FINANCIAL CRISIS INSIGHTS ON BANK PERFORMANCE REPORTING (PART 1)

Assessing the Key Factors Influencing Price-to-Book Ratios

CFA Institute

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Executive Summary

The financial crisis has presented a monumental opportunity for incisive reflection on and reform of deficiencies in the current financial reporting framework. These deficiencies have contributed to the limited transparency of bank financial statements. One feature of the crisis that begs for a keen review of its causes and implications is the sustained depressed (i.e., less than 1) price-to-book ratios (P/Bs) of banks during the crisis. P/B and other closely related measures, such as the price-to-tangible-book ratio (P/TB), are key bank valuation metrics.

Although P/B is one of many metrics that investors monitor when valuing banks, we focus on it in this study because it is widely referenced by policymakers as a yardstick for the financial health of banks. Another key concern regarding the pattern of long-term-depressed P/Bs of banks is that it undermines the investability of the banking sector. Equity issuance becomes less attractive if equity is considered too cheap by issuing banks.

A key analytical angle in this study concerns the relationship between loan impairments and P/Bs.[1] Loans are a key element of a bank's financial assets, and their impairments affect both the market value of equity (stock price) and the equity book value of banks.[2] Loan impairments are widely applied and considered important by investors, as shown in a European Central Bank (ECB) survey[3] of leading banking analysts.

One principal issue for investors and other financial reporting stakeholders during the financial crisis was the extent to which the amount and timing (too little, too late) of financial asset (e.g., loan) impairments contributed to overstated reported balance-sheet net assets and, thereafter, to depressed P/Bs. Thus, it is not surprising that the *CFA Institute 2014 Global Market Sentiment Survey (GMSS) report identified improved requirements in the accounting for impairments as the second-most important required regulatory reform to avert future financial crises (73% of survey respondents called for improvements in the requirements to impair troubled credit holdings).*[4] Correspondingly, the timing of our study is aligned with the significant raft of current initiatives from the International Accounting Standards Board (IASB), the Financial Accounting Standards Board (FASB), and other regulatory bodies aimed at improving the accounting for financial instruments and the overall transparency of banking financial institutions. It also highlights the importance of the asset quality review being conducted by the ECB and other regulators.

[1]Loan impairments represent the write-down in the carrying value of loans due to the deterioration in the ability of banks' borrowers to fulfill their contractual payment obligations to the banks. Loan impairments should occur when the expected recoverable cash flows from bank borrowers decline. Under existing requirements, however, impairments are recognized when there is objective evidence (as defined in the accounting literature) of non-recoverability of contractual cash flows owed by borrowers.

[2]For our sample of banks, the carrying value of loans is on average 48% of total assets, with a median value of 52% of total assets; the maximum observation across the sample is 86% of total assets.

[3]European Central Bank (2010).

[4]CFA Institute (Forthcoming 2014b).

Limited Illustrative Evidence of Delayed Loan Impairments during the Financial Crisis

There is wide consensus among financial reporting stakeholders that the incurred-loss impairments methodology required by current accounting standards led to the problem of "too little, too late" recognition of loan impairments. Academic studies have also shown that banks tend to smooth earnings by delaying loan impairments recognition in challenging economic environments and accelerating it during boom periods.[5] Notwithstanding this evidence related to past financial crises, there are few recent studies that empirically illustrate the extent to which loan impairments were timely or delayed during the recent subprime and European sovereign debt financial crises and how delayed impairments may have affected such valuation metrics as P/B. To illustrate the relationship between loan impairments and P/B, we posed the following key research questions:

- *How timely were loan impairments during the financial crisis?*
- *What were the effects of delayed loan impairments, if any, on P/B?*

Analytical Method

In addition to loan impairments, we examined the impact of profitability and risk on P/B. As detailed in Sections 3, 4, and 5, we assessed the relationship between P/B and various measures of loan impairments, profitability, and risk. To examine the nature of these relationships, we conducted multiple tests, including the following.

- *Multi-period trend analysis:* To illustrate the respective year-to-year variation patterns of P/Bs, loan impairments, profitability, and risk, we charted their annual averages across multiple periods (2003–2013).
- *Analyzing annual bank observations with different P/B characteristics:* We tested whether there are differences in measures of loan impairments, profitability, and risk across samples of annual bank observations distinguished by P/B (low versus high P/B, decreasing versus increasing P/B). These tests show how the magnitude and direction of change of P/Bs are associated with the magnitude and direction of change of loan impairments, profitability, and risk.
- *Correlation analysis and regression tests:* We conducted correlation analysis and regression tests to determine the relative effects (magnitude and direction of association) of these factors, which we expected to influence stock price and P/B.

These tests were conducted using a sample of 51 banks (see Section 3.1.1)—31 from the European Union (EU) and 20 from Australia, Canada, Japan, and the United States. Our sample includes 72.5% (29 of 40) of the banks identified as large, complex banking groups by the 2013 European Financial Stability report.[6] The analysis period is 2003–2013, which covers the periods before, during, and after the financial crisis.

[5]See, for example, Liu and Ryan (2006).
[6]European Central Bank (2013).

We recognize that there are other tests, such as event studies,[7] that would more robustly test whether there was a "cause and effect" (i.e., causative) relationship between the loan impairments, profitability, and stock price and P/B. Nevertheless, the results from the combination of tests that we conducted provide a good indication of the relationship between these factors and P/B.

Key Findings

Our results show that during the financial crisis, the *representation of loan impairments on balance sheet (allowance for loan losses) and nonperforming loans lags the capital markets' economic write-down of these loans and this lagging trend was particularly evident for the EU banks*. This finding signals the delayed recognition of loan impairments and justifies the efforts being made by the IASB and FASB to ensure the timely recognition of financial asset impairments. It also highlights the importance of the ongoing asset quality review and emphasis on balance-sheet repair by the ECB and various national regulators.

In addition, comparing the pre-provision income and net income for the sample banks shows that *loan impairments significantly contributed to reduced overall net income at different junctures during the financial crisis (e.g., 2008, 2009, 2010)*. The pre-provision income had a sharp drop in 2008 but improved significantly in 2009 and 2010. However, ROE dropped sharply in 2008 and remained low thereafter. The contrast in pre-provision income and ROE trends in 2009 and 2010 reveals that impairments had a particularly significant effect on net income during the height of the financial crisis. The significant loan-impairments-related deduction on pre-provision income implies that loan impairments significantly and adversely affected the expected future earnings and overall stock price—especially because reported net income is a key input in forecasting future earnings and estimating the going-concern portion of a bank's market value.

The results also show that *profitability as measured by reported return on equity (ROE) and return on assets (ROA) has a positive association with P/B, affirming that profitability is a key driver of P/B*, although this relationship weakened during the crisis, reflecting that historical ROE has limited predictive value for future earnings and stock price. We link this latter finding to the ongoing regulatory, structural changes that are bound to affect the long-term profitability of banks, meaning that historical ROE had little information content for forecasting future ROE. Furthermore, a year-to-year comparison of ROE versus the cost of equity shows that the *cost of equity has exceeded the return on equity since the beginning of the financial crisis*—showing that the low return (negative economic profit) has been a contributing factor to low stock prices.

We similarly found that the capital markets' measures of risk, such as cost of equity, stock price beta,[8] and credit default swap (CDS) spread, have a negative association with P/B. In addition, a comparison of the CDS spreads of similarly rated (investment-grade) EU banks (27) and

[7]Event studies directly test stock price reactions to particular information changes or dissemination while controlling for other factors that would influence the stock price contemporaneously. Event studies allow inferences to be made regarding the information content of financial reporting information.

[8]Stock price beta is the covariance of a company's stock price with an index (e.g., FTSE 100 or any index that represents diversified stocks). It is derived from regression models based on time-series data of stock prices and selected index values. It is a key input in the capital asset pricing model for determining required return and the discount rate.

non-financial companies (33) *shows that there has been an incremental spread (e.g., 120 bps in 2012) for the banks—hinting at an incremental risk aversion toward the bank sector*, which translates to relatively higher risk premiums, lower stock prices, and lower P/Bs.

Our analysis in Section 3 includes other measures of risk, such as capital adequacy, which allowed us to capture one of the key factors considered in evaluating bank value (i.e., from the CAMELS[9] framework). However, our results show that the improvement in capital adequacy that has been occurring since the beginning of the crisis has not readily translated into improved P/Bs.

Key Policy Recommendations

Building on the findings of this study, we put forward the following policy recommendations in Section 2.

- *In addition to amortized cost carrying values, fair value measurement of loans should be recognized on the face of the balance sheet*: Our results indicate that the allowance for loan losses on bank balance sheets has generally lagged the write-down of market value owing to declining asset quality. To remedy the problem of "too little, too late" recognition of loan losses and provide the most decision-useful information, we recommend that standard setters require the recognition of both the amortized cost and the fair value of financial assets on the face of financial statements (e.g., parenthetical presentation of loan fair value amounts on balance sheet)—especially because we found that current requirements to provide only disclosures of fair values for loans do not ensure that these disclosed fair values are always prepared with the rigor that would be ordinarily applied for recognized financial statement information.[10] It is evident from our study that current requirements for loan fair value disclosures are not an adequate substitute for the recognition of loan fair value on the main financial statements.

- *Bank risk disclosures need continued enhancement*: Information risk contributes to investors' banking sector risk aversion. Thus, as has been recommended by numerous stakeholders, including the Financial Stability Board's Enhanced Disclosure Task Force (EDTF), risk disclosures need to be enhanced to help investors better understand bank business models and reduce the risk premium that investors assign owing to the limited transparency of bank financial statements.

Overall, implementing these recommendations can help to restore investor trust and confidence in the banking sector. It is worth remembering that investors are suppliers of loss-absorbing equity as well as debt capital and that their trust and confidence in banks is essential to the effective functioning of the banking sector. A vibrant, well-functioning banking sector remains crucial for overcoming the ongoing economic malaise that is being experienced across the developed world economies.

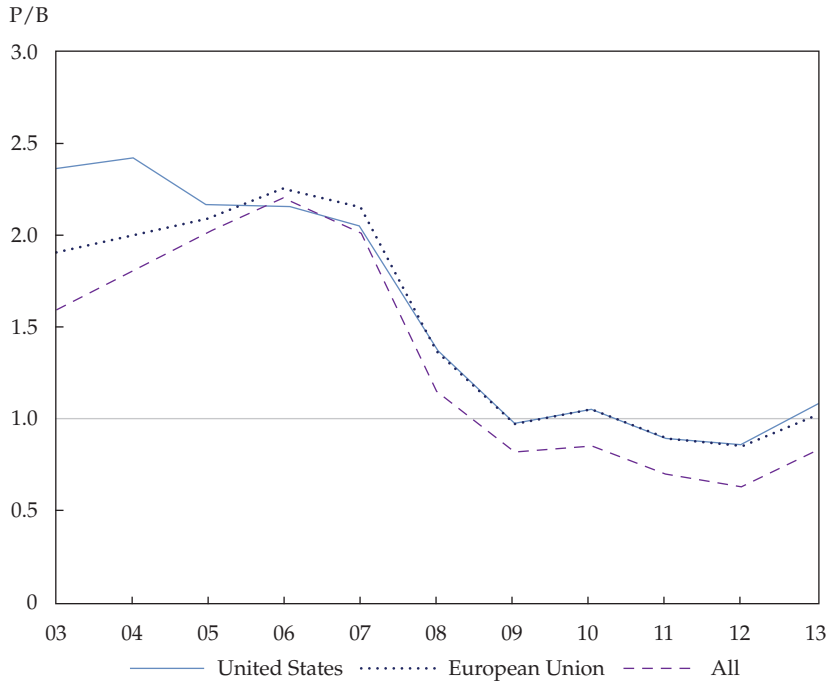
[9]CAMELS is the acronym for a widely applied framework for analyzing banks. It stands for capital adequacy, asset quality, management quality, earnings, liquidity, and sensitivity to interest rates.
[10]CFA Institute (Forthcoming 2014b).

1. Introduction and Key Findings

1.1. Introduction

As shown in **Figure 1.1**, the decline and low levels of P/Bs of large global banks, especially in the EU and the United States, have been pronounced throughout the financial crisis. Therefore, having a precise understanding of the determinants of P/B is useful in understanding the cause of the decline.

Figure 1.1. P/Bs for the Sample of 51 Global Banks, 2003–2013



Note: A longer time series than that shown in the figure would similarly illustrate that P/B does go through phases of depression (e.g., during economic crises). This figure primarily reflects the horizon of analysis of this study (i.e., just before, during, and immediately following the recent financial crisis).

Market commentators and policymakers have posited several reasons for the sustained low P/Bs of many large banks across the globe during the financial crisis. For example, a recent Bank of England (BOE) Financial Stability Report provided the following explanation:

> *Two reasons can plausibly explain why global banks are currently trading at price to book ratios close to historic lows, typically below one. First, investors may be concerned that accounting book values are not a true representation of banks' true net assets. This could be because of accounting practices, such as the requirement to recognize losses when they are incurred rather than expected. A loss of confidence in financial statements may also result from their focus on point estimates of asset valuation. In reality, there is often a range within which a bank could plausibly choose to value a position. Second, banks may be unable to generate earnings sufficient to exceed investors' required returns.*[11]

[11]Bank of England (2012a, p. 24).

The 2013 ECB Financial Stability Review echoed the same messages regarding key drivers of low P/Bs:

> *Continued action is needed to mitigate lingering skepticism regarding euro area bank balance sheets. Market valuations of euro area banks have remained below their book valuation since 2009, while those of US banks have risen above 1 during 2013. While some of this subdued difference may relate to subdued profitability of euro area banks, it also relates to asset quality transparency, which would benefit from more extensive disclosures, a cleaning up of bank balance sheets, and a removal of nonperforming loans legal resolution.*[12]

The objective of our study was to closely examine the various factors that likely contributed to low P/Bs during the financial crisis. We focused on the following factors.

- *Loan impairments:* Loans are a key element of a bank's financial assets, and loan impairments affect both the market value of equity (stock price) and the equity book value of banks. As expressed in the BOE report, investors may be concerned that accounting book values, including loan carrying values, are not a true representation of banks' true net assets because of such accounting practices as the requirement to recognize losses when they are incurred rather than expected.

- *Profitability:* Investors' bleak view of the future profitability of the banking sector (i.e., expected return on equity being below the cost of equity) can lead to a decline in P/B. In our analysis, we assumed that realized/reported profitability has information content for investors' outlooks for future profitability and that it is correlated with P/B. That said, as discussed in Section 1.2.2, we recognize that there are points in time when the reported/realized ROE is not predictive of future profitability.

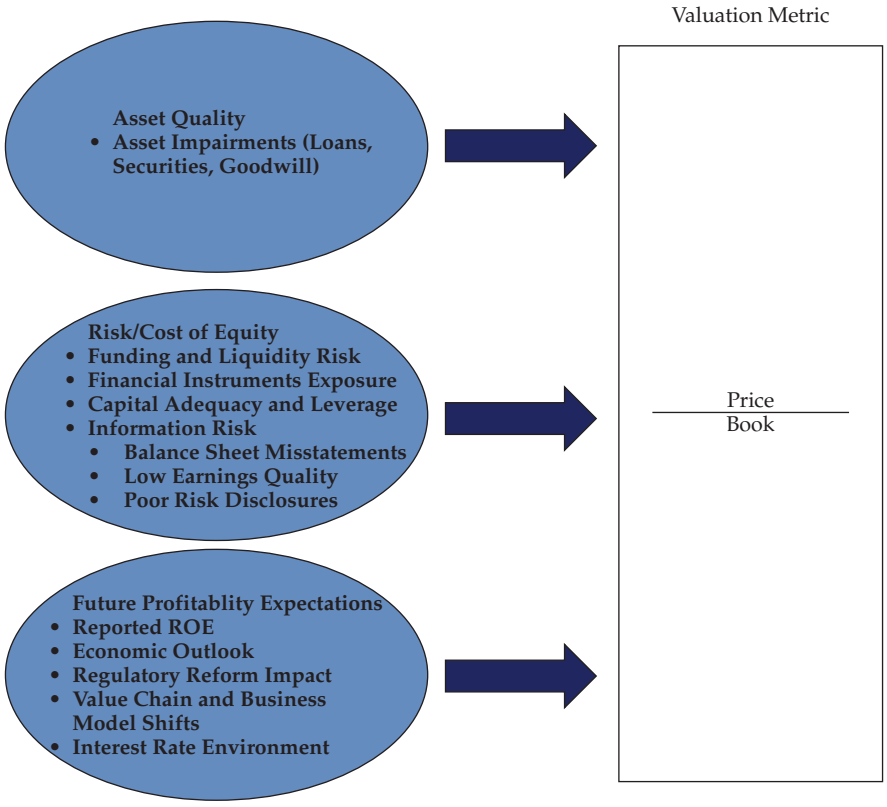
- *Risk:* Investors in banks are confronted with the inherent complexity of bank business models, as well as with challenges associated with the opacity of these institutions (information risk).[13] The combination of these factors contributes to the difficulties that investors face in understanding and trusting the financial statements of banks. As such, investors assign a higher risk premium to banks in their valuations. A Bank for International Settlements paper noted that the high book-to-market ratios (i.e., low P/Bs) observed during the financial crisis could be explained by the information risk faced by investors.[14] Similarly, the EDTF report attributed the low P/Bs of global systemically important financial institutions (SIFIs) to the difficulties that investors face in understanding the risks faced by banks.[15]

Figure 1.2 shows factors other than loan impairments that influence the profitability, risk, stock price, and P/B of a bank (e.g., regulatory requirements, leverage and regulatory capital adequacy, management quality, general economic environment including interest rate levels). Concurrently, there are multiple analytical adjustments made by investors to reported balance sheets that result in differences in the effective economic balance sheet (a component of the

[12]European Central Bank (2013, p. 10).
[13]Partnoy and Eisinger (2013). The authors analyzed the financial statements and disclosures of some of the largest US banks (e.g., Wells Fargo and J.P. Morgan) and observed that the opacity of banks has contributed to the loss of investor trust in banks and the observed low P/Bs across a significant number of major global banks. On the basis of the opacity of banks, the authors argued for clearer disclosures.
[14]Yang and Tsatsaronis (2010).
[15]Financial Stability Board (2012).

numerator) and denominator (book value of equity) of P/B.[16] That said, it is hard to observe and effectively measure the full spectrum of analytical adjustments made by investors to the reported book value and to gauge the corresponding impact on P/B. Hence, in this study, we primarily focused on analyzing the effects of loan impairments on reported P/Bs, alongside selected profitability and risk measures.

