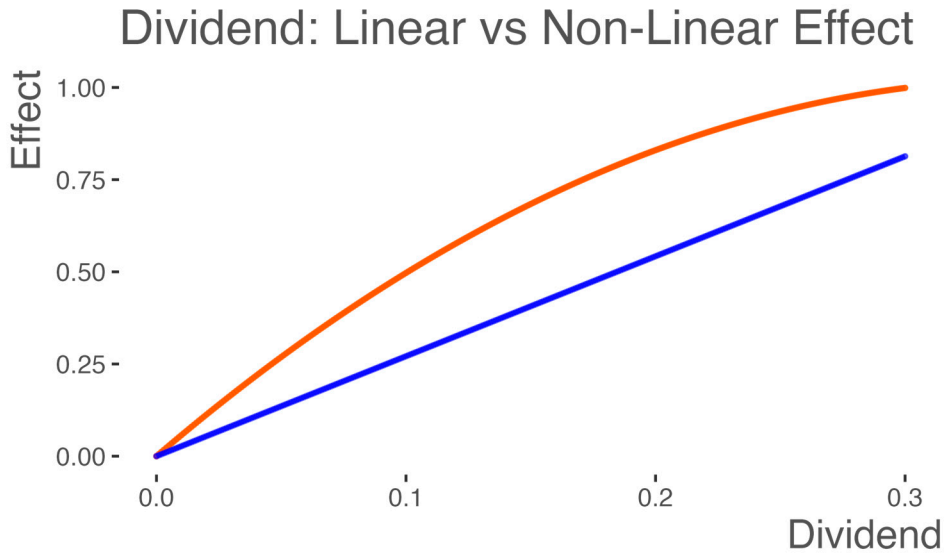

Figure 4. Non-linear effect of the dividend.

Equation (3) was run excluding data from the year 2020 to determine if the onset of the COVID-19 crisis affected the results. The conclusions remained consistent. To further assess the robustness of Equation (3), we employed two complementary techniques: cross-validation and temporal stability assessment, similar to Equation (2). Both methods confirmed the stability, consistency, and robustness of our model estimates.

5. Discussion

The P/B ratio dipped below 1 during the 2008 crisis and has maintained relative stability, even at the beginning of the 2020 crisis. The persistent sub-1 ratio post-2008 suggests a long-term adjustment in investor valuation frameworks, possibly reflecting a reassessment of risk or a shift in investment strategies.

We find a consistent stability in annual earnings reported. Furthermore, when dividend distribution faces no restrictions, there is a parallel stability in the proportion of dividends disbursed each year. There is a tendency for higher earnings in the Income Statement compared to Other Comprehensive Income. This could be justified by considering that profits recorded in the Income Statement can be distributed as dividends, unlike profits recorded in Other Comprehensive Income.

Previous studies have established a significant relationship between Income Statement results and the price-to-book (P/B) ratio (Balasubramnian et al. 2019). Additionally, prior research has consistently found no significant relationship between share capital and bank market value, often attributing this lack of correlation to factors such as increased cost of capital and declining profitability (He et al. 2024; Bertsatos and Sakellaris 2016; Handorf 2011).

Our study confirms that investors undervalue their contributions to bank equity due to perceptions of lower profitability and reduced future cash flows, despite increased bank stability. Additionally, our research expands on these findings in several key ways. First, we demonstrate that the positive relationship between equity components and bank market value extends beyond the results reported in the Income Statement. Specifically, our analysis reveals a nuanced, non-linear relationship between Income Statement performance

figures and the P/B ratio. This indicates that as Year Net Income increases, the growth in the P/B ratio not only continues but accelerates, suggesting a progressively intensifying valuation impact from rising profits.

Second, our study finds that most components related to investor contributions intended as safeguards for third parties do not significantly explain share price movements. However, there are two notable exceptions: Treasury Stock and Share Premium. Treasury Stock reflects shareholder return on investment and equity reduction, while Share Premium accounts facilitate the distribution of dividends with fewer regulatory obstacles. Our findings suggest that the market does not value investor contributions aimed at protecting creditors; instead, it appears to reward strategies that reduce these safeguards.