Figure 1.2. Multiple Factors That Influence Price-to-Book Ratios



1.1.1. How Do Reported Loan Impairments Affect P/B?

The extent to which loan impairments affect the stock price and book value per share results in a corresponding impact on P/B (i.e., direction and magnitude of change). P/B declines signify that the market value per share has decreased to a greater extent than the book value per share. As described in a recent BOE report, P/B can be decomposed as follows:[17]

$$\frac{\text{Price}}{\text{Book}} = \frac{(\text{Market valuation of net assets} + \text{Market valuation of future investments})}{\text{Accounting value of net assets}}.$$

[16]Analytical adjustments are required because of incomplete balance sheets (i.e., excluded assets and economic obligations, such as operating leases or those arising from off-balance-sheet structured entities) and to reflect investor judgment of the economic worth of recorded assets and liabilities (e.g., goodwill).
[17]Bank of England (2012a).

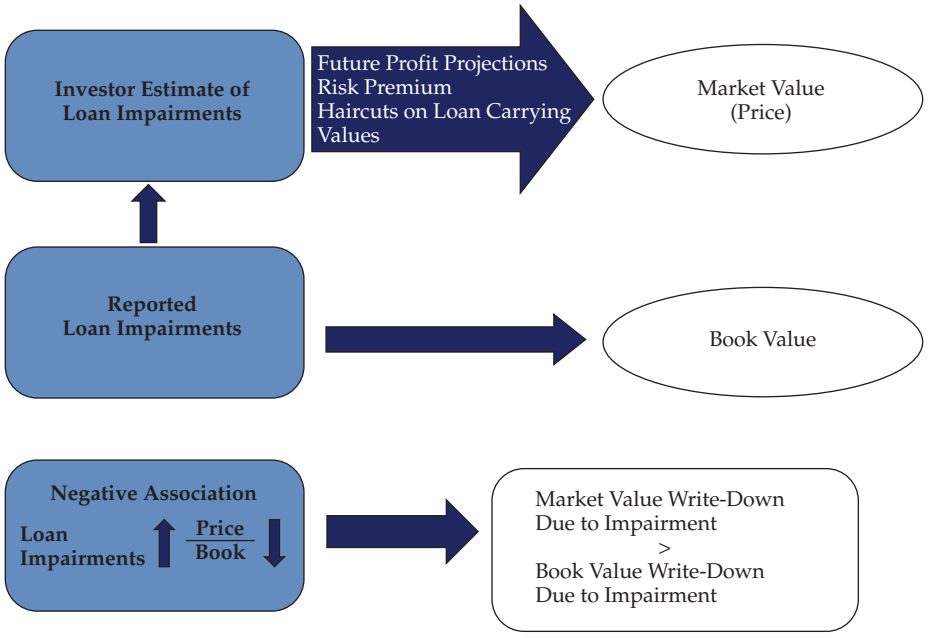
The P/B numerator (market value) can be decomposed into two components: projection of balance-sheet value by investors (market valuation of net assets) and the going-concern value (market valuation of future investments).

The link between reported loan impairments and book value (accounting value of net assets) is self-evident. However, establishing the direct relationship between reported loan impairments and market value per share is less straightforward owing to differences in the amount and timing of reported impairments compared with independent investor estimates of impairments. In part, these differences arise because the reporting date may only occur several weeks or months after there is readily observable evidence of deterioration in asset quality and a drop in asset values due to a challenging economic environment. For example, a deteriorating economic environment[18] will result in investors writing down the market value of banks prior to company reporting dates. In a similar vein, even with an alignment in the timing of write-downs, investors' independent estimates of impairments could be higher or lower than the bank's reported measurement of impairments depending on the valuation assumptions they make with respect to the loan book portfolio.[19] In other words, there can be differences in (1) the timing and/or (2) the magnitude of investors' independent estimates relative to reported impairments.

That being said, reported impairments should have either confirmatory value or incremental information content regarding the management's view of the magnitude of write-down of the loan book. In any case, even when making independent impairments estimates, investors use past reported impairments as an input for their valuation of banks.[20] For example, they can model the relationship between historical GDP growth levels and the reported loan impairments, charge-offs, allowance for loan losses, or nonperforming loans and thereafter forecast impairments on the basis of projected GDP growth levels. Consequently, despite the time lag, investors' independent estimates of impairments are ultimately informed by reported impairments. Therefore, we expected a relationship between reported impairments, investors' independent estimates of impairments, stock price, and P/B as shown in **Figure 1.3**. We further discuss and illustrate the relationship between reported impairments and P/B in Section 5.1.

[18]Declining gross domestic product (GDP), rising unemployment, decreasing house prices, and other company-specific developments that affect the riskiness and return potential of different asset classes that occur during the year.
[19]The European Central Bank (2010) noted that investors' independent estimates of impairments can be determined using various approaches and inputs. For example, they can be based on (1) modeling the correlation between historical reported impairments and the economic growth rate and thereafter projecting future impairments on the basis of expected economic growth, (2) scenario analysis to project future losses of portfolios, and (3) analyzing vintage-based delinquencies and migration matrices (e.g., rollover rate between delinquency buckets).
[20]We assessed a number of sell-side research reports and identified the analytical approaches used by sell-side analysts when they project impairments forecasts.

Figure 1.3. Expected Relationship (Negative Association) between Loan Impairments and P/B



1.1.2. Contribution of Study

Following is an outline of the contribution of this study.

1.1.2.1. Inform the Accounting Standard Setting Bodies

There is a compelling case for increased consideration by standard setters of findings derived from value relevance studies because they focus on the usefulness of information from the perspective of equity investors—a critical subset of users of financial reports.[21] Our study contributes evidence regarding the extent to which loan impairments could be affecting bank valuation. Providing such evidence helps meet the demands of various financial reporting stakeholders for standard setters to develop accounting standards with sufficient consideration of empirical and other useful forms of evidence (e.g., stakeholder surveys and various types of analytical studies regarding the usefulness of financial reporting information).

1.1.2.2. Build on Analyst-Oriented and Regulatory-Policy-Based Studies

There are a number of practitioner-based studies that our study builds on, including regulatory-policy-based studies, such as a Bank for International Settlements paper that reviewed the drivers of bank stock returns and analyzed trends of market-to-book ratios of banks.[22] Similarly, recent BOE Financial Stability Reports[23] attempted to explain the low P/Bs of banks during the financial crisis. A recent J.P. Morgan sell-side research report examined financial instrument

[21]Barth, Beaver, and Landsman (2001).
[22]Yang and Tsatsaronis (2010).
[23]Bank of England (2012a, 2012b).

accounting by European banks.[24] R.G. Associates' *Analyst's Accounting Observer* analyzed fair value reporting by US banks during the 2010 and 2011 reporting cycles.[25] These analyst-oriented studies provide evidence on the impact of adjusting all financial instruments to a fair value equivalent and offer insight on the likely misstatement of book values on bank balance sheets.

1.1.2.3. Build on Insights from Academic Studies

A number of academic studies have considered the relationship between financial reporting information and the recent financial crisis. In broad terms, many of these studies examine the pros and cons of fair value information, including whether fair value contributed to the procyclicality of banks.[26] There are also studies that pre-date the financial crisis that showed the patterns of loan impairments during crisis and boom periods.[27] However, there is a general paucity of empirical evidence on the overall effect of financial reporting attributes on P/B. There are a few exceptions, including an NYU Stern School of Business paper that showed that ROE significantly explains observed P/Bs of US commercial banks.[28] More pointedly, Pae, Thornton, and Welker (2005) provided evidence of the effect of accounting information on P/B and contended that low-P/B firms are likely to be distressed and to have economic characteristics different from those of high-P/B firms. They presented evidence showing that low-P/B firms are more likely to have conservative earnings than high-P/B firms. However, they did not directly test the effect of loan impairments on P/B. In addition, there is limited research focusing on the effect of timeliness of loan impairments on stock price and valuation metrics, such as P/B, during the recent financial crisis. As such, there is a gap in existing literature that lends itself to the analysis undertaken in our study.

[24]J.P. Morgan Cazenove (2012).
[25]R.G. Associates (2012) showed that adjustments to fair value measurement on balance sheet of all financial instruments should increase P/B and found that 11 of 16 banks whose P/B was less than 1 had a P/B greater than 1 after a full fair value adjustment.
[26]Barth and Landsman (2010) provided a synthesis of the considerable body of academic evidence assessing the value relevance and economic consequences of various aspects of financial reporting information before and during the economic crisis.
[27]See, for example, Liu and Ryan (2006).
[28]Damodaran (2009) analyzed a sample of US commercial banks and found a strong correlation between P/B and ROE (i.e., in excess of 0.7).

1.2. Key Findings: Loan Impairments, Profitability, Risk, and P/B

We tested the relationship between P/B and reported loan impairments, profitability, and risk, and in this section, we discuss our key findings.

1.2.1. Loan Impairments and P/B

We tested the relationship between P/B and two impairments measures: the periodic impairments charge reflected in the income statement and the allowance for loan losses.[29] We conducted various tests, including the following: analysis of loan impairments measures across differing P/B samples (low-P/B versus high-P/B groups), multiple-period trend analysis, correlation analysis, and regression analysis. The findings with respect to these loan impairments measures follow.

1.2.1.1. Reported Loan Impairments vs. P/B (Negative Association)

All the tests in Section 3.2 show a negative association between reported loan impairments and P/B.[30] In other words, P/B declines correspond with loan impairments increases. The multiperiod trend analysis shows that, on average, P/B decreased whereas the impairments measures increased over the analysis period (2003–2013).

In addition, splitting the annual bank observations by median (top versus bottom 50% of P/Bs) and assessing the impairments measures of these two groups provide the following results:

- *For annual bank observations below the median P/B (low P/B), Impairments charge/Net interest income = 34.1% and Allowance for loan losses/Gross loans = 2.7%.*
- *For annual bank observations above the median P/B (high P/B), Impairments charge/Net interest income = 16.3% and Allowance for loan losses/Gross loans = 1.7%.*

These results show that banks with relatively high impairments measures also have relatively low P/Bs.

[29]Loan loss allowance is a reserve created to provide for losses that a bank expects to take as a result of uncollectable or troubled loans.

[30]A negative association between variables means that a similar variation in the variables occurs at the same time but in opposite directions. Increases (decreases) of one factor (e.g., P/B) occur at the same time as decreases (increases) of the other factor (e.g., loan impairments).

We also analyzed the year-to-year change in the impairments measures across two samples distinguished by whether year-to-year P/B increased (increasing P/B) or decreased (decreasing P/B). The average year-to-year change in impairments measures was as follows:

- *For annual bank observations with decreasing P/B, the average year-to-year increase in Impairments charge/Net interest income = 7.4% and the average year-to-year increase in Allowance for loan losses/Gross loans = 0.2%.*
- *For annual bank observations with increasing P/B, the average year-to-year decrease in Impairments charge/Net interest income = –6% and the year-to-year decrease in Allowance for loan losses/Gross loans = –0.07%.*

These results illustrate that changes in P/B and loan impairments measures likely occur at the same time but in opposite directions, which is another indicator of a negative association. In addition, the correlation analysis and regression tests reported in Section 4 show that both impairments charge and allowance for loan losses have a negative association with P/B over the analysis period. These findings of a negative association indicate that reported impairments have an effect on P/B.

1.2.1.2. Several Indicators Showing Changes in Allowance for Loan Losses Lagged Changes in P/B

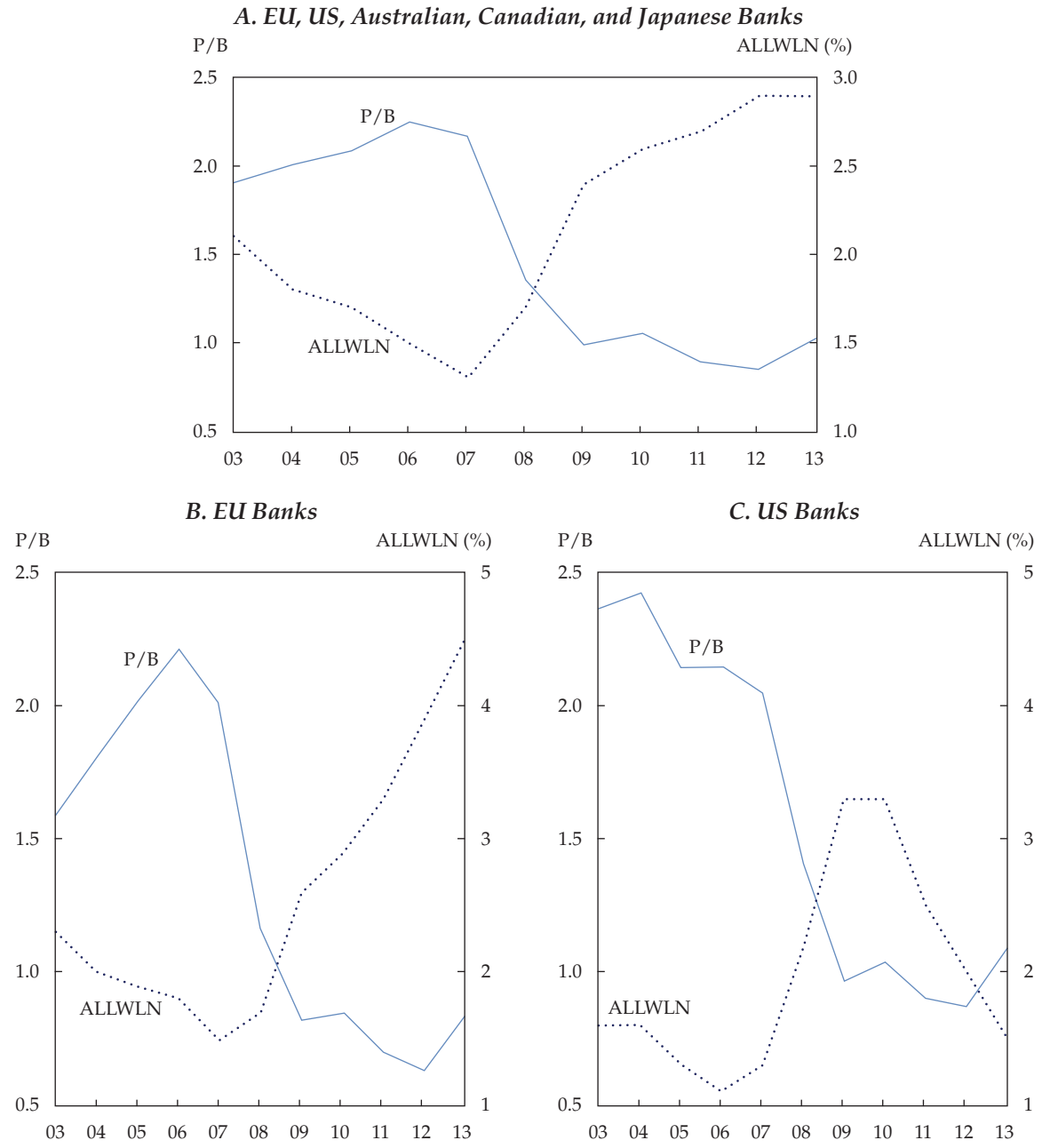
Multi-Period Trend Analysis: EU Banks' Allowance for Loan Losses Lag P/Bs

Our analysis of multi-period trends in Section 3.2.1 shows a negative association between P/B and allowance for loan losses. In other words, increases in allowance for loan losses are associated with decreases in P/B over the entire analysis period (2003–2013). However, the chart analysis of multi-period trends shows that the negative association between reported impairments and the market value of banks is weaker after 2008. The multi-period analysis shows that, on average, P/B declined sharply in 2008–2009 and remained low, albeit with phases of slight recovery in 2010. In tandem, increases in the allowance for loan losses and nonperforming loans occurred in 2008, with a sharp rise occurring in 2009. For EU banks, the allowance for loan losses and nonperforming loans continued to trend upward after 2009 (see **Figure 1.4**). This continued rise in nonperforming loans for EU banks has also been highlighted by two recent publications.[31]

Effectively, the *trend analysis of P/B versus allowance for loan losses over the financial crisis periods shows that the balance-sheet representation of loan impairments conveys the economic reality on a relatively staggered basis compared with the P/B adjustment.*

[31]PricewaterhouseCoopers (2013) showed a continued rise in nonperforming loans across 22 EU countries, from €514 billion in 2008 to €1,187 billion in 2012. Six key countries—Germany, the United Kingdom, Spain, Ireland, Italy, and France—had a rise from €404 billion in 2008 to €895 billion in 2012. The trend of rising nonperforming loans since 2008 is consistent with the data trends of the sample banks reviewed in this study. The European Central Bank (2013) also highlighted the upward-trending nonperforming loans.