Our analysis confirms a significant relationship between the P/B ratio and Common Equity Tier 1 (CET1) capital. In contrast, other forms of capital, such as Tier 2 regulatory capital, are less valued or not valued at all by investors. This finding aligns with earlier research (Belkhir et al. 2021; Jordan et al. 2011). Furthermore, consistent with prior studies by Andreeva et al. (2023), our research establishes a significant relationship between dividends paid and the P/B ratio. We confirm that investors do not value banks for merely boosting their minimum required regulatory capital in compliance with Basel III, as previous researchers have done (Ercegovac et al. 2020). This reaction persists despite findings by researchers like Song (2023) and Adelopo et al. (2022), who argued that increased capital requirements do not directly contribute to the observed reduction in profitability, with varying effects depending on the size of the bank (Gržeta et al. 2023). Possible explanations include banks' resistance to raising equity due to government guarantees (Baron 2020), or that strong equity requirements do not impede banks' performance but do reduce shareholder value (Durand and Le Quang 2022).

Our study highlights that investors prefer high current returns without considering the long-term future of the entity. We can identify a significant non-linear relationship between CET1 and the P/B ratio. This is evidenced by our discovery of a non-linear relationship between the Income Statement and the P/B ratio, particularly since the Income Statement factors into the calculation of CET1. Second, our findings reveal a pronounced concave quadratic effect, suggesting that the impact of dividends on the P/B ratio increases at a decreasing rate as dividend payments rise.

As for final conclusions and implications, our analysis suggests that the limitations imposed on dividend distributions and the application of Basel III, intended to strengthen banks' capital bases and enhance their intermediation capabilities, do not inherently bolster the sustainability of their market prices. This implies a disconnect between regulatory intentions and market perceptions, highlighting a complex interplay where increased regulatory capital requirements may be viewed unfavorably by investors, regardless of their potential benefits for financial stability, even though some previous researchers suggest that it is not necessarily correct to assume that stricter regulations, such as Basel III, will negatively affect the profitability or efficiency of banks (Bolfek et al. 2024).

Several previous studies evaluated the role of regulatory capital in strengthening the resilience of bank lending activities during crisis periods. The results suggested that banks with higher regulatory capital ratios prior to the crises lend more resiliently to the real economy during the crisis than those with lower regulatory capital ratios ex-ante. This implies that recent reforms on bank regulatory capital have effectively built-up bank strength, which in turn helped banks continue lending to the real economy during crises (Mateev et al. 2024; Anani and Owusu 2023; Cao and Chou 2022; Alkhazali et al. 2024; Le et al. 2023; De Bandt et al. 2022).

However, the observed dominance of profitability and dividend policies over direct investor contributions in influencing market valuations necessitates a critical reevaluation of the impacts of Basel III, as highlighted by Vickers (2019). Regulation faces multiple challenges that call for a rethinking of its design (Durand and Le Quang 2022). Specifically, it is essential to examine how increases in regulatory capital adversely affect market value. The implementation of Basel III, which leads to a decline in the P/B ratio, may prompt

banks to increase their dividend payouts, as posited by Gambacorta et al. (2023). Such actions could further deteriorate the financial condition of these entities, potentially creating a feedback loop that depresses market confidence and valuations even further.

There is a strong dynamic behavior in the P/B ratio, with past values exerting a significant influence on future values. This underscores the importance of historical trends in understanding the trajectory of this crucial metric.

There are differences between countries, and additionally, a bank's asset volume played a role in the P/B ratio, with larger banks and those in the second quartile experiencing greater penalization, in line with previous research (Gharaibeh and Jaradat 2021). This situation suggests a complex interplay of factors influencing this metric.