Figure 1.4. P/B vs. Allowance for Loan Losses/Gross Loans (ALLWLN)



Correlation and Regression Analysis: Evidence of Lagging Relationship

As reported in Section 4.1, we found that *both allowance for loan losses and nonperforming loans have a stronger correlation with the previous-period (time t – 1) P/B than with the current-period (time t) P/B.*[32] This finding signals that the changes in the balance-sheet representation of loan impairments during a particular year have a higher correlation with P/B changes from the previous

[32]Allowance for loan losses had a statistically significant correlation of –0.39 with previous-period P/B and –0.29 with current-period P/B.

period than with those from the current period. This finding effectively shows that the balance-sheet representation of loan losses lagged the market value write-down due to these losses.

The regression models in Section 4.2 show an overall negative association between reported impairments measures and P/B. The models also show that since the beginning of the crisis (i.e., 2008), there has been a less discernible negative association between allowance for loan losses and P/B. Because the regression models test the extent to which there is a contemporaneous relationship between reported impairments measures and P/B,[33] the less discernible relationship indicates that either or both of the following conditions exist:

- Differences in timing (changes in allowance for loan losses lag changes in P/B): Reported impairments lag the market value write-downs, which leads to a weakened contemporaneous relationship.
- Differences in amounts (magnitude of reported impairments versus market value write-downs): During a particular reporting period, the investor write-down of market value affects the change in P/B to a greater degree than the reported loan impairments do. In Section 5.1.3, we further illustrate the interrelationship of reported loan impairments, investor estimates of impairments, and changes in P/B. We show that when market value of write-downs exceed reported impairments, P/B declines because the market value of write-downs is the dominating effect on the changes in P/B.

Taken together, our findings indicate that reported impairments have an effect on P/B (negative association). The results also point to the likelihood that during the financial crisis, there were delayed reported loan impairments relative to investors' adjustments of market value due to impairments. When impairments occur "too little, too late," they contribute to the overstatement of bank net worth. These findings justify the efforts being made by the IASB and FASB to ensure a more complete and timely recognition of financial asset impairments. They also highlight the importance of the asset quality review efforts by the ECB and various national regulators.

1.2.1.3. Loan Impairments' Significant Effect on ROE and Going-Concern Value

Comparing the pre-provision income and net income for the sample banks shows that *loan impairments significantly contributed to reduced overall net income at different junctures during the financial crisis—2008, 2009, 2010 (Section 3.3.1)*. The pre-provision income had a sharp drop in 2008 but improved significantly in 2009 and 2010. However, ROE dropped sharply in 2008 and remained low thereafter. The contrast in pre-provision income and ROE trends in 2009 and 2010 reveals that impairments had a particularly significant effect on net income during the height of the financial crisis. A further illustration of the significant effect of loan impairments on ROE during the financial crisis can be seen after decomposing ROE into Net interest income/Equity and Impairment charge/Equity for the periods just before the crisis (2006, 2007) and during the height of the crisis (2008–2011). The ROE decomposition for the sample banks shows that the net interest income effect on ROE was about the same before and during the crisis (the decomposition of ROE relates to 45 of the sample banks where there is paired data in the years analyzed for the following fields: ROE, Net interest income/Equity and

[33] "Contemporaneous" means that there is covariation between the reported impairments and P/B from the same reporting period.

Impairment charge/Equity). However, the impairment charge was significant and of a greater magnitude than net income during the financial crisis.

- *Average ROE: Before crisis (15.0%), during crisis (2.4%)*
- *Average Net interest income/Equity: Before crisis (26.1%), during crisis (26.7%)*
- *Average Impairment charge/Equity: Before crisis (3.2%), during crisis (10.1%)*

The significant loan-impairments-related deduction on pre-provision income means that for 2008, 2009, and 2010, loan impairments significantly and adversely affected expected future earnings and overall stock prices—especially because reported net income is a key input in forecasting future earnings and estimating the going-concern portion of a bank's market value.[34]

1.2.2. Profitability and P/B

The decomposition of market value of a firm (see Section 5.2) shows that, all things being equal, a higher ROE should result in increased market value. Correspondingly, a higher ROE should result in a higher P/B. In other words, ROE and other measures of profitability should have a positive association with stock price and P/B. Thus, we tested the relationship between profitability and P/B. Profitability is measured by the ROE, pre-provision income, and return on assets (ROA) of analyzed banks.

1.2.2.1. Profitability and P/B (Positive Association)

In Sections 3.3 and 4, various tests—comparison of profitability measures across differing P/B samples (e.g., low-P/B versus high-P/B groups), time-trend analysis, correlation analysis, and regression analysis—*show a positive association between reported profitability and P/B*.[35] In other words, the P/B declines occurred in periods when profitability decreased. A strong positive association between P/B and profitability was also demonstrated in an NYU Stern School of Business paper on the valuation of financial services firms.[36]

1.2.2.2. Profitability and P/B (Positive Association Weakened during the Financial Crisis)

The regression tests show that *the positive association weakened during the financial crisis, meaning that ROE became less predictive of stock price during this period*. Historical ROE is not always a good predictor of future profitability in the banking sector, especially when significant structural adjustments have occurred. Effectively, there are phases during different economic cycles when historical ROE can become less value relevant. The reduced relevance of historical profitability as a bank valuation input is demonstrated by our regression test findings as well as by a recent

[34]As discussed earlier, the market value and stock price of a bank can be broken down into two components: (1) market valuation of net assets and (2) market valuation of future investments (going-concern value).
[35]A positive association between variables means that a similar variation in the variables occurs at the same time and in the same direction. Increases (decreases) of one factor (e.g., P/B) occur at the same time as increases (decreases) of the other factor (e.g., ROE).
[36]As noted previously, Damodaran (2009) found a strong correlation between P/B and ROE (i.e., in excess of 0.7) in a sample of US commercial banks.

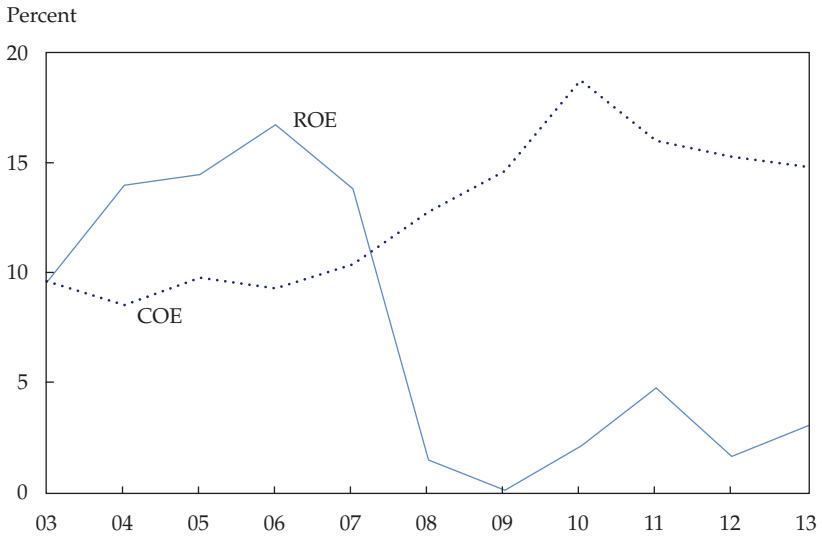
Barclays sell-side research paper.[37] The paper showed that for the year 2013, there was a weak correlation between historical profitability (i.e., as measured by ROE) and price-to-tangible-book valuation ratios (P/TB).

The decoupling of recent performance as measured by ROE and prospective profitability can be understood in light of the ongoing changes to the regulatory landscape. These regulatory changes have affected the prospective profitability of the banking sector. Regulatory requirements (e.g., the Basel, Liikanen, Vickers, and Volcker reforms) related to capital, liquidity, and business models will influence the return potential of previously highly profitable business segments (e.g., certain investment banking services, proprietary trading).[38] Several large, complex financial institutions (LCFIs) have also curtailed previously high-fee-earnings activities, such as the originate-to-distribute business model of securitizing loans via structured vehicles and other special-purpose entities. Hence, historical ROE could have limited predictive value for the future ROE of many of these LCFIs.

1.2.2.3. ROE Less than Cost of Equity since Beginning of Financial Crisis

The multi-period trend analysis shows that the *average ROE was greater than the average cost of equity (COE) in the pre-crisis period (2003–2007) but less than the average COE from 2008 onward*. The fact that ROE is less than COE helps explain the low P/Bs since the beginning of the financial crisis (see **Figure 1.5**).

Figure 1.5. ROE vs. COE for the Sample of 51 Banks



[37]Barclays Equity Research (2013).

[38]US regulators are considering capital adequacy rules that require the US subsidiaries of foreign banks (e.g., Deutsche Bank) to be ring-fenced and have sufficient capital from a US capital requirement standpoint. In other words, consolidated entity capital adequacy would not suffice for the US-based operations of foreign banks, and this change would likely lead to a higher aggregate funding cost for foreign banks with US operations.

1.2.3. Risk and P/B

The decomposition of market value of a firm in Section 5.2 shows that the discount rate, which reflects the time value of money and risk premium assigned to future cash flows, is another determinant of firm value. We expected the market pricing of risk to be inversely related to stock price and P/B.

1.2.3.1. P/B and Risk (Negative Association)

As shown in Sections 3.4 and 4, the battery of tests (e.g., multi-period trend analysis and correlation analysis) related to market pricing of risk factors (stock price beta, COE, and CDS) versus P/B provides *some evidence of a negative association between risk and P/B*.

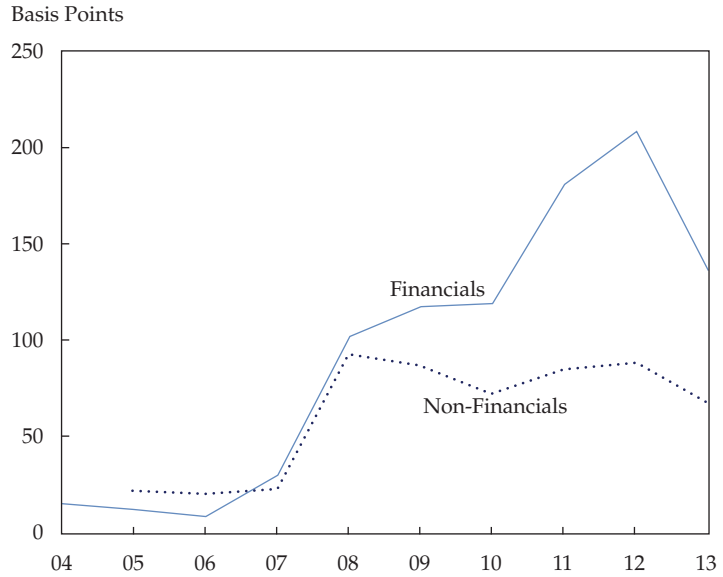
1.2.3.2. Cross-Sector CDS Spreads Show General Investor Risk Aversion toward Banks

In addition to the tests conducted in Section 3.4.1, we assessed the CDS spreads of similarly rated (investment-grade) financial and non-financial companies. This test helped illustrate investors' risk aversion toward the financial sector and helped explain the relationship between risk and P/B. Investors' risk aversion toward banks tends to be reflected in a high risk premium, as shown in the following analysis from an article by PIMCO's global head of credit research (Stracke 2012):

> *The persistently high borrowing costs and low equity prices of global banks is one of this year's great financial puzzles. Why, in an era when central banks are doing nearly everything they can to ensure liquidity in funding markets, do banks still have to pay so much more than industrial companies to borrow in the bond markets? Why, when banks have done so much to improve their balance sheets, dramatically increase capital ratios and tighten lending standards do many banks still pay anywhere from 50% to 100% more in credit spreads relative to similarly rated industrials? Granted, real credit risks remain in banks, especially related to lingering concerns about the European sovereign crisis and the economic outlooks in the U.S. and China, but those macro drivers should raise similarly grave credit risks for industrial companies with the same credit ratings. . . .*
>
> *While there are likely a number of reasons behind the disparity in credit spreads at banks versus similarly rated industrials, we believe that one key driver is simply that investors have a very difficult time understanding the risks they take in lending to a bank. Many banks have gone to considerable lengths in recent years to disclose more information about their risks, but the fact remains that investors tend to see banks as opaque black boxes where risks are still poorly disclosed or—worse—actively obscured by management. Industrial companies may be complicated, but their risks in general can be readily understood. In the case of a bank, however, both bond and equity investors often have great difficulty knowing precisely what they are investing in.* (p. 1)

As expressed in this excerpt, there was an incremental spread for and risk aversion toward the financial sector. Thus, we sought to assess the extent to which this incremental spread was in place for European banks by analyzing the 2004–2013 CDS spreads of a portfolio of European investment-grade financial (27) and non-financial (33) companies. The results are shown in **Figure 1.6**.

Figure 1.6. CDS Spreads of European Investment-Grade Financial (27) and Non-Financial (33) Companies



Source: Bloomberg.

The figure *shows an incremental credit spread for banks and risk aversion toward financial companies during the financial crisis and especially from 2010 to 2012*. The incremental average spread of the sample investment-grade banks relative to their non-financial counterparts is as follows: 2005 (–9 bps), 2006 (–11 bps), 2007 (6 bps), 2008 (10 bps), 2009 (30 bps), 2010 (47 bps), 2011 (96 bps), 2012 (120 bps), and 2013 (69 bps).

In the 2005–08 period, CDS spreads for financial and non-financial companies were roughly similar. Since 2009, however, the spreads for financial companies have been significantly wider than those for non-financial companies. The incremental spread has been particularly pronounced since 2009, when the European sovereign debt crisis began. We assume that incremental risk aversion toward financial companies exists because similarly rated companies should have approximately the same price of credit risk and CDS spreads.

We can infer that, all things being equal, investors' incremental risk aversion toward financial companies must have been reflected in an incremental cost of capital and contributed to the relatively low P/Bs of banks since the beginning of the financial crisis.

1.2.3.3. P/B and Capital Adequacy/Leverage (No Discernible Association)

It is commonly recognized that excess leverage contributes to bank risk.[39] Therefore, we analyzed the multi-period trends of P/B versus capital adequacy, or leverage, measures—Tier 1 capital and tangible equity levels (see Section 3.4.1).[40] However, we found that there is no

[39]Admati and Hellwig (2013).

[40]The capital adequacy measures are Tier 1 capital (Capital/Risk-weighted assets) and tangible equity (Book value of tangible equity/Tangible assets).

discernible association between leverage and P/B across multiple reporting periods. P/Bs of most of the sample banks have remained relatively depressed since the beginning of the crisis. In contrast,

- *Tier 1 capital for the sample banks improved, from an average of 8.7% in 2007 to more than 13% in 2012–2013, and*
- *tangible equity marginally improved, from 3.5% in 2007 to 4.7% in 2012.*

The counteracting effects of poor asset quality and bleak investor outlooks for the future profitability of banks may outweigh the benefits of reduced risk associated with increased equity levels. Or this finding may simply reflect that investors did not adequately penalize banks for the high leverage levels that prevailed before the crisis and that P/Bs for banks should have been lower than they were before the crisis to reflect the excess leverage of banks.

The finding of *no discernible association between leverage and P/B also shows that reported leverage is not signaling differing risk profiles of banks across different countries as would be expected.* This finding highlights the need for banks to report comparable baseline information (e.g., total assets) used as an input in the determination of leverage. It is difficult to determine comparable levels of total assets and leverage on the basis of reported balance sheets owing to differing requirements for offsetting derivatives assets and liabilities under US GAAP and International Financial Reporting Standards (IFRS). The lack of comparability lessens the information content of reported leverage across banks because differing leverage (Assets/Equity) could simply be a reflection of different ways of calculating total assets. Thus, there is a need to converge the reporting of total assets across leading economies, and the failure to converge financial instrument offsetting requirements was a missed opportunity.

2. Policy Recommendations

Our key findings in Section 1.2 confirmed that the delayed recognition of loan impairments in the run-up to and during the financial crisis contributed to the observed low P/Bs of many banks since the crisis began. The tendency of banks to delay the recognition of impairments due to existing accounting requirements justifies the efforts made by both the IASB and the FASB to ensure a more complete and timely recognition of financial asset impairments. In making policy recommendations, we considered the key findings of our study and also considered the findings from a CFA Institute impairments survey[41] and the related views expressed in a CFA Institute comment letter to the IASB and FASB.[42] In this section, we discuss three key policy recommendations:

- Fair value recognition of loans on the face of financial statements is necessary.
- Enhanced bank risk disclosures are needed.
- Improved reporting of accounting leverage is necessary.