Future studies should consider examining potential divergences in investor behavior, particularly between institutional investors and individual shareholders when trading bank shares. Additionally, considering data from other regions, such as the United States, can help address concerns regarding the external validity of our findings. Ultimately, our work invites further exploration of the effects of the COVID-19 crisis that began in 2020, providing a more comprehensive understanding of its impact on this ratio.

Author Contributions: Conceptualization, F.G.M.; methodology, F.G.M., J.D.J. and R.Q.S.d.l.M.; software, R.Q.S.d.l.M.; validation, F.G.M. and J.D.J., writing—original draft preparation, F.G.M.; writing—review and editing, F G.M. and J.D.J.; formal analysis, R.Q.S.d.l.M.; investigation, F.G.M., J.D.J. and R.Q.S; resources, F.G.M.; data curation, F.G.M., J.D.J. and R.Q.S.d.l.M.; visualisation, F.G.M., J.D.J. and R.Q.S.d.l.M.; writing—original draft preparation, F.G.M. and J.D.J.; writing—review and editing, F.G.M. and J.D.J. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Data Availability Statement: Dataset available on request from the authors.

Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A

Entity	Country
Aareal Bank	Germany
AIB Group Plc	Ireland
Banca Monte dei Paschi	Italy
Banca Popolare di Sondrio	Italy
Banco Comercial Português, SA	Portugal
Bankinter	Spain
Banque Cantonale Vaudoise	Switzerland
Barclays Bank Plc	UK
BBVA	Spain
BNP Paribas SA	France
BPER Banca SpA	Italy
Close Brothers Group Plc	UK
Commerzbank AG	Germany
Crédit Agricole	France
Credito Emiliano SpA	Italy
Credito Valtellinese SpA	Italy
Danske Bank A/S	Denmark

Entity	Country
DNB ASA	Norway
HSBC Holdings PlC	UK
Intesa Sanpaolo SpA	Italy
Jyske Bank A/S	Denmark
KBC Group NV	Brussels
Liechtensteinische Landesbank AG	Switzerland
Lloyds Banking Group Plc	UK
Mediobanca - Banca di Credito Finanziario SpA	Italy
Nordea Bank Abp	Finland
Raiffeisen Bank International AG	Austria
Ringkjøbing Landbobank A/S	Denmark
Royal Bank of Scotland plc	UK
Sabadell	Spain
Santander	Spain
Skandinaviska Enskilda Banken AB (publ.)	Sweeden
Société Générale SA	France
Spar Nord Bank A/S	Denmark
SpareBank 1 Nord-Norge	Norway
SpareBank 1 SMN	Norway
SpareBank 1 SR-Bank ASA	Norway
St. Galler Kantonalbank AG	Switzerland
Standard Chartered Plc	UK
Svenska Handelsbanken AB (publ)	Sweeden
Swedbank AB (publ)	Sweeden
Sydbank A/S	Denmark
UniCredit SpA	Italy
Unione di Banche Italiane SpA	Italy
Valiant Holding AG	Switzerland

Notes

1 Higher risk taking will likely increase the cash flows, but during crisis they likely result in huge loan losses due to large bad debts particularly in high-risk category loans.

2 The cross-sectional analysis in Table 4 has the same number of observations as the panel one in subsequent tables, because the cross-sectional analysis uses only banks that had data for all years within the period 2005 to 2020.

3 Cross-validation was carried out using a 4-fold cross-validation scheme, where we randomly divided the dataset into four subsets of similar size. In each iteration, one subset was used as the validation set while the remaining three were used to estimate the model. This procedure was repeated four times. We checked that the value of the estimates, their standard deviation, and the R-squared are similar to those of the full model, which allowed us to verify the consistency and robustness of the model. Additionally, to check the temporal stability of the model, we estimated two models, one without data from the first year and the other removing data from the last year, and adjusted the model in each of these periods. This allowed us to assess how the model estimates varied over time. These evaluations provide a comprehensive understanding of the stability and reliability of the model in different scenarios and periods, reinforcing the reliability and robustness of our results.