2.1. Fair Value Recognition of Loans on the Face of Financial Statements

In addition to the amortized cost recognition, measurement, and presentation, we recommend the recognition and presentation of the fair value of loans on the face of financial statements. We recognize the ongoing efforts being made by the IASB and FASB and the anticipated improvements from the proposed shift from the prevailing incurred-loss model (ILM) to the expected-loss model (ELM). This shift could be considered a step in the right direction and an improvement over the current practice. That said, several concerns regarding the ELM approach remain, including the following:

- The underlying complexity of the ELM will likely result in varied interpretation and subjective application of impairments requirements.
- The ELM is still likely to allow a high degree of preparer discretion in determining the amount and timing of recognized impairments. For example, reporting entities will be required to make judgments regarding significant credit deterioration and what they consider to be the foreseeable future. The subjective nature of these judgments could result in inconsistency and incomparability of the reported impairments amounts. We recognize that critics of fair value also point to the subjectivity of fair value amounts derived from internal models, but our counterargument is that such information is more decision useful to investors.
- The ELM requires the periodic adjustment of expected cash flows, taking into account credit deterioration. However, it does not determine value on the basis of an updated discount rate, which creates a disconnect between the expected-loss-based impairments and what would be fair-value-based impairments. Fair-value-based impairments better represent the economic reality of the decline in asset values.

[41]CFA Institute (2013c).
[42]CFA Institute (2013a).

In other words, the ELM is less decision useful than fair value measurement and is not exempt from the criticisms of complexity and potential subjectivity made toward fair value measurement.

Therefore, we recommend that standard setters require the recognition of both the amortized cost and the fair value of financial assets on the face of financial statements (e.g., parenthetical presentation of loan fair value amounts). We make this recommendation notwithstanding the seeming consensus by the IASB and FASB on the necessity of a mixed measurement attribute framework for financial instruments. Fair value measurement provides the most up-to-date value of financial assets and thus provides decision-useful information. In fact, we argue that requiring the presentation of both fair value and amortized cost amounts would better meet the IASB's and FASB's objectives of mixed measurement attributes than would a choice of one measurement over the other.

Our arguments for fair value measurement for loans are supported by the following:

- investor support for fair value information from CFA Institute surveys,
- abundant empirical evidence of decision usefulness of fair value measurement for financial instruments,
- evidence that concerns about pro-cyclicality of fair value are overstated, and
- the fact that current loan fair value disclosures are not an adequate substitute for recognition.

2.1.1. Investor Support for Fair Value Information from 2013 Impairments Survey and Other Surveys

The 2013 impairments survey results showed the following:[43]

- 46% of respondents considered fair value to be the most decision-useful measure for reflecting the expected credit losses of financial instruments,
- 41% considered the ELM the most appropriate measure, and
- only 5% considered the ILM the best measure.

The results showing that investors prefer fair value measurement over the ELM are consistent with previous related survey results. A 2010 CFA Institute survey on financial instruments showed that 71% of respondents supported fair value measurement of loans.[44] Similarly, a 2009 CFA Institute survey on IFRS 9, *Financial Instruments: Classification and Measurement* found that 52% of respondents supported fair value measurement for loans.[45]

[43]CFA Institute (2013c).
[44]CFA Institute (2010).
[45]CFA Institute (2009).

2.1.2. Abundant Empirical Evidence of Decision Usefulness of Fair Value

There is a substantial body of empirical evidence pointing to the value relevance of fair value information for all financial instruments.[46] One such study—Blankespoor, Linsmeier, Petroni, and Shakespeare (2012)—showed that, on the basis of data from before and during the crisis, fair value information for financial instruments would have enhanced the prediction of credit risk and the anticipation of bank failures. Furthermore, Hodder, Hopkins, and Wahlen (2006) showed the risk relevance of fair value information. They showed that simulated full fair value financial statements result in incremental volatility of income and that the incremental volatility reflects elements of risk not captured under the current reporting regime (with separate net income and comprehensive income and mixed measurement attribute reporting).

2.1.3. Concerns about Pro-Cyclicality of Fair Value Are Overstated

An often-cited justification for limiting the requirement for all financial instruments to be measured at fair value is the concern regarding pro-cyclicality.[47] However, emerging evidence shows that concerns regarding the pro-cyclicality of fair value measurements were likely overstated. For example, a recent paper highlighted the fact that three key German financial institutions—Deutsche Industriebank AG (IKB), Landesbank Sachsen Girozentrale (Sachsen LB), and Hypo Real Estate Holding AG (HRE)—that failed or were rescued during the crisis did not apply fair value accounting to financial instruments prior to the financial crisis.[48] These banks were regulated on the basis of historical cost accounting under German local GAAP (HGB). Yet, they took on very high leverage either on balance sheet (HRE) or off balance sheet (IKB and Sachsen LB), which ultimately led to their demise.

The following additional arguments against the pro-cyclical effects of fair value have been made:

- *Write-downs during the financial crisis were mostly attributable to assets measured at amortized cost.* An analysis of German, French, Spanish, and UK large and small banks showed that amortized cost assets range from 46% to 84% of total assets whereas fair value through profit and loss assets that necessitate net income write-downs ranges from only 2% to 38% of total assets.[49]

  Although the proportion of fair value assets is on average minimal across the universe of banks, large, complex banking groups have a greater proportion of trading assets and liabilities that are measured at fair value. Thus, as part of our overall study of bank performance

[46]Blankespoor, Linsmeier, Petroni, and Shakespeare (2012); Beaver and Venkatachalam (2003); Barth, Beaver, and Landsman (1996). Value relevance empirical studies ascertain whether there is an association between the information contained in annual reports and stock prices. They are often used as a means of inferring the usefulness of financial reporting information.

[47]There is natural pro-cyclicality inherent in the banking business model. During economic downturns and phases of credit contraction, banks typically shrink their balance sheets to safeguard their solvency and capital adequacy. Unnatural pro-cyclical effects would only arise if forced asset sales to meet regulatory capital requirements were triggered by excessive fair value asset write-downs (i.e., if assets were believed to have been reported below their fundamental economic value). Forced asset sales would trigger a downward-spiraling effect on asset prices and bank asset values (i.e., forced asset sales would reduce the value of bank balance sheets, which would then force further asset sales). For this reason, several commentators have assumed that if fair value write-downs by banks occurred during the crisis, then such write-downs had to be pro-cyclical in nature.

[48]Georgescu and Laux (2013).

[49]Georgescu and Laux (2013).

during the financial crisis, we also analyzed the composition of the comprehensive income statement for mostly large, complex banks to assess the extent to which fair value write-downs affected ROE. (The ongoing research aims to explain the information characteristics of components of the comprehensive income statement. The 50 banks are from the EU [35], the United States [10], Canada [4], and Australia [1]. The results will be reported in forthcoming publications.) We specifically reviewed the ROE, Impairment charge/Equity, Net interest income/Equity, Fee income/Equity, and Trading profit/Equity before (2006, 2007) and during the crisis (2008–2011). Although there were large trading losses in 2008, the results show that the magnitude of write-downs over multiple periods was more pronounced for loans that are measured at amortized cost. For the sample banks, we found the following results:

- *Average ROE: Before crisis (14.1%), during crisis (2.5%)*
- *Average Impairment charge/Equity: Before crisis (7.0%), during crisis (9.5%)*
- *Average Trading profit/Equity: Before crisis (8.7%), during crisis (1.7%). There was an average loss only in 2008 (–6.9%); all the other years (2006, 2007, 2009, 2010, and 2011) saw average trading gains.*

On average, ROE was influenced by hefty trading gains before the crisis, and there have been trading gains after 2009. The significant average trading losses in 2008 relate to trading assets and reflect the deterioration in economic value at the beginning of the crisis. Investors would be misled if these were not reported on the profit and loss statement.

- *Prudential regulators have flexibility to allow the application of prudential filters to determine regulatory capital.* The prudential filters can exclude accounting information (e.g., unrealized gains or losses on available-for-sale securities).

The evidence derived from European banks is consistent with evidence based on data from US banks, which shows that the write-downs that occurred and triggered regulatory capital replenishments (i.e., with pro-cyclical effects) were not primarily due to fair value measurement. Badertscher, Burks, and Easton (2012) provided empirical evidence that the proportion of "other than temporary impairments" (OTTI) was insignificant compared with the bad debt expense of loans, as were the comparative effects on capital erosion.[50] Similarly, Schaffer (2010) analyzed 14 large US banks and showed that the average reduction in capital due to impairments based on an incurred loss was 15.6%, compared with only 2.1% for fair-value-measured items.

Therefore, we recommend that standard setters not give undue weight to concerns about pro-cyclicality of fair value measurement because there is no compelling evidence for the assertions of unnatural and detrimental pro-cyclical effects.

[50]The evidence was derived from a sample of 150 US commercial banks and showed that for the period September 2007–December 2008, the proportion of OTTI, which reflects securities' fair value impairments, was insignificant compared with the bad debt expense of loans. There were OTTI losses of $19 billion, compared with $214 billion of bad debt expense over this period, which is based on amortized cost measurement. Correspondingly, the OTTI impact on capital ratio was insignificant relative to the impact of incremental bad debt expense on capital ratio. Stripping out OTTI write-downs, the median capital ratio would have been 10%, rather than 9.9%; without bad debt expense, the capital ratio would have been 10.7%. This shows that the capital erosion due to impairments was primarily attributable to the bad debt expense of loans where fair value accounting was not applied.

2.1.4. Current Loan Fair Value Disclosures Are Not an Adequate Substitute for Recognition

In the supplemental paper to this study, we discussed the challenges arising from the current requirements of only disclosures of loan fair value amounts and posited that preparers may fail to be rigorous in calculating these amounts because they are not required on the face of financial statements.[51] For this reason, we recommended enhancing loan fair value disclosures and requiring their presentation on the face of financial statements to make these amounts more prominent and to encourage greater scrutiny by auditors, regulators, and investors.

Academic evidence supports the notion that disclosure is not a substitute for recognition and measurement. Hirst, Hopkins, and Wahlen (2004) applied the behavioral experiment methodology in a study in which experienced bank analysts took part in an analytical exercise based on simulated full fair value financial statements. They found that experienced analysts incorporated fair value information when such information was recognized in financial statements (income statement and balance sheet) but not when it was only disclosed. Hirst et al. (2004) described the constraints that analysts face in applying fair value information that is not recognized on the face of the financial statements:

> *A growing body of evidence in the behavioral finance literature suggests that analysts face significant constraints on the time and effort they can devote to accounting-data acquisition and analysis. The typical equity analyst works in a cognitively demanding environment and must perform a variety of different tasks, including security analysis, portfolio management, marketing, and other tasks. In addition, buy-side analysts usually work for funds that own large numbers of companies, requiring analysts to follow many current and prospective investments. Thus, analysts receive a diffuse, steady flow of potentially relevant information about the economy, industries, and each company they follow.*
>
> *Although the current piecemeal-fair-value-income measurement regime provides all of the data that analysts need to compute full-fair-value income, banks report these data in different locations in the financial statements and footnotes, increasing the time and effort to acquire fair-value data. Analysts cannot rely on most commercial electronic databases to reduce the costs of gathering these data, because many databases do not include fair value-footnote data. Buy-side analysts also cannot rely on fair value analysis generated by either sell-side analysts or the financial press because most sell-side and press reports use financial data and ratios based on recognized (i.e., piecemeal fair-value) accounting numbers, such as book-to-market and price-to-earnings.*
>
> *Thus, although fair-value data are relevant elements of banks' publicly available financial information, time- and effort-constrained bank analysts must incur incremental costs to acquire and use these data. Under piecemeal-fair-value-income measurement, even specialist analysts may not acquire and use fair-value disclosures. Under full-fair-value income measurement, where banks measure income with all fair-value gains/losses and report it in a performance statement, analysts may be more likely to acquire and use risk-relevant and value-relevant fair-value information than under piecemeal-fair-value-income measurement.* (pp. 458–459)

[51] CFA Institute (Forthcoming 2014b).

This excerpt further highlights access constraints as one of the key impediments to buy-side investors' use of fair value information that is only disclosed and makes a good case for recognition of fair value on the face of financial statements.

2.2. Enhanced Bank Risk Disclosures

Notwithstanding the evidence we found of a negative association between risk (cost of equity) and P/B, it was hard to obtain any measure reported in the financial statements that fully captures the aggregate entity-specific risk. The difficulty in analyzing aggregate entity-specific risk is exacerbated by the limited availability of comparable time-series data related to the different categories of risk for banks. The absence of comparable, robust time-series data makes it difficult for investors to model and derive independent aggregate estimates of entity-specific risk from the fundamental reported data. Therefore, the risk disclosures of banks need to be improved so as to help investors better measure and monitor the aggregate risk of individual firms. Enhanced risk disclosures have been demanded and specified by numerous stakeholders, including the EDTF (the EDTF has specified the need for enhancement of disclosures in six key areas: capital adequacy, credit risk, liquidity and funding risk, market risk, risk governance and business model, and other risk areas). A recent KPMG report on UK bank performance articulated the importance of risk reporting for investors:

> *More than any other industry, the risk choices taken by a bank have an immediate impact on financial performance. They are essential context for an understanding of current earnings. We believe investors need help to connect this information with its implications for current and medium term business performance.*
>
> *A significant step would be to bring an earnings focus to the extensive balance sheet risk now being provided. Linking risk reporting with earnings performance could help investors compare underlying profitability across banks following different risk strategies.* (KPMG 2014, p. 25)

We echo the core message in this excerpt regarding the need for banks to provide adequate context to their reported risk information. It is important for banks to proactively communicate about the full spectrum of risks faced, including those related to emerging risk areas. The communication of risks through annual reports should be done in a manner that interlinks the reported financial statements (income statement and balance sheet), information within the notes to the financial statements, and any other risk disclosures (e.g., Basel Pillar 3 disclosure requirements). As recommended in a CFA Institute (2011) study of financial instrument risk disclosures, integration of information and adherence to communication principles (e.g., use of tables for quantitative information, cross-referencing, and effective signposting) will help investors better process risk information.

Enhanced risk disclosures can reduce the uncertainty risk premium that investors assign to bank financial statement information and that we believe contributes to general risk aversion by investors toward banks as they grapple with comprehending the typical complexity of the bank business model and underlying risk exposures. Overall, a significant improvement of risk disclosures can help restore investor trust and confidence in the banking sector.

2.3. Improved Reporting on Accounting Leverage

The additional risk that banks face because of excess leverage was reaffirmed during the financial crisis, as was the importance and need for investors to monitor both nominal leverage (e.g., tangible equity) and risk-weighted regulatory capital adequacy measures (e.g., Tier 1 capital levels). That said, while conducting our study, we found it hard to meaningfully compare the nominal leverage of banks across jurisdictions (e.g., the EU versus the United States) owing to incomparability of total assets of banks across these two regions.[52] Because of this incomparability, reported accounting leverage also has limits on the extent to which it can represent the relative riskiness of banks across different jurisdictions. Thus, *enhanced financial reporting (financial instrument offsetting and balance-sheet presentation requirements) that yields comparable total assets is needed to allow investors to compare nominal accounting leverage of banks*, and the failure to converge US GAAP and IFRS offsetting requirements was a missed opportunity to critically improve the comparability of financial statements.

[52]This incomparability is due to differing derivatives offsetting requirements in different jurisdictions (the United States versus the EU).

3. Analysis: Impact of Loan Impairments, Profitability, and Risk on P/B

This section outlines the bank data profile and P/B trends (Section 3.1). In this section, we also evaluate the following relationships:

- loan impairments and P/B (Section 3.2),
- profitability and P/B (Section 3.3), and
- risk and P/B (Section 3.4).

3.1. Bank Data Profile and P/B Trends

3.1.1. Data Profile

3.1.1.1. Sample Breakdown

As shown in **Exhibit 3.1**, the sample of 51 banks is drawn from 16 countries with financial statements based on differing accounting standards (IFRS and Australian, Canadian, Japanese, and US GAAP). The sample includes many SIFIs and mid-size banks. The sample includes 72.5% (29 of 40) of the banks identified as large, complex banking groups by the 2013 European Financial Stability report.[53]

US GAAP and IFRS have differing requirements for derivatives offsetting, resulting in differential impacts on reported total assets and incomparability of ROA and leverage (Assets/Equity) for EU and US banks.

Exhibit 3.1. Sample Bank Profile

Europe (IFRS)	United States (US GAAP)	Other
United Kingdom	JPMorgan Chase	*Australia (IFRS)*
HSBC	Citigroup	ANZ Banking Group
Barclays	Bank of America	Commonwealth Bank
The Royal Bank of Scotland	Bank of New York Mellon	
Lloyds Banking Group	Northern Trust	*Canada (Canadian GAAP)*
Standard Chartered	Zions Bancorporation	Toronto-Dominion Bank
	Wells Fargo & Company	Scotiabank
France	Capital One Financial Corporation	Royal Bank of Canada
BNP Paribas	State Street Corporation	Canadian Imperial Bank of Commerce
Crédit Agricole	Sun Trust Bank	

(continued)

[53]European Central Bank (2013).