References

Abuzayed, Bana, Philip Molyneux, and Nedal Al-Fayoumi. 2009. Market Value, Book Value and Earnings: Is Bank Efficiency a Missing Link? *Managerial Finance* 35: 156–79. [CrossRef]

Adelopo, Ismail, Nikolina Vichou, and Kwop Yip Cheung. 2022. Capital, liquidity and profitability in Europeans Banks. *Journal of Corporate Accounting and Finance* 33: 23–35. [CrossRef]

Agrawal, Surendra, Reza Monem, and Mohamed Ariff. 1996. Price to Book Ratio as a valuation model: An Empirical Investigation. *Finance India* X2: 333–44.

Aiyar, Shekhar, Charles Calomiris, and Tomasz Wieladek. 2015. Bank Capital Regulation: Theory, Empirics, and Policy. *IMF Economic Review* 63: 955–83. [CrossRef]

Alkhazali, Osamah, Mohamad Husam Helmi, Ali Mirzaei, and Mohsen Saad. 2024. The Impact of Capital on Bank Profitability during the COVID-19 Pandemic. *Global Finance Journal* 62: 100994. [CrossRef]

Altavilla, Carlo, Miguel Boucinha, and Jose Luis Peydro. 2018. Monetary Policy and Bank Profitability in a Low Interest Rate Environment. *Economic Policy* 33: 531–86. [CrossRef]

Anani, Makafui, and Felix Owusu. 2023. Regulatory Capital and Bank Risk-Resilience amid the COVID-19 Pandemic: How Are the Basel Reforms Faring? *Finance Research Letters* 52: 103591. [CrossRef]

Andersen, Henrik, and Ragnar Enger Juelsrud. 2024. Optimal Capital Adequacy Ratios for Banks. *Latin American Journal of Central Banking* 5: 100107. [CrossRef]

Andreeva, Desislava, Paul Bochmann, and Julius Schneider. 2023. *Evaluating the Impact of Dividend Restrictions on Euro Area Bank Market Values*. Working Paper Series European Central Bank No 2787. Frankfurt am Main: European Central Bank. [CrossRef]

Arellano, Manuel. 1987. Computing Robust Standard Errors for Within-groups Estimators. *Oxford Bulletin of Economics and Statistics* 49: 431–34. [CrossRef]

Arping, Stefan. 2019. Capital Regulation and Bank Deposits*. *Review of Finance* 23: 831–53. [CrossRef]

Augeraud-Véron, Emmanuelle, and Whelsy Boungou. 2023. The Impact of COVID-19 on Bank Profitability: Cross-Country Evidence. *German Economic Review* 24: 69–95. [CrossRef]

Baker, Malcolm, and Jeffrey Wurgler. 2015. Would stricter capital requirements raise the cost of capital? Bank capital regulation and the low-risk anomaly. *American Economic Review* 105: 315–20. [CrossRef]

Balasubramnian, Bhanu, Ajay A. Palvia, and Dilip K. Patro. 2019. Can the Book-to-Market Ratio Signal Banks' Earnings and Default Risk? Evidence Around the Great Recession. *Journal of Financial Services Research* 56: 119–43. [CrossRef]

Baron, Matthew. 2020. Countercyclical Bank Equity Issuance. *The Review of Financial Studies* 33: 4186–230. [CrossRef]

Belkhir, Mohamed, Sami Ben Naceur, Ralph Chami, and Anis Samet. 2021. Bank Capital and the Cost of Equity. *Journal of Financial Stability* 53: 100843. [CrossRef]

Belloni, Marco, Maciej Grodzicki, and Mariusz Jarmuzek. 2021. *What Makes Banks Adjust Dividend Pay-Outs?* Frankfurt am Main: European Central Bank. Available online: https://www.ecb.europa.eu/press/financial-stability-publications/macroprudential-bulletin/html/ecb.mpbu202106_4~63bf1035a7.en.html (accessed on 1 December 2021).