Exhibit 3.1. Sample Bank Profile (continued)

Europe (IFRS)	United States (US GAAP)	Other
France (continued)		*Japan (Japanese GAAP)*
Société Générale		Mizuho Financial Group
Natixis		Sumitomo Mitsui Financial Group
		Mitsubishi UFJ Financial Group
Spain		Nomura Holdings
Banco Santander		
BBVA		
Banco Sabadell		
Bankinter		
Italy		
Intesa Sanpaolo		
Banca Popolare di Milano		
UniCredit		
Germany		
Deutsche Bank		
Commerzbank		
Switzerland		
UBS		
Credit Suisse		
Belgium		
Dexia		
KBC Bank		
Ireland		
Bank of Ireland		
Allied Irish Banks		
Sweden		
Nordea Bank		
Svenska Handelsbanken		
Netherlands		
ING		
SNS REAAL		
Austria		
Erste Bank		
Raiffeisen		
Portugal		
Millennium BCP		

Note: US GAAP and IFRS have differing requirements for derivatives offsetting, resulting in differential impacts on reported total assets and incomparability of ROA and leverage (Assets/Equity) for EU and US banks.

EU banks dominate the sample because they have been subject to both the subprime lending and the sovereign debt crises and they allow a longer time span for analyzing relationships during the financial crisis. Another reason for including mostly EU banks is that they have relatively homogeneous reporting requirements because they mostly report under IFRS.

Even though the banks are from only 16 countries, many of them have significant cross-border and global operations in Asia, Africa, and South America, and in that respect, there is a degree of global coverage in analyzing these banks.

3.1.1.2. Diverse Data Sources

The fundamental financial reporting information and P/B data for the banks are from the Bankscope, Capital IQ, and Bloomberg databases. The cost of equity and stock price beta data are from Bloomberg, and the CDS spreads are from Markit and Bloomberg.

3.1.1.3. Analytical Horizon

The analysis of the 51 banks is based on data from 2003 to 2013 so as to distinguish the information content of financial reporting information over the pre-crisis, crisis, and post-crisis periods.

3.1.2. P/B Trends over Time

Table 3.1 shows the descriptive statistics of P/B for the full sample of banks.[54] The arithmetic mean dropped sharply in 2008 and 2009, and a slight recovery occurred in 2010. A declining pattern returned in 2011 and 2012, and another slight recovery occurred in 2013. The P/B median dropped from 2007 to 2012, with a slight recovery in 2013.

Table 3.1. Key Statistics of P/B by Year for Full Sample

	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
Mean	1.03	0.85	0.90	1.06	0.99	1.36	2.17	2.25	2.09	2.01	1.91
Median	0.84	0.66	0.73	0.88	0.95	1.35	2.01	2.09	2.07	2.02	1.84
Maximum	3.10	2.49	2.80	3.22	2.29	3.15	4.81	5.88	3.77	3.84	4.93
Minimum	0.03	0.05	0.07	0.09	0.14	0.21	0.81	0.93	1.16	0.81	0.65
Number	51	51	51	51	51	51	51	51	50	49	48

Notes: The data represent the statistical attributes of sample banks within countries. The number of banks reflects those with available data in the databases used for this study.

Table 3.2 shows an analysis of P/B by country for the 2003–13 reporting periods.

Table 3.2. P/B of Sample Banks for Each Country by Year

Country	*N*	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
Australia	2	2.33	2.05	1.79	1.97	1.91	1.94	2.78	2.63	2.54	2.03	2.04
Canada	4	1.98	2.07	2.29	2.44	1.77	2.34	3.35	3.01	2.76	2.39	2.35
Japan	4	0.82	0.67	0.65	0.91	1.14	1.51	2.14	1.94	1.62	2.01	2.83
US	10	1.09	0.87	0.90	1.04	0.97	1.41	2.05	2.15	2.15	2.43	2.37

(continued)

[54] Year-end P/B = $\left(\frac{\text{Year-end stock price}}{\text{Book value of equity per share}}\right)$.

Table 3.2. P/B of Sample Banks for Each Country by Year (continued)

Country	*N*	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
EU												
Austria	2	0.59	0.55	0.63	0.92	0.94	0.90	2.85	4.07	3.28	2.65	1.60
Belgium	2	0.44	0.20	0.24	0.59	0.63	1.40	1.66	1.70	1.60	1.53	1.39
France	4	0.62	0.37	0.51	0.66	0.63	0.82	1.44	1.73	1.49	1.43	1.26
Germany	2	0.45	0.41	0.44	0.52	0.49	0.82	1.42	1.44	1.19	1.07	0.86
Ireland	2	1.85	1.36	0.99	0.18	0.28	1.30	2.33	2.46	2.40	2.26	2.46
Italy	3	0.41	0.28	0.30	0.53	0.62	0.78	1.44	1.59	1.53	1.27	1.08
Netherlands	2	0.84	0.84	0.95	1.09	0.78	0.92	2.06	1.80	1.81	1.77	1.57
Portugal	1	0.72	0.20	0.57	0.67	0.76	1.60	2.91	2.53	2.17	2.16	1.82
Spain	4	0.78	0.64	0.78	1.05	1.27	1.62	2.49	2.59	2.38	2.07	1.66
Sweden	2	1.56	1.11	1.10	1.11	0.86	0.81	1.69	2.02	1.87	1.67	1.45
Switzerland	2	1.16	0.82	1.12	1.45	1.52	1.64	2.34	2.54	2.24	2.08	1.81
UK	5	0.92	0.75	0.85	1.11	0.82	1.31	2.15	2.34	2.26	2.17	2.05
EU	31	0.84	0.63	0.70	0.85	0.82	1.16	2.01	2.21	2.02	1.81	1.59

Note: *N* represents the number of sample banks with observations per country.

3.1.2.1. Significant Declines in P/B across Countries during the Crisis

In 2008, significant declines in P/B occurred for most of the countries. These declines were followed by a slight recovery in 2010, though in most cases the P/Bs were still depressed (less than 1). Another notable declining trend began in 2011, and this decline was particularly pronounced for European banks.

3.1.2.2. Varied Multi-Period P/B Patterns across Countries

The P/B declines occurred more rapidly in some EU countries than in others. The UK, German, French, and Italian banks had sharp drops after 2007, whereas Spanish banks had a more gradual decline over time. Although the P/Bs of Spanish banks fell at the onset of the crisis in 2007 and 2008, they were not as low as those of some other key European countries, such as the United Kingdom, France, and Germany. Spanish banks' P/Bs dropped below 1 in 2010 as Spain's housing bubble kicked in. Australian and Canadian banks are notable exceptions to the trend of significant declines and sustained low P/Bs. For these banks, P/Bs have been greater than 1 through the analysis period.

3.2. Loan Impairments and P/B

As discussed earlier and in Section 5.1, the respective impact of loan impairments on the numerator and denominator of P/B influences the change in P/B. To establish the relationship between loan impairments and P/B, we conducted the following tests: multi-period trend analysis (Section 3.2.1) and analysis of the difference in loan impairments measures among samples with differing P/B characteristics (Section 3.2.2). In general, these tests provided robust evidence of all four impairments measures being negatively associated with P/B.

3.2.1. Multi-Period Trend Analysis: P/B vs. Loan Impairments Measures

The loan impairments measures we assessed are

- Impairments charge/Net interest income (IMPCHG),
- Charge-off/Net interest income (CHGOFF),
- Allowance for loan losses/Gross loans (ALLWLN), and
- Nonperforming loans/Gross loans (NPL).

Table 3.3, **Table 3.4**, and **Table 3.5** provide a breakdown of P/B versus the four loan impairments measures for the samples of global, EU, and US banks, respectively.

Figure 3.1, **Figure 3.2**, **Figure 3.3**, and **Figure 3.4** visually illustrate the multi-period trends of P/B versus loan impairments measures.

Table 3.3. P/B vs. Impairments Measures: EU, US, Canadian, Japanese, and Australian Banks

Year	P/B	*N*	IMPCHG	*N*	CHGOFF	*N*	ALLWLN	*N*	NPL	*N*
2003	1.91	48	16.4%	43	22.9%	44	2.1%	42	2.3%	35
2004	2.01	49	9.5	49	20.0	41	1.8	49	1.8	42
2005	2.09	50	8.4	49	16.7	47	1.7	51	1.6	45
2006	2.25	51	9.1	49	12.7	45	1.5	51	1.5	48
2007	2.17	51	12.4	49	12.8	48	1.3	51	1.6	49
2008	1.36	51	32.7	49	17.2	46	1.7	51	2.1	48
2009	0.99	51	51.0	50	26.6	46	2.4	51	3.9	49
2010	1.06	51	36.6	50	27.4	47	2.6	51	4.3	49
2011	0.90	51	37.7	49	23.1	45	2.7	51	4.5	49
2012	0.85	51	31.8	50	22.2	46	2.9	51	5.1	50
2013	1.03	51	28.7	42	19.9	32	2.9	38	4.7	42

Table 3.4. P/B vs. Impairments Measures: EU Banks

Year	P/B	*N*	IMPCHG	*N*	CHGOFF	*N*	ALLWLN	*N*	NPL	*N*
2003	1.59	29	18.5%	30	16.1%	26	2.3%	28	2.3%	22
2004	1.81	29	10.9	31	14.8	23	2.0	29	2.1	25
2005	2.02	30	8.0	31	9.3	29	1.9	31	2.1	27
2006	2.21	31	9.9	31	10.2	27	1.8	31	2.0	30
2007	2.01	31	13.3	31	11.4	30	1.5	31	2.1	31
2008	1.16	31	33.0	31	13.5	28	1.7	31	2.6	30
2009	0.82	31	55.9	31	20.2	27	2.6	31	5.0	30
2010	0.85	31	44.2	31	23.4	28	2.9	31	5.6	30
2011	0.70	31	52.0	31	23.0	27	3.3	31	6.1	30
2012	0.63	31	45.0	31	25.5	28	3.9	31	7.3	31
2013	0.84	31	42.2	26	28.3	16	4.5	20	7.4	24

Table 3.5. P/B vs. Impairments Measures: US Banks

Year	P/B	*N*	IMPCHG	*N*	CHGOFF	*N*	ALLWLN	*N*	NPL	*N*
2003	2.37	10	10.5%	9	17.3%	9	1.6%	9	0.9%	8
2004	2.43	10	6.3	10	13.0	9	1.6	10	0.6	8
2005	2.15	10	9.3	9	13.9	9	1.3	10	0.3	9

(continued)

Table 3.5. P/B vs. Impairments Measures: US Banks (continued)

Year	P/B	*N*	IMPCHG	*N*	CHGOFF	*N*	ALLWLN	*N*	NPL	*N*
2006	2.15	10	6.3	9	10.3	9	1.1	10	0.4	9
2007	2.05	10	12.1	9	13.4	9	1.3	10	0.8	9
2008	1.41	10	44.9	9	26.1	9	2.2	10	1.7	9
2009	0.97	10	57.5	10	43.6	10	3.3	10	3.0	10
2010	1.04	10	32.8	10	39.6	10	3.3	10	2.9	10
2011	0.90	10	16.3	9	25.0	10	2.5	10	2.2	10
2012	0.87	10	11.2	10	17.5	10	2.0	10	1.8	10
2013	1.09	10	4.3	10	12.0	9	1.5	9	1.2	9

Figure 3.1. P/B vs. Impairments Charge/Net Interest Income (IMPCHG)

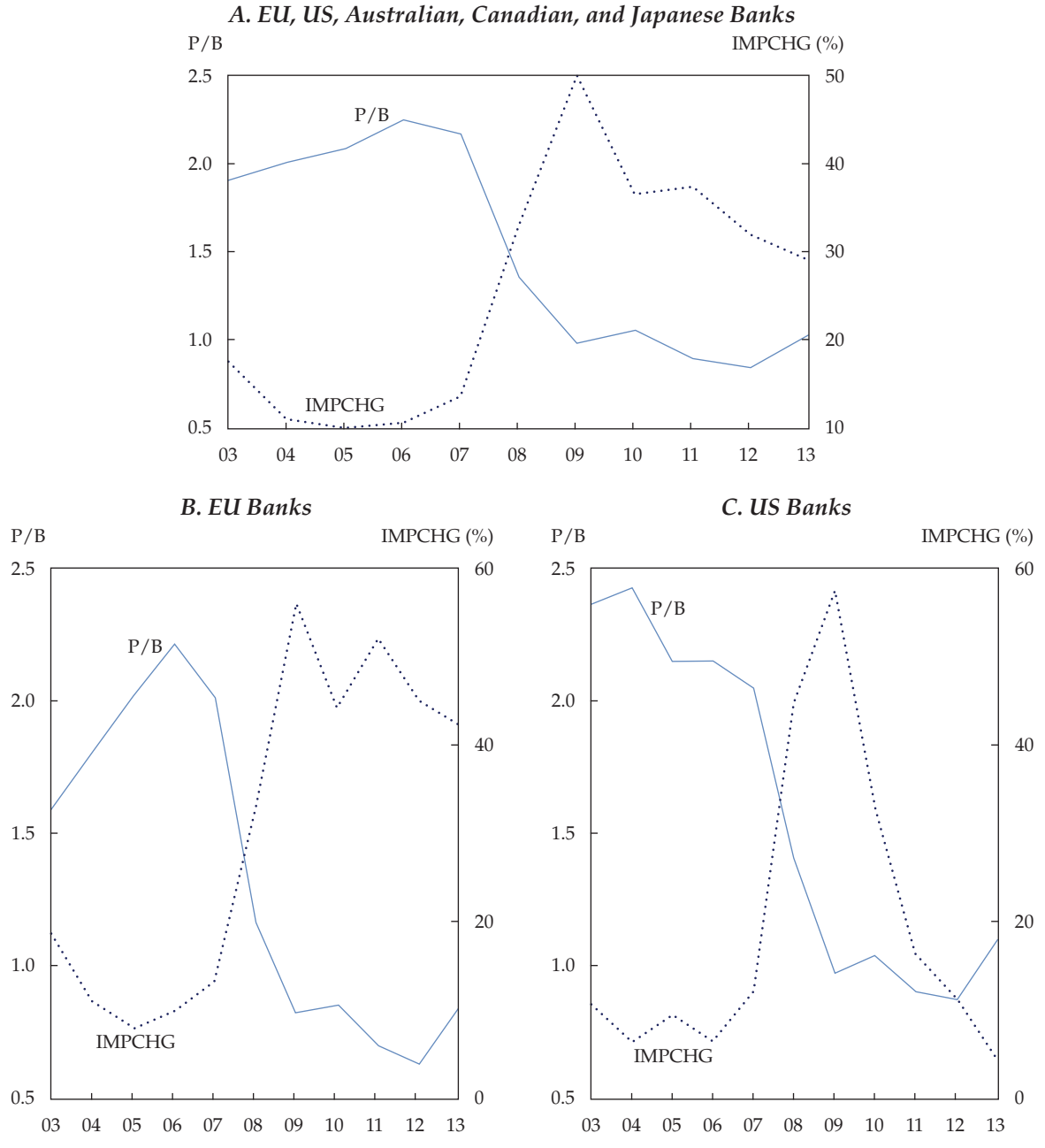


Figure 3.2. P/B vs. Loan Charge-Offs/Net Interest Income (CHGOFF)

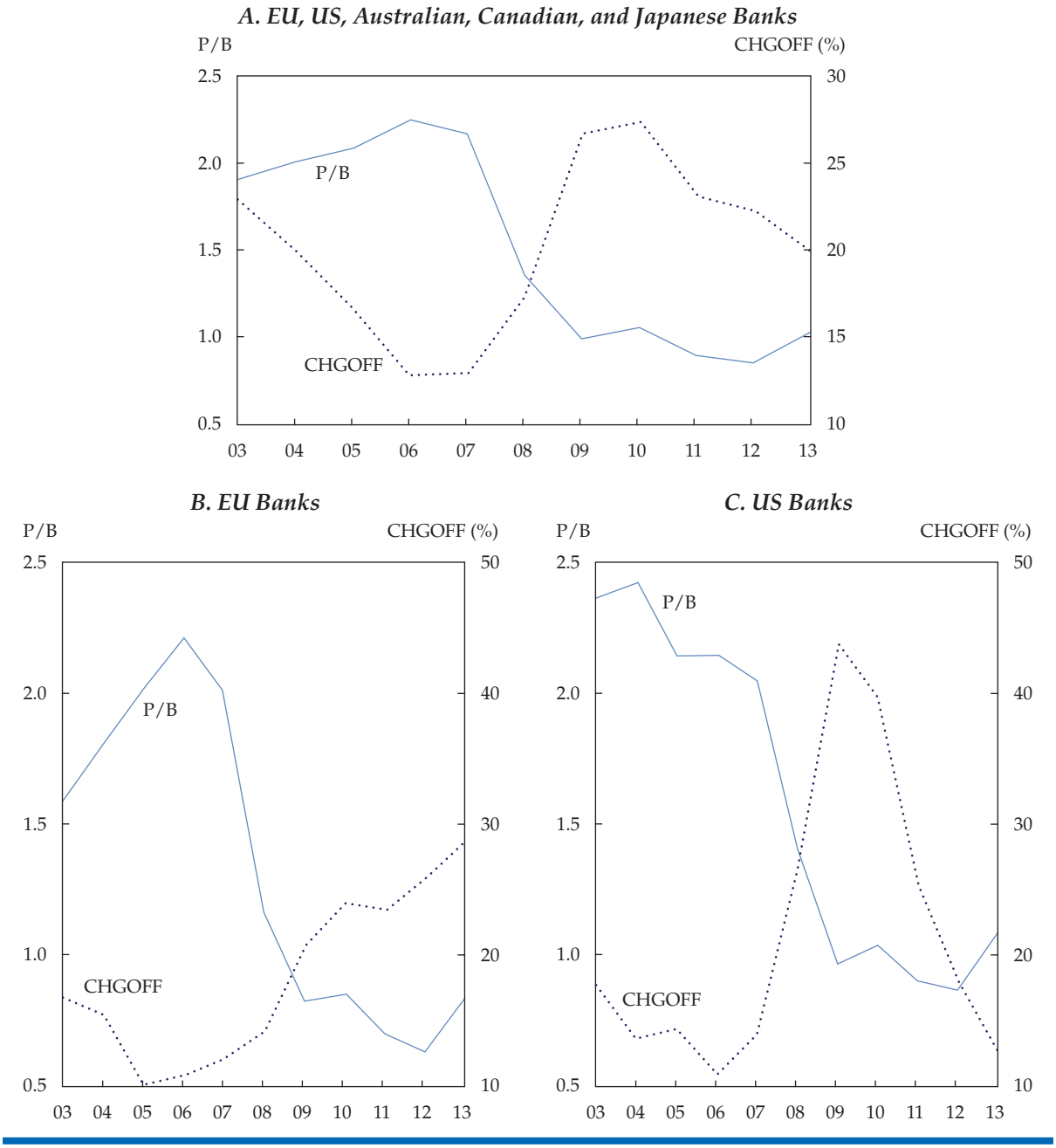


Figure 3.3. P/B vs. Allowance for Loan Losses/Gross Loans (ALLWLN)