Bertsatos, Georgios, and Plutarchos Sakellaris. 2016. A dynamic model of bank valuation. *Economics Letters* 145: 15–18. [CrossRef]

Bogdanova, Bilyana, Ingo Fender, and Előd Takáts. 2018. The ABCs of Bank PBRs. BIS Quarterly Review, pp. 81–95. Available online: https://www.bis.org/publ/qtrpdf/r_qt1803h.pdf (accessed on 1 March 2018).

Bolfek, Martin, Karmen Prtenjača Mažer, and Berislav Bolfek. 2024. What Are the Differences in the Area of Profitability and Efficiency When Early and Late Adopters Are Analyzed Regarding the Basel III Leverage Ratio? *Journal of Risk Financial Management* 17: 31. [CrossRef]

Borio, Claudio, Leonardo Gambacorta, and Boris Hofmann. 2017. The Influence of Monetary Policy on Bank Profitability. *International Finance* 20: 48–63. [CrossRef]

Burdekin, Richard CK, and Yang Yang. 2013. Book-to-Market Equity, Asset Correlations and the Basel Capital Requirement: Cross market trading in China's large state-owned commercial banks 2006–2011. *Contemporary Economic Policy* 31: 366–77. [CrossRef]

Calomiris, Charles, and Doron Nissim. 2014. Crisis-related shifts in the market valuation of banking activities. *Journal of Financial Intermediation* 23: 400–35. [CrossRef]

Cao, Yifei, and Jen-Yu Chou. 2022. Bank Resilience over the COVID-19 Crisis: The Role of Regulatory Capital. *Finance Research Letters* 48: 102891. [CrossRef]

Casciello, Raffaela, Marco Maffei, and David A. Ziebart. 2024. Regulatory and Contextual Factors Influencing Earnings and Capital Management Decisions: Evidence from the European Banking Sector. *Review of Quantitative Finance and Accounting* 63: 87–146. [CrossRef]

Chen, Qianying, Mitsuru Katagiri, and Jay Surti. 2022. Monetary Surprises and Bank Equity Valuation with Prolonged Low Interest Rates. *Finance Research Letters* 47: 102608. [CrossRef]

Chiorazzo, Vincenzo, Carlo Milani, and Francesca Salvini. 2008. Income diversification and bank performance: Evidence from Italian banks. *Journal of Financial Services Research* 33: 181–203. [CrossRef]

Chousakos, Kyriakos, and Gary Gorton. 2017. Bank Health Post-Crisis. Banque of France. *Financial Stability Review* 21: 55–67. [CrossRef]

Claessens, Stijn, Nicholas Coleman, and Michael Donnelly. 2018. Low-For-Long' Interest Rates and Banks' Interest Margins and Profitability: Cross-country Evidence. *Journal of Financial Intermediation* 35: 1–16. [CrossRef]
Collins, Daniel, Edward Maydew, and Ira Weiss. 1997. Changes in the value-relevance of earnings and book values over the past forty years. *Journal of Accounting and Economics* 24: 39–67. [CrossRef]
Das, Somnath, and Baruch Lev. 1994. Nonlinearity in the returns earnings relation: Tests of alternative specifications and explanations. *Contemporary Accounting Research* 11: 353–79. [CrossRef]
De Bandt, Olivier, Ceyhun Bora Durdu, Ichue Hibiki, Yasin Mimir, Jolan Mohimont, Kalin Nikolov, Sigrid Roehrs, Jean-Guillaume Sahuc, Valerio Scalone, and Michael Straughan. 2022. *Assessing the Impact of Basel III: Evidence from Structural Macroeconomic Models*. Banque de France Working Papers, no 864. Paris: Banque de France. [CrossRef]
Demir, Ender, and Gamze Ozturk Danisman. 2021. Banking Sector Reactions to COVID-19: The Role of Bank-Specific Factors and Government Policy Responses. *Research in International Business and Finance* 58: 101508. [CrossRef]
Demirguc-Kunt, Asli, Enrica Detragiache, and Ouarda Merrouche. 2013. Bank Capital: Lessons from the Financial Crisis. *Journal of Money, Credit and Banking* 45: 1147–64. [CrossRef]
DeYoung, Robert, and Karin Roland. 2001. Product mix and earnings volatility at commercial banks. Evidence from a degree of total leverage model. *Journal of Financial Intermediation* 10: 54–84. [CrossRef]
Dontoh, Alex, Suresh Radhakrishnan, and Joshua Ronen. 2007. Is stock price a good measure for assessing value- relevance of earnings? An empirical test. *Review of Managerial Science* 1: 3–45. [CrossRef]
Drago, Danilo, Maria Mazzuca, and Renata Trinca. 2013. Do loans fair value affect market value? Evidence from European banks. *Journal of Financial Regulation and Compliance* 21: 108–20. [CrossRef]
Duke, Stephen Bassey, Ikenna Dominic Nneji, and S. E. Nkamare. 2015. Impact of Dividend Policy on Share Price. Valuation in Nigerian Banks. *Archives of Business Research* 3: 49–90. [CrossRef]
Durand, Pierre, and Gaëtan Le Quang. 2022. Banks to Basics! Why Banking Regulation Should Focus on Equity. *European Journal of Operational Research* 301: 349–72. [CrossRef]
Dursun-de Neef, Özlem, and Alexander Schandlbauer. 2021. COVID-19 and Lending Responses of European Banks. *Journal of Banking & Finance* 133: 106236. [CrossRef]
Ercegovac, Roberto, Mario Pecaric, and Ivica Klinac. 2020. What Determines the Price to Book Ratio in the European Banking Sector? *Journal of Economics and Finance* 70: 62–280.
European Central Bank. 2012. Developments in the price-to-book ratios of large and complex banking groups Box 4. *Financial Stability Review*, pp. 63–65. Available online: https://www.ecb.europa.eu/press/financial-stability-publications/fsr/focus/2012/pdf/ecb~cd3aea780c.fsrbox201212_04.pdf (accessed on 1 December 2012).
Ferretti, Riccardo, Giovanni Gallo, Andrea Landi, and Valeria Venturelli. 2018. *Market-Book Ratios of European Banks: What Does Explain the Structural Fall?* CEFIN Working Papers Nº 65. Modena: Centro Studi Banca e Finanza (Universita degli Studi di Modena e Reggio Emilia).
Fiechter, Peter, and Zoltan Novotny-Farkas. 2017. The impact of the institutional environment on the value relevance of fair values. *Review of Accounting Studies* 22: 392–429. [CrossRef]
Gambacorta, Leonardo, Tommaso Oliviero, and Hyun Song Shin. 2023. Low price-to-book ratios and bank dividend payouts: Economic policy implications. *Economic Policy* 38: 675–701. [CrossRef]
García-Olalla, Myriam, and Manuel Luna. 2021. Market reaction to supranational banking supervision in Europe: Do firm- and country-specific factors matter? *Empírica* 48: 947–75. [CrossRef]
Gersbach, Hans, and Volker Hahn. 2010. *Banking-on-the-Average Rules*. CEPR Discussion Papers. London: CEPR. [CrossRef]
Gharaibeh, Omar Khlaif, and Mahmoud Ali Jaradat. 2021. Determinants of Stock Prices in Jordanian Banks: An Empirical Study of 2006–2018. *The Journal of Asian Finance, Economics and Business (JAFEB)* 8: 349–56. [CrossRef]
Giner, Begoña, and Araceli Mora. 2020. The value relevance of risk disclosure: An analysis of the banking sector. *Accounting in Europe* 17: 129–57. [CrossRef]
Goh, Beng Wee, Dan Li, Jeffrey Ng, and Kevin Ow Yong. 2015. Market Pricing of Banks' Fair Value Assets Reported Under SFAS 157 During the 2008 Economic Crisis. *Journal of Accounting and Public Policy* 34: 129–45. [CrossRef]
Graeff, Imke, and Yuri Biondi. 2017. Rethinking Bank Shareholder Equity: The Case of Deutsche Bank. *Accounting Forum* 41: 318–33. [CrossRef]
Grodzicki, Maciej, Carlos Rodriguez, and Davide Vioto. 2019. Recent developments in banks' price-to-book ratios and their determinants. *Financial Stability Review* 5: 66–69.
Gržeta, Ivan, Saša Žiković, and Ivana Tomas Žiković. 2023. Size Matters: Analyzing Bank Profitability and Efficiency under the Basel III Framework. *Financial Innovation* 9: 43. [CrossRef]
Guermazi, Walid, and Khamoussi Halioui. 2020. Do differences in national cultures affect cross country conditional conservatism behavior under IFRS? *Research in International Business and Finance* 52: 101171. [CrossRef]
Guerrieri, Luca, and Michele Modugno. 2024. The Information Content of Stress Test Announcements. *Journal of Banking & Finance* 160: 107087. [CrossRef]
Handorf, Willian. 2011. Capital management and bank value. *Journal of Banking Regulation* 12: 331–41. [CrossRef]