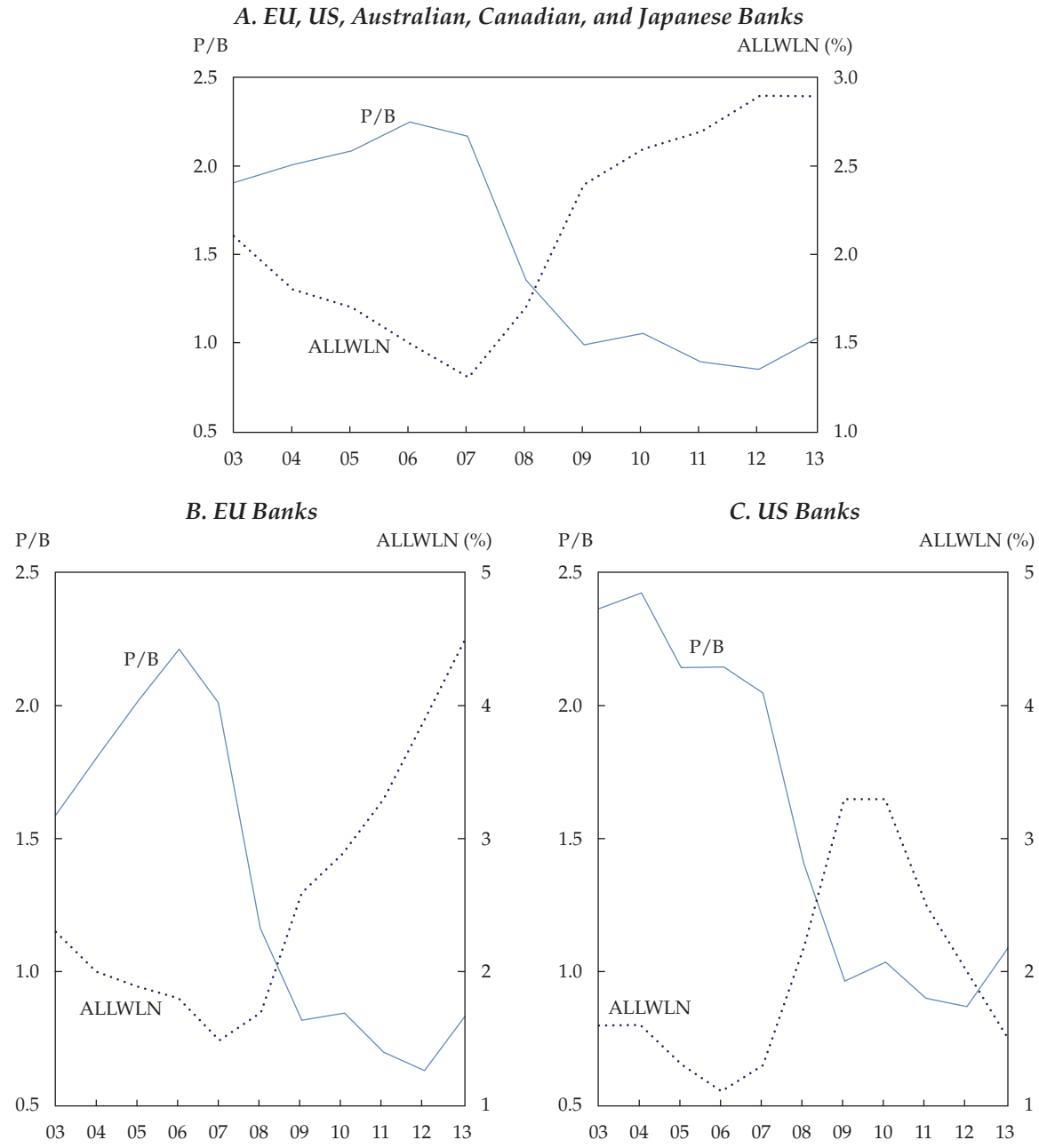
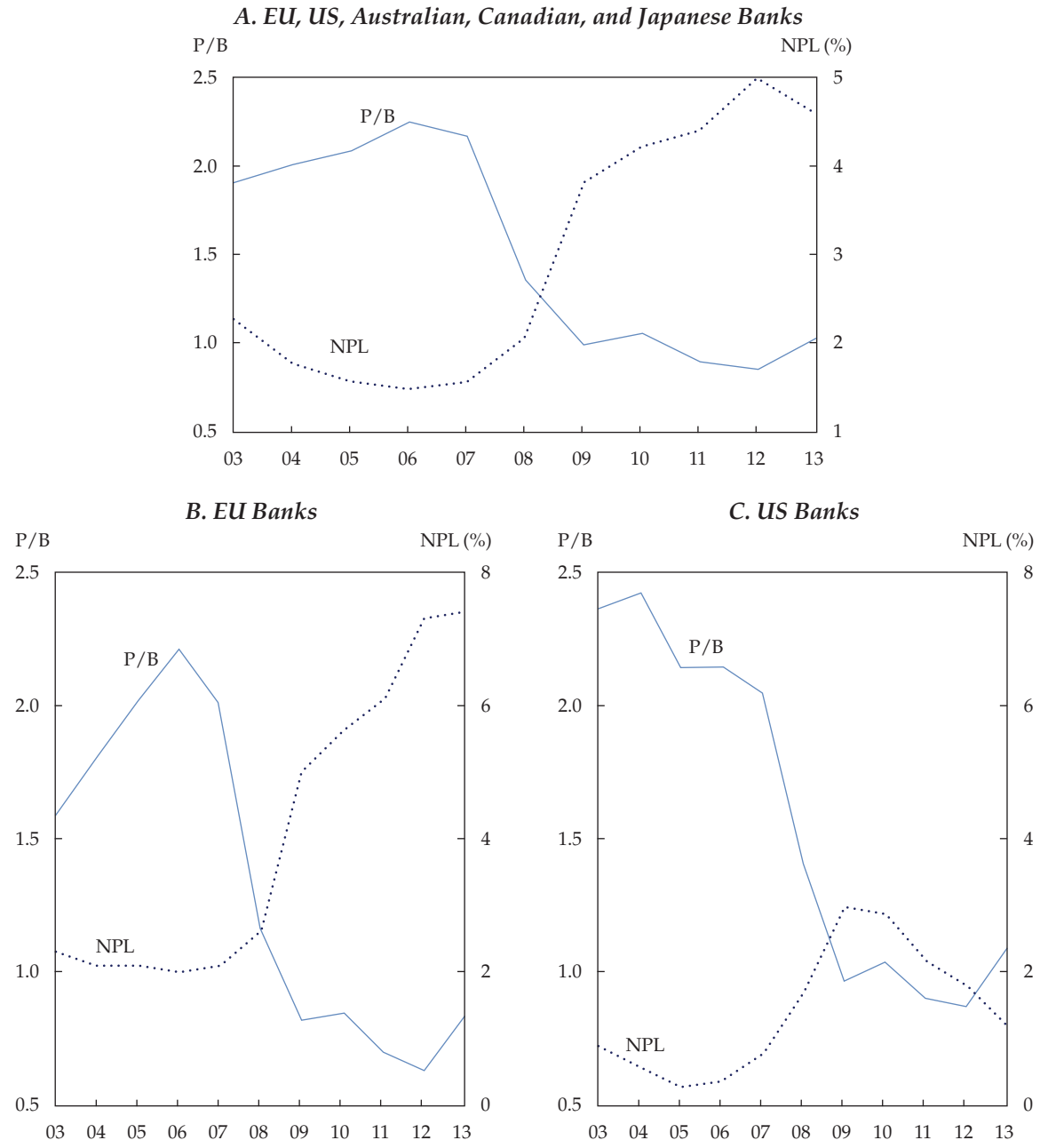


Figure 3.4. P/B vs. Nonperforming Loans/Gross Loans (NPL)



3.2.1.1. P/B vs. Loan Impairments Measures (Negative Association)

The figures show that across the full analytical horizon (2003–2013), loan impairments increases have occurred whenever P/B declined, which shows that impairments measures have a negative association with P/B.

3.2.1.2. P/B vs. Loan Loss Allowance (Evidence of Lagging Relationship)

The figures convey that the sample banks' P/Bs began to decline in 2007, followed by sharp declines in 2008 and 2009. In contrast, the allowance for loan losses and nonperforming loan measures had sharp increases in 2009 and 2010.

The figures show that the most precipitous year-to-year drop in P/B across all sample banks occurred from 2008 to 2009, and there was a sustained low P/B thereafter, albeit with a slight recovery in 2010. The sharp drop in 2008 and subsequently depressed P/B imply that equity investors had most likely factored the subprime-associated write-offs into stock prices at the onset of the financial crisis. In contrast, even though the increasing trend had begun in preceding years, the sharp rise in impaired loans and loan loss allowances mainly occurred in 2009 and thereafter continued to trend upward, hinting at a more gradual adjustment of accounting book values in reported bank balance sheets relative to the market value adjustment.

The trendline shows that the lagging recognition of allowances for loan losses and nonperforming loans versus the P/B adjustment was more pronounced for EU banks than it was for US banks. In fact, allowances for loan losses and nonperforming loans of EU banks continued to rise after 2009, which was also highlighted in recent PricewaterhouseCoopers, ECB, and International Monetary Fund (IMF) publications.[55] The 2013 ECB report noted that although, in aggregate, provisioning of EU banks is increasing, it has barely kept pace with the deterioration in asset quality.

The balance impairments measures for the US banks peaked in 2009 and declined thereafter (2010–2013). This finding hints at a slower pace of balance-sheet repair by EU banks relative to US banks.

3.2.1.3. Loan Impairments Measures (Differing Patterns for US Banks and EU Banks)

The impairments measures for EU and US banks were comparable before the financial crisis. US banks had higher impairments charges during the subprime crisis period (2008 and 2009). However, in the years thereafter (2010–2013), EU banks had higher impairments owing to the European sovereign debt crisis.

Although the allowances for loan losses of US banks were comparable to those of EU banks in the pre-crisis period and were lower after 2010, the allowance for loan losses per unit of nonperforming loan shows that US banks have relatively higher loan provisioning levels than EU banks. We reported on these trends in a supplemental paper.[56]

[55]PricewaterhouseCoopers (2013); European Central Bank (2013); International Monetary Fund (2013).
[56]CFA Institute (Forthcoming 2014b).

3.2.2. Loan Impairments Measures for Annual Bank Observations with Different P/B Characteristics

Another way of understanding the underlying relationship between loan impairments and P/B is to compare the loan impairments measures for samples of annual bank observations with different P/B characteristics (i.e., magnitude of P/B and direction of change in P/B). Thus, we determined the difference between the loan impairments measures for sample groups that were differentiated as follows:

- Low-P/B versus high-P/B samples: These were derived by splitting the full sample of annual bank observations into two subsamples comprising low-P/B banks (i.e., below the full sample median value of 1.44) and high-P/B banks (i.e., equal to or above the median).
- Increasing-P/B versus decreasing-P/B samples: We split the full sample of annual observations into two groups. The increasing-P/B (decreasing-P/B) group consists of the annual bank observations where P/B during a reporting period was higher (lower) than that of the previous period.

3.2.2.1. Low-P/B Banks Have Higher Loan Impairments Measures than High-P/B Banks

Table 3.6 highlights the difference between arithmetic means of impairments measures for the low- and high-P/B samples of annual bank observations. All four impairments-related measures show that low-P/B banks have higher impairments levels than high-P/B banks. For example, the impairments charge (IMPCHG) for low-P/B banks was 34.1%, whereas the mean for high-P/B banks was 16.3%. The differences between the means for all four measures are statistically significant. This finding indicates that impairments are negatively associated with P/B.

Table 3.6. **Difference between Means: Loan Impairments Measures for Low- and High-P/B Groups**

Loan Impairments Measures	Low-P/B Banks (< 1.44)	*N*	High-P/B Banks (≥ 1.44)	*N*	Statistically Significant Difference?
IMPCHG	34.1%	261	16.3%	254	Yes
CHGOFF	27.1	231	13.4	242	Yes
ALLWLN	2.7	261	1.7	260	Yes
NPL	4.3	252	1.9	244	Yes

Notes: The number of observations varies among the loan impairments metrics depending on whether banks had available data for the respective loan impairments metric within each sample. The data are for the 2003–13 period. *N* is the number of firm-year observations. "Statistically significant difference" indicates significance at $p = 0.01$.

3.2.2.2. Year-to-Year Changes: Decreasing-P/B (Increasing-P/B) Annual Bank Observations Have Increasing (Decreasing) Impairments Measures

Table 3.7 shows that the year-to-year decreasing-P/B annual bank observations had year-to-year increases in impairments measures. A decrease in IMPCHG, CHGOFF, and ALLWLN occurred for increasing-P/B banks. The yearly change in loan impairments measures—except

for CHGOFF—had statistically significant differences between the decreasing- and increasing-P/B samples. These findings further illustrate a negative association between impairments measures and P/Bs.

Table 3.7. Difference between Means: Yearly Changes in Impairments Measures for Increasing- vs. Decreasing-P/B Groups

Year-to-Year Change in Loan Impairments Measures	Decreasing P/B	*N*	Increasing P/B	*N*	Statistically Significant Difference?
IMPCHG	7.4%	265	–6.3%	186	Yes
CHGOFF	2.1	245	–1.2	165	No
ALLWLN	0.2	274	–0.07	187	Yes
NPL	0.5	260	0.1	171	Yes

Notes: The number of observations varies among the loan impairments metrics depending on whether banks had available data for the respective loan impairments metric within each sample. The data are for the 2003–13 period. There are fewer observations for year-to-year changes compared with low- versus high-P/B groups because we did not obtain data for the year before the first year of analysis (2003). *N* is the number of firm-year observations. "Statistically significant difference" indicates significance at $p = 0.01$.

3.3. Profitability and P/B

As we will discuss in Section 4.2, we expected measures of profitability to be positively associated with P/B. In other words, more profitable firms should have higher P/Bs. We conducted multi-period trend analysis (Section 3.3.1) and analyzed the difference in profitability measures for samples with different P/B characteristics (Section 3.3.2). In general, we found robust evidence of a positive association between profitability measures and P/B.

3.3.1. Multi-Period Trend Analysis: P/B vs. Profitability Measures

We assessed the multi-period trends of the following measures for profitability:

- Pre-provision income/Equity (PPIE),
- ROE,
- ROA, and
- net interest margin (NIM).

We also compared ROE with COE.

Table 3.8, **Table 3.9**, and **Table 3.10** provide a breakdown of P/B versus profitability measures across the samples of global, EU, and US banks.

Figure 3.5 and **Figure 3.6** illustrate the multi-period trends of P/B versus profitability measures.

Table 3.8. P/B vs. Profitability: EU, US, Japanese, Australian, and Canadian Banks

Year	P/B	*N*	PPIE (%)	*N*	ROE (%)	*N*	ROA (%)	*N*	NIM (%)	*N*	COE (%)	*N*
2003	1.91	48	27.0	49	9.7	45	0.64	45	2.5	37	9.7	42
2004	2.01	49	25.5	49	14.1	51	0.82	51	2.3	41	8.7	44
2005	2.09	50	26.9	49	14.5	51	0.81	51	2.0	48	9.9	45
2006	2.25	51	24.8	49	16.8	51	0.96	51	1.9	49	9.5	45
2007	2.17	51	21.8	49	13.9	51	0.78	51	1.8	50	10.5	51
2008	1.36	51	8.7	49	1.7	51	0.21	51	1.9	50	13.0	51
2009	0.99	51	19.9	48	0.3	51	0.06	51	1.9	50	14.7	51
2010	1.06	51	19.3	49	2.3	51	0.32	51	1.9	50	18.8	51
2011	0.90	51	11.1	49	4.9	50	0.25	51	1.9	51	16.1	51
2012	0.85	51	15.2	49	1.9	51	0.26	51	1.8	51	15.4	51
2013	1.03	51	16.6	43	3.3	46	0.34	43	1.7	45	14.9	51

Table 3.9. P/B vs. Profitability: EU Banks

Year	P/B	*N*	PPIE (%)	*N*	ROE (%)	*N*	ROA (%)	*N*	NIM (%)	*N*	COE (%)	*N*
2003	1.59	29	21.9	29	10.9	30	0.59	30	2.1	20	9.8	25
2004	1.81	29	22.9	29	14.1	31	0.69	31	2.0	22	8.9	24
2005	2.02	30	26.8	29	15.8	31	0.73	31	1.7	29	9.7	25
2006	2.21	31	24.9	29	17.4	31	0.84	31	1.5	30	9.8	25
2007	2.01	31	21.9	29	14.6	31	0.73	31	1.5	30	11.1	31
2008	1.16	31	6.2	29	0.1	31	0.18	31	1.6	30	13.1	31
2009	0.82	31	19.0	28	1.6	31	0.17	31	1.6	30	13.4	31
2010	0.85	31	18.5	29	(1.6)	31	0.14	31	1.6	30	19.5	31
2011	0.70	31	5.6	29	1.9	30	(0.03)	31	1.5	31	17.2	31
2012	0.63	31	12.6	29	(3.3)	31	(0.04)	31	1.5	31	16.8	31
2013	0.84	31	15.6	28	(1.7)	27	0.02	24	1.4	25	16.4	31

Table 3.10. P/B vs. Profitability: US Banks

Year	P/B	*N*	PPIE (%)	*N*	ROE (%)	*N*	ROA (%)	*N*	NIM (%)	*N*	COE (%)	*N*
2003	2.37	10	30.7	10	15.5	9	1.2	9	3.7	10	10.5	10
2004	2.43	10	25.8	10	13.9	10	1.3	10	3.4	10	9.5	10
2005	2.15	10	24.8	10	14.6	10	1.3	10	3.3	10	10.6	10
2006	2.15	10	24.3	10	15.5	10	1.4	10	3.4	9	9.9	10
2007	2.05	10	22.1	10	10.3	10	0.9	10	3.0	10	10.4	10
2008	1.41	10	18.3	10	2.0	10	0.2	10	3.1	10	14.1	10
2009	0.97	10	22.3	10	(0.8)	10	(0.2)	10	3.2	10	17.7	10
2010	1.04	10	20.2	10	5.8	10	0.6	10	3.3	10	17.4	10
2011	0.90	10	15.7	10	7.3	10	0.8	10	3.1	10	13.3	10
2012	0.87	10	15.3	10	7.8	10	0.8	10	2.8	10	13.5	10
2013	1.09	10	14.8	10	7.7	9	0.8	9	2.7	10	12.8	10

Notes: US ROA is not comparable to EU ROA owing to the netting of derivatives assets and liabilities in the determination of total assets under US GAAP. Hence, total assets of US banks are relatively understated compared with EU banks, which report under IFRS. That said, PPIE, ROE, and NIM also show that the US banks have been more profitable than the EU banks.

Figure 3.5. P/B vs. ROE and Pre-Provision Income/Equity

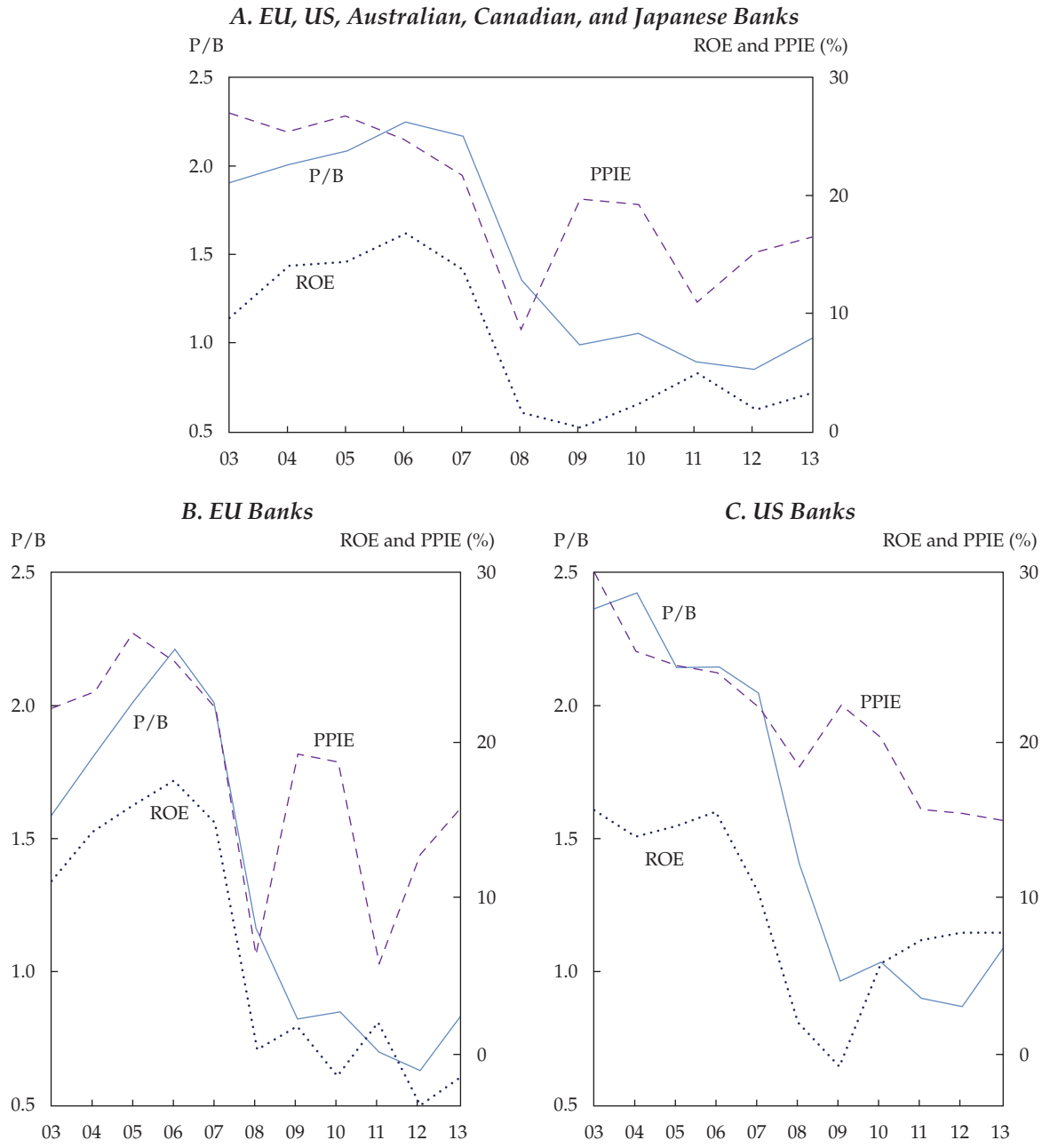
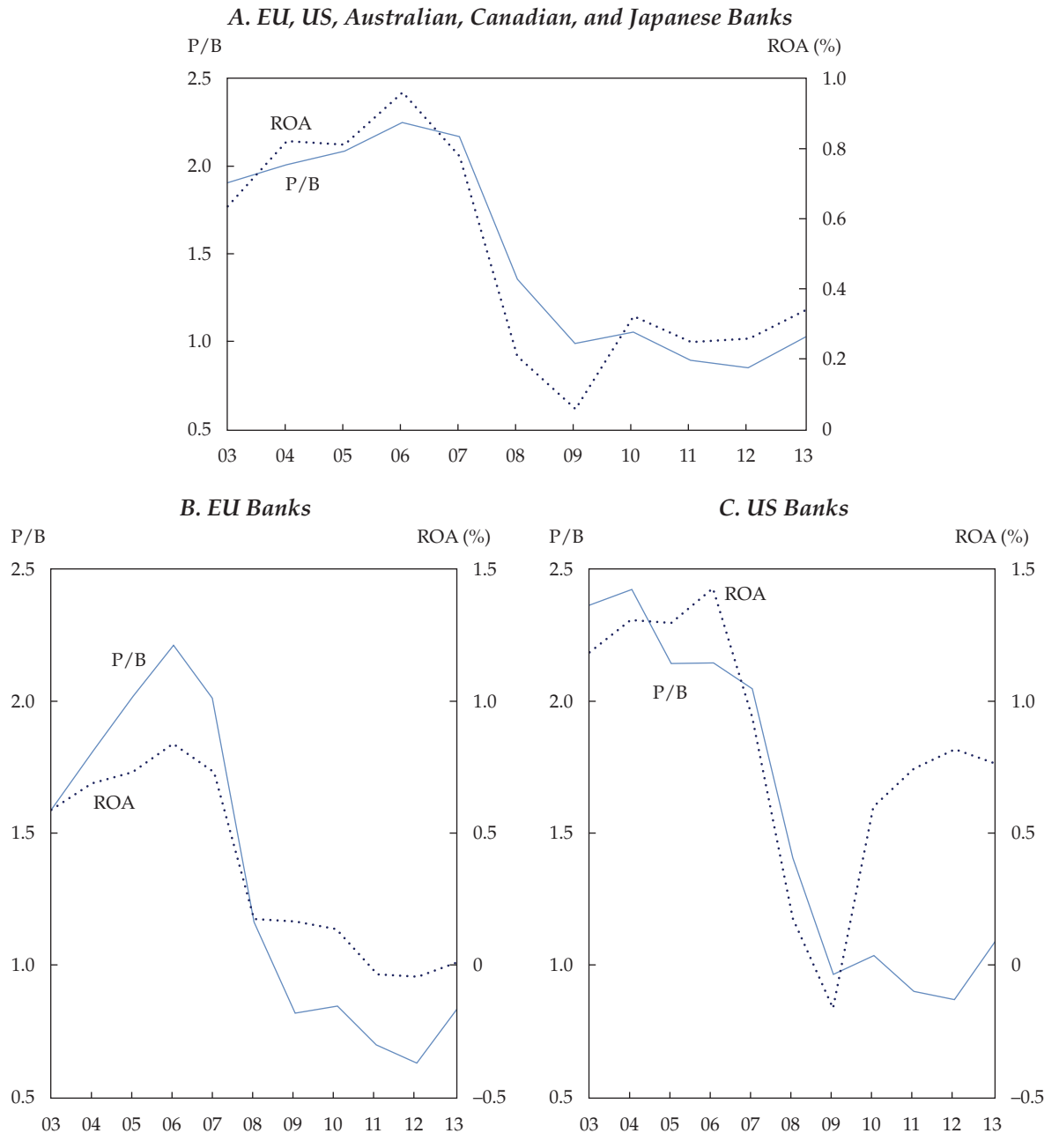


Figure 3.6. P/B vs. ROA



3.3.1.1. P/B vs. Profitability Measures (Positive Association)

The multi-period trend analysis shows alignment in the direction and timing of changes of P/B versus changes in ROE and ROA. In general, the trend analysis shows that profitability increases (decreases) tend to occur whenever P/B increases (decreases), signaling a positive association between profitability and P/B.

3.3.1.2. Financial Crisis Effects: Positive Association Is Less Discernible since the Crisis

The alignment between P/B and profitability trends was pronounced from 2003 to 2010 but weakened thereafter (2011–2013). As noted in Section 1.2.2, the myriad of regulatory and structural reforms that have occurred within the banking sector since the beginning of the financial crisis are likely to have reduced the predictive value of reported/historical profitability with respect to future profitability and stock price.

3.3.1.3. Financial Crisis Effects: Pre-Provision Income Significantly Offset by Impairments

The difference between pre-provision income and ROE levels conveys the impact of loan impairments on ROE. Figure 3.5 shows that for the full sample of banks, the most pronounced differences were in 2009 and 2010, signifying that the spike in loan impairments during those years was a key factor in the overall poor levels of profitability across the full sample of analyzed banks.

3.3.1.4. Financial Crisis Effects: ROE Less than COE during Crisis

Low P/Bs are a likely consequence of ROE being less than COE. Thus, we analyzed ROE versus COE trends (**Figure 3.7**). The data show that ROE was lower than COE during the financial crisis, which explains the low P/Bs of many of the sample banks during the financial crisis.[57]

3.3.1.5. Different Profitability Patterns for EU and US Banks

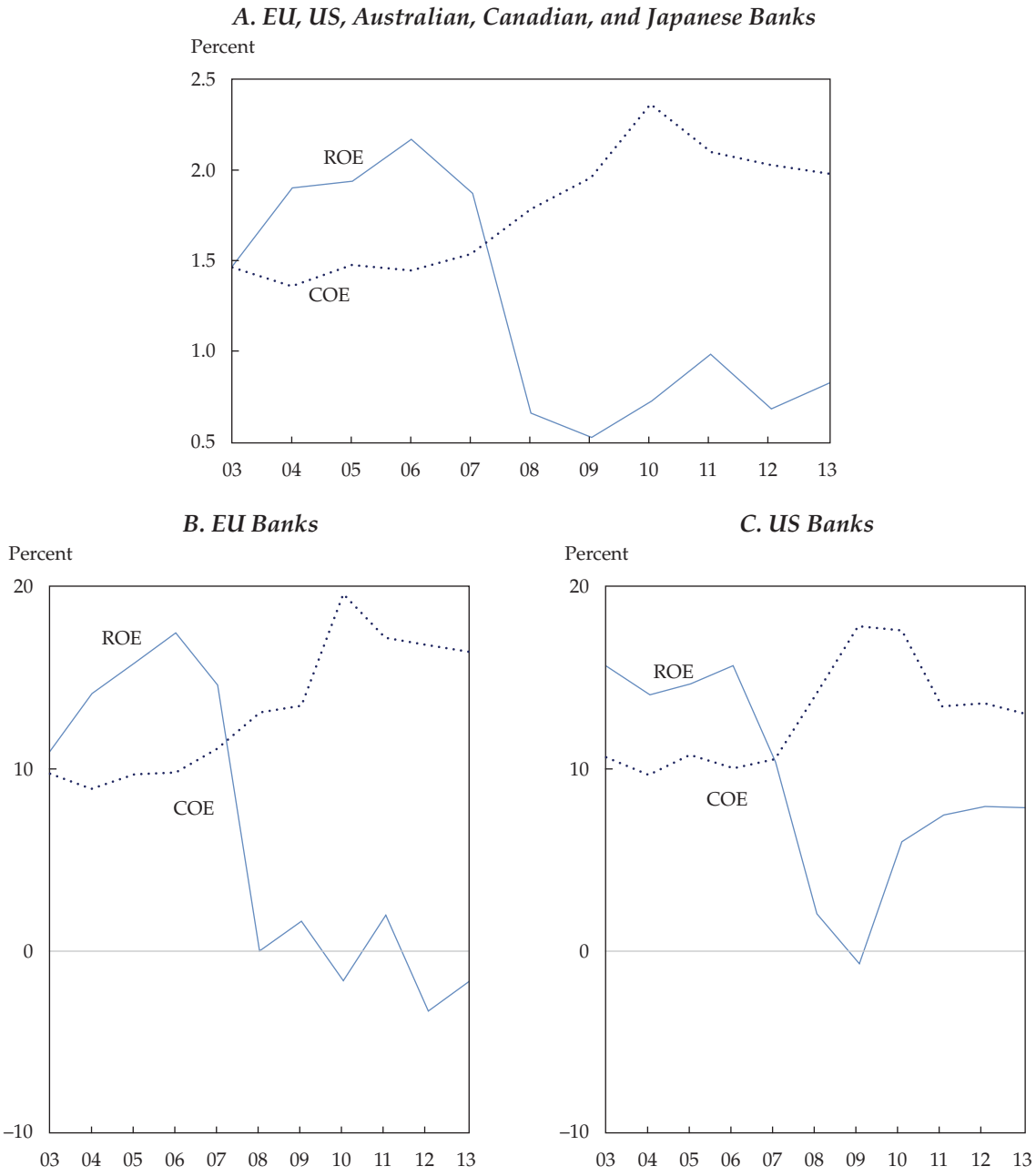
There are several differences between EU and US sample banks.

- Higher ROE of US banks since 2010: The data show that the ROE of EU and US sample banks was comparable prior to and during the early stages of the financial crisis (2008 and 2009). However, from 2010 onward, US banks generally had higher ROE levels than EU banks. The ECB and IMF have attributed the continued relatively weak profitability of EU banks to the increasing nonperforming loans in a number of EU countries—countries where stressed economic environments have contributed to rising nonperforming loan exposures for individuals, firms, and states.[58]

- EU banks showing sustained adverse impacts of impairments on pre-provision income: As can be seen in Figure 3.5, the difference between pre-provision income and ROE was most pronounced for EU banks in 2009, 2010, 2012, and 2013, whereas for US banks, this difference was greatest in 2007, 2008, 2009, and 2010. These findings show that the effects of

[57]COE was less than ROE in 98% of observations where P/B was less than 1.
[58]European Central Bank (2013); International Monetary Fund (2013).

Figure 3.7. ROE vs. COE



poor asset quality on the profitability of EU banks have continued to be significant since the beginning of the crisis. They also show that for US banks, the adverse effects of asset quality on profitability were mostly experienced during the early years of the crisis.

- Higher ROA of US banks: Except for 2008 and 2009, US sample banks reported higher ROA than EU banks during the analyzed periods. The higher ROA could in part be explained by the different derivative asset offsetting requirements under US GAAP versus

IFRS, which result in lower total assets, all else being equal. However, the data also show that US banks had higher net interest margins and ROE, which proves that US banks have been more profitable.

- Financial crisis effects (ROE less than COE to a greater extent for EU banks than US banks): From Figure 3.7, we can see that since the beginning of the financial crisis, COE has exceeded ROE to a much larger extent for EU banks than for US banks. This finding can help explain why the US banks have had comparably higher P/Bs than EU banks.

3.3.2. Profitability Measures for Annual Bank Observations with Different P/B Characteristics

Similar to the approach used for loan impairments, we analyzed whether profitability measures were different for the following sample categories, which are differentiated by magnitude and direction of change of P/B: low- versus high-P/B groups and decreasing- versus increasing-P/B groups.

3.3.2.1. Low-P/B Banks Have Lower Profitability Measures than High-P/B Banks

The differences between the arithmetic means of profitability measures for the two P/B-differentiated samples (i.e., low and high) of annual bank observations are reported in **Table 3.11**. The findings show that higher P/B observations have higher profitability as measured by ROE, ROA, and PPIE. For example, the low-P/B banks in the sample had a mean ROE (ROA) of 1.9% (0.2%), whereas the high-P/B banks had a mean ROE (ROA) of 13.6% (0.8%). This finding is an indicator of the positive association between profitability and P/B.

Table 3.11. **Difference between Means: Profitability Measures for Low- and High-P/B Groups**

Profitability Measure	Low-P/B Banks (< 1.44)	*N*	High-P/B Banks (≥ 1.44)	*N*	Statistically Significant Difference?
ROE	1.9%	270	13.6%	262	Yes
ROA	0.2	267	0.8	262	Yes
PPIE	16.5	258	23.7	252	Yes

Notes: The number of observations varies for different profitability measures depending on whether banks had available data for the respective profitability measure within the samples. The data are for the 2003–13 period. *N* is the number of firm-year observations. "Statistically significant difference" indicates significance at $p = 0.01$.

3.3.2.2. Year-to-Year Changes: Decreasing-P/B (Increasing-P/B) Annual Bank Observations Had Decreases (Increases) in Profitability Measures

Table 3.12 shows the differences between means of year-to-year changes in ROE and ROA for increasing- versus decreasing-P/B groups. On average, ROE and ROA decreased for decreasing-P/B banks, whereas these measures increased for increasing-P/B banks. The differences in changes are statistically significant for ROE and ROA. These findings provide further evidence of the positive association between profitability and P/B.

Table 3.12. Difference between Means: Yearly Change in Profitability Measures for Decreasing- vs. Increasing-P/B Groups

Year-to-Year Change in Profitability Measures	Decreasing-P/B Banks	*N*	Increasing-P/B Banks	*N*	Statistically Significant Difference?
ROE	–2.9%	275	2.6%	195	Yes
ROA	–0.2	276	0.1	193	Yes
PPIE	–2.1	265	0.6	187	No

Notes: The number of observations varies for different profitability metrics depending on whether banks had available data for the respective profitability metric within the samples. The data are for the 2003–13 period. There are fewer observations for year-to-year changes than for low- versus high-P/B groups because we did not obtain data for the year before the first year of analysis (i.e., 2003). *N* is the number of firm-year observations. "Statistically significant difference" indicates significance at $p = 0.01$.

3.4. Risk and P/B

As we will discuss in Section 4.2, we expected measures of risk to be negatively associated with P/B. In other words, firms that have higher risk should have lower P/Bs. We conducted multi-period trend analysis (Section 3.4.1) and analyzed the differences between risk measures for samples with different P/B characteristics (Section 3.4.2). In general, these tests provide evidence of risk being negatively associated with P/B.

3.4.1. Multi-Period Trend Analysis of Risk Measures vs. P/B

We analyzed the multi-period trends for the following measures for equity and credit market pricing of aggregate risk versus P/B:

- Stock price beta reflects the co-movement of stock price relative to the market index and is an established measure of systematic risk. Higher beta values represent riskier banks.
- Cost of equity—which, alongside the cost of debt, is a component of the discount rate, or required return—includes the risk premium that investors assign to specific companies.
- CDS spread primarily reflects the entity-wide credit risk and is another proxy for capital market (i.e., credit market) judgment of bank risk. Higher CDS spreads are associated with riskier banks.

We also assessed the multi-period trends of capital adequacy versus P/B. Excessive leverage of banks contributes to bank risk. Therefore, we assessed the time trends of P/B versus tangible equity and Tier 1 capital ratios.

Table 3.13, **Table 3.14**, and **Table 3.15** provide a breakdown of P/B versus different measures of market pricing of risk and capital adequacy across the sample of global, EU, and US banks.

Figure 3.8, **Figure 3.9**, and **Figure 3.10** illustrate the multi-period trends of P/B versus the measures of equity and credit market pricing of risk.

Table 3.13. P/B vs. Risk Measures: EU, US, Canadian, Japanese, and Australian Banks

			Market Pricing of Risk						Capital Adequacy and Leverage			
					COE		CDS Spread				Tangible	
Year	P/B	*N*	Beta	*N*	(%)	*N*	(bps)	*N*	Tier 1	*N*	Equity	*N*
2003	1.91	48	1.0	42	9.7	42			8.6%	49	4.3%	46
2004	2.01	49	0.9	50	8.7	44	18.1	35	8.8	48	4.2	45
2005	2.09	50	0.9	51	9.9	45	14.7	37	8.5	49	3.8	48
2006	2.25	51	0.9	51	9.5	45	10.4	43	8.5	48	3.9	51
2007	2.17	51	1.0	51	10.5	51	23.6	44	8.1	49	3.5	51
2008	1.36	51	1.1	51	13.0	51	113.2	45	9.5	51	3.0	51
2009	0.99	51	1.4	51	14.7	51	154.2	45	11.2	50	4.0	50
2010	1.06	51	1.5	51	18.8	51	149.9	47	11.9	51	4.1	51
2011	0.90	51	1.3	51	16.1	51	260.0	46	12.2	50	4.4	51
2012	0.85	51	1.3	51	15.4	51	253.9	42	13.1	51	4.7	51
2013	1.03	51	1.3	50	14.9	51	179.3	37	13.5	37	5.2	37

Note: Tier 1 = Tier 1 equity capital/Risk-weighted assets; Tangible equity = Tangible book value of equity/Tangible assets.

Table 3.14. P/B vs. Risk Measures: EU Banks

			Market Pricing of Risk						Capital Adequacy and Leverage			
					COE		CDS Spread				Tangible	
Year	P/B	*N*	Beta	*N*	(%)	*N*	(bps)	*N*	Tier 1	*N*	Equity	*N*
2003	1.59	29	1.0	25	9.8	25			8.3%	30	3.5%	30
2004	1.81	29	1.0	30	8.9	24	15.6	24	8.4	29	3.4	29
2005	2.02	30	0.9	31	9.7	25	12.9	24	8.0	30	3.2	31
2006	2.21	31	0.9	31	9.8	25	9.5	29	8.3	30	3.4	31
2007	2.01	31	1.1	31	11.1	31	23.9	29	8.0	30	3.1	31
2008	1.16	31	1.2	31	13.1	31	117.4	29	8.9	31	2.7	31
2009	0.82	31	1.4	31	13.4	31	156.4	29	10.8	30	3.5	30
2010	0.85	31	1.5	31	19.5	31	171.2	31	11.3	31	3.6	31
2011	0.70	31	1.4	31	17.2	31	323.2	31	11.7	30	4.0	31
2012	0.63	31	1.4	31	16.8	31	315.6	28	13.3	31	4.2	31
2013	0.84	31	1.4	30	16.4	31	206.4	29	14.2	22	4.6	22

Table 3.15. P/B vs. Risk Measures: US Banks

			Market Pricing of Risk						Capital Adequacy and Leverage			
					COE		CDS Spread				Tangible	
Year	P/B	*N*	Beta	*N*	(%)	*N*	(bps)	*N*	Tier 1	*N*	Equity	*N*
2003	2.37	10	1.2	10	10.5	10			9.8%	10	6.3%	10
2004	2.43	10	1.1	10	9.5	10	30.8	5	10.0	10	6.5	10
2005	2.15	10	1.0	10	10.6	10	23.3	5	9.1	10	5.9	10
2006	2.15	10	1.0	10	9.9	10	14.3	6	9.2	10	5.5	10
2007	2.05	10	1.0	10	10.4	10	30.9	7	8.5	10	5.0	10
2008	1.41	10	1.3	10	14.1	10	135.8	7	12.1	10	3.9	10
2009	0.97	10	1.7	10	17.7	10	192.3	7	12.3	10	5.8	10
2010	1.04	10	1.8	10	17.4	10	134.6	7	13.5	10	6.3	10
2011	0.90	10	1.3	10	13.3	10	149.9	7	13.5	10	6.5	10
2012	0.87	10	1.3	10	13.5	10	144.5	5	13.4	10	6.9	10
2013	1.09	10	1.4	10	12.8	10	82.6	5	13.3	10	7.2	10

Notes: US capitalization (Equity/Total assets) is not comparable to EU capitalization owing to differing derivatives offsetting (assets and liabilities) requirements under US GAAP and IFRS. Because of the differing offsetting requirements, derivatives assets and total assets are lower for US banks reporting under US GAAP than they are for EU banks reporting under IFRS, which partially explains the higher observed capitalization levels of US banks. There are also other factors that limit the comparability of capital (e.g., lack of comparability of risk-weighted assets, which are an input to determining regulatory capital).

Figure 3.8. P/B vs. Beta

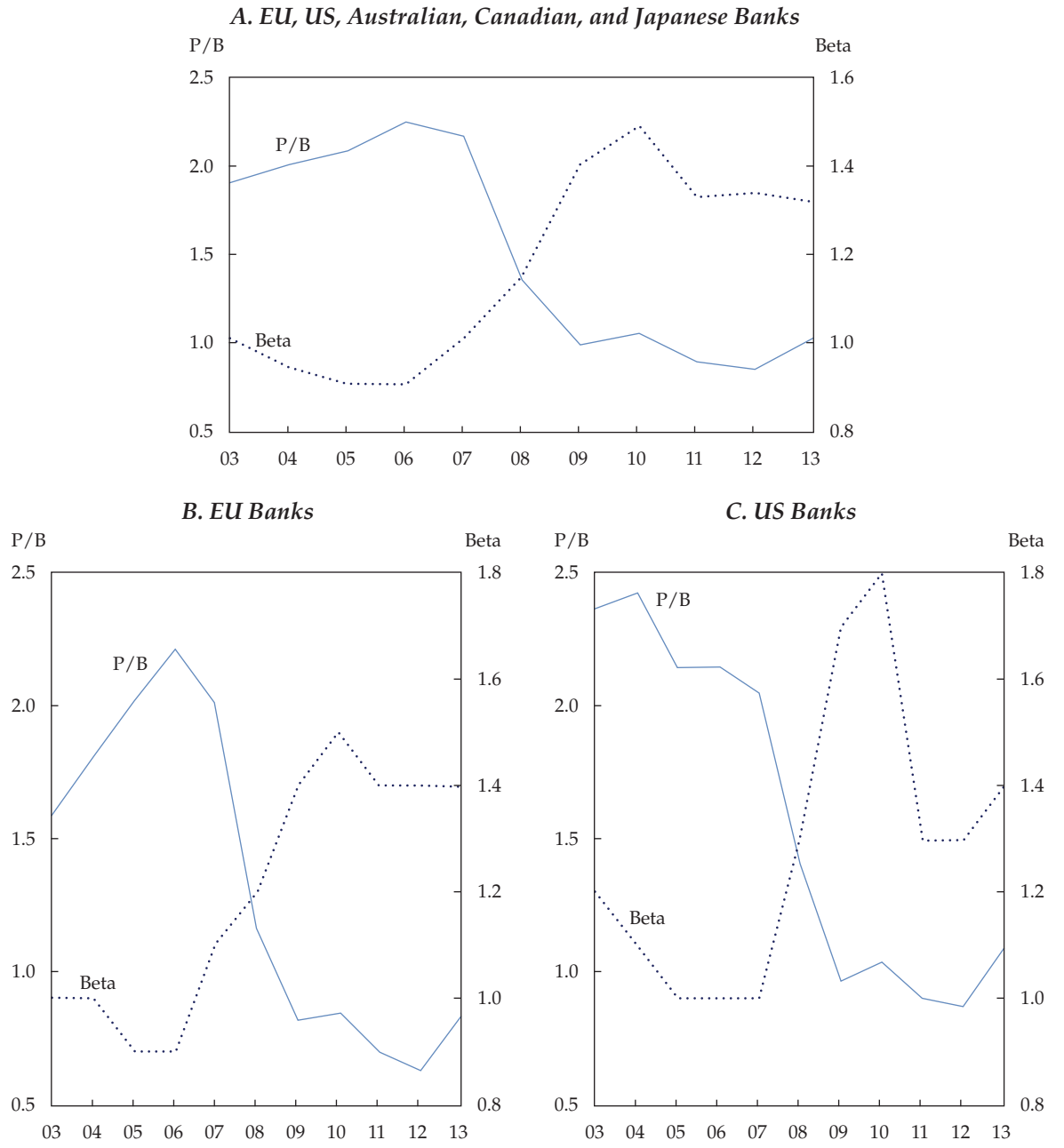


Figure 3.9. P/B vs. COE

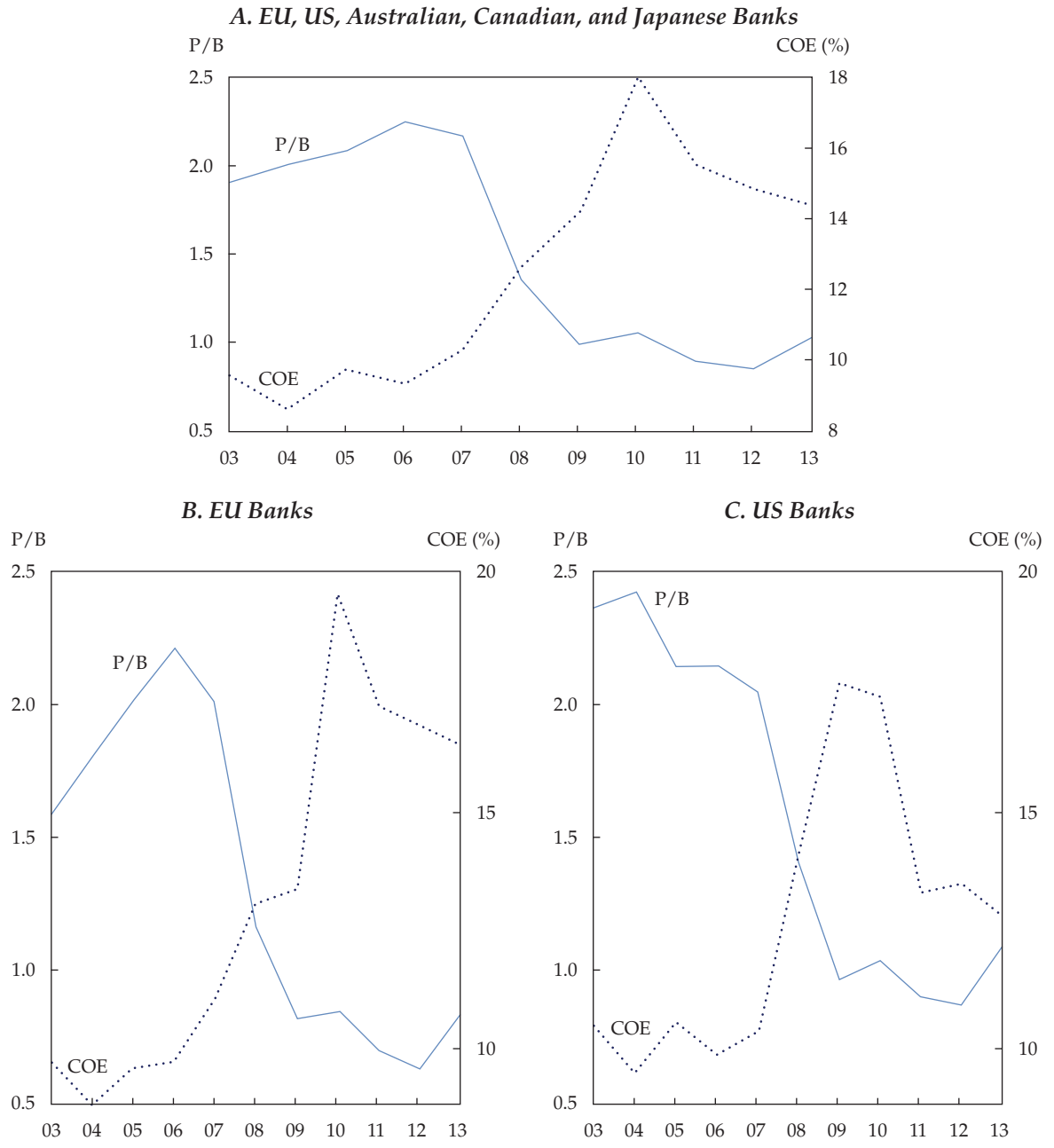