He, Liangliang, Hui Li, Hong Liu, and Tuyet Nhung Vu. 2024. Why do banks issue equity? *Research in International Business and Finance* 69: 102256. [CrossRef]
Huizinga, Harry, and Luc Laeven. 2012. Bank valuation and accounting discretion during a financial crisis. *Journal of Financial Economy* 106: 614–34. [CrossRef]
IASB. 2018. *Conceptual Framework for Financial Reporting*. London: IFRS Foundation. Available online: https://www.ifrs.org/content/dam/ifrs/publications/pdf-standards/english/2021/issued/part-a/conceptual-framework-for-financial-reporting.pdf (accessed on 1 September 2010).
Jordan, Dan J., Douglas Rice, Jacques Sanchez, and Donald H. Wort. 2011. Explaining Bank Market-to-Book Ratios: Evidence From 2006 to 2009. *Journal of Banking and Finance* 35: 2047–55. [CrossRef]
Kolev, Kalin. 2019. Do investors perceive marking-to-model as marking-to-myth? Early evidence from FAS 157 disclosure. *Quarterly Journal of Finance* 9: 1950005. [CrossRef]
Kothari, Sri Prakash. 2001. Capital market research in accounting. *Journal of Accounting and Economics* 31: 105–231. [CrossRef]
Krishnan, Cnv, and Yu He. 2022. Investor Perception, Market Reaction, and Post-Issue Performance in Bank Seasoned Equity Offerings. *Journal of Risk and Financial Management* 15: 275. [CrossRef]
Le, Thi Ngoc Lan, Muhammad Ali Nasir, and Toan Luu Duc Huynh. 2023. Capital requirements and banks performance under Basel-III: A comparative analysis of Australian and British banks. *The Quarterly Review of Economics and Finance* 87: 146–57. [CrossRef]
Leong, Ken-Yien, Mohamed Ariff, Zarei Alireza, and M. Ishaq Bhatti. 2023. Bank stock valuation theories: Do they explain prices based on theories? *International Journal of Managerial Finance* 19: 331–50. [CrossRef]
Liao, Lin, Helen Kang, and Richard D. Morris. 2020. The Value Relevance of Fair Value and Historical Cost Measurements During the Financial Crisis. *Accounting and Finance* 61: 2069–107. [CrossRef]
Macit, Fatih, and Zeynep Topaloglu. 2012. Why bank market value to book value ratios so different: Evidence from Turkish banking sector. *Economic and Business Review* 14. [CrossRef]
Marangu, Kenneth, and Ambrose Jagongo. 2014. Price to book value ratio and financial statement variables (An empirical study of companies quoted at Nairobi Securities Exchange, Kenya). *Global Journal of Commerce & Management Perspective* 3: 50–56.
Mateev, Miroslav, Ahmad Sahyouni, and Turki Al Masaeid. 2024. Bank Performance before and during the COVID-19 Crisis: Does Efficiency Play a Role? *Review of Managerial Science* 18: 29–82. [CrossRef]
McMillan, David. 2004. Non-Linear Error Correction: Evidence for UK Interest Rates. *The Manchester School* 72: 626–40. [CrossRef]
O'Donnell, Niall, Darren Shannon, and Barry Sheehan. 2024. The Impact of Monetary Policy Interventions on Banking Sector Stocks: An Empirical Investigation of the COVID-19 Crisis. *Financial Innovation* 10: 44. [CrossRef]
Ogwang, John. 2021. Some Non-Linear Problems in Accounting and Finance: Can We Apply Regression? *International Journal of Business, Economics and Management* 8: 81–99. [CrossRef]
Pesaran, Hashem, and Allan Timmermann. 1995. Predictability of stock returns: Robustness and economic significance. *The Journal of Finance* 50: 1201–28. [CrossRef]
Richardson, Scott. 2006. Over-investment of free cash flow. *Review of Accounting Studies* 11: 159–89. [CrossRef]
Sarin, Natasha, and Lawrence Summers. 2016. Understanding Bank Risk through Market Measures. *Brookings Papers on Economic Activity* 2016: 57–127. [CrossRef]
Saunders, Austen, and Matthew Willison. 2021. *Measure for Measure: Evidence on the Relative Performance of Regulatory Requirements for Small and Large Banks*. Staff Working Paper. Nº 922. Londoin: Bank of England.
Shabir, Mohsin, Ping Jiang, Wenhao Wang, and Özcan Işık. 2023. COVID-19 Pandemic Impact on Banking Sector: A Cross-Country Analysis. *Journal of Multinational Financial Management* 67: 100784. [CrossRef]
Sharma, Sudhi, Indira Bhardwaj, and Kamal Kishore. 2023. Capturing the impact of accounting and regulatory variables on stock prices of banks—An empirical study of Indian banks in panel data modelling. *Asian Journal of Accounting Research* 2: 184–93. [CrossRef]
Siekkinen, Jimi. 2016. Value relevance of fair values in different investor protection environments. *Accounting Forum* 40: 1–15. [CrossRef]
Soewarno, Noraya, and Siti Rahmi Utami. 2010. Significance of accounting information in explaining market and book values: The case of Indonesian Banks. *International Research Journal of Finance and Economics* 55: 146–57.
Song, Guoxiang. 2023. Evaluating Large Bank Risk Using Stock Market Measures in the Basel III Period. *Journal of Corporate Accounting and Finance* 34: 21–32. [CrossRef]
Tabak, Benjamin Miranda, Igor Bettanin Dalla Riva e Silva, and Thiago Christiano Silva. 2022. Analysis of Connectivity between the World's Banking Markets: The COVID-19 Global Pandemic Shock. *The Quarterly Review of Economics and Finance* 84: 324–36. [CrossRef] [PubMed]
Uwuigbe, Olubukola Ranti, Uwalomwa Uwuigbe, Jimoh Jafaru, Ebeguki Edith Igbinoba, and Olufemi Adebayo Oladipo. 2016. Value relevance of financial statements and share price: A study of listed banks in Nigeria. *Banks and Bank Systems* 11: 135–43. [CrossRef]
Vickers, John. 2019. Safer, but Not Safe Enough. *Journal of Risk and Financial Management* 12: 152. [CrossRef]
Wagner, Martin Knaup. 2009. *A Market-Based Measure of Credit Quality and Banks' Performance During the Subprime Crisis*. Working Paper. Tilburg: Tilburg University.

Xiazi, Xing, and Mohsin Shabir. 2022. Coronavirus pandemic impact on bank performance. *Frontiers in Psychology* 13: 1014009. [CrossRef] [PubMed]
Zéghal, Daniel, and Anis Maaloul. 2011. The accounting treatment of intangibles—A critical review of the literature. *Accounting Forum* 35: 262–74. [CrossRef]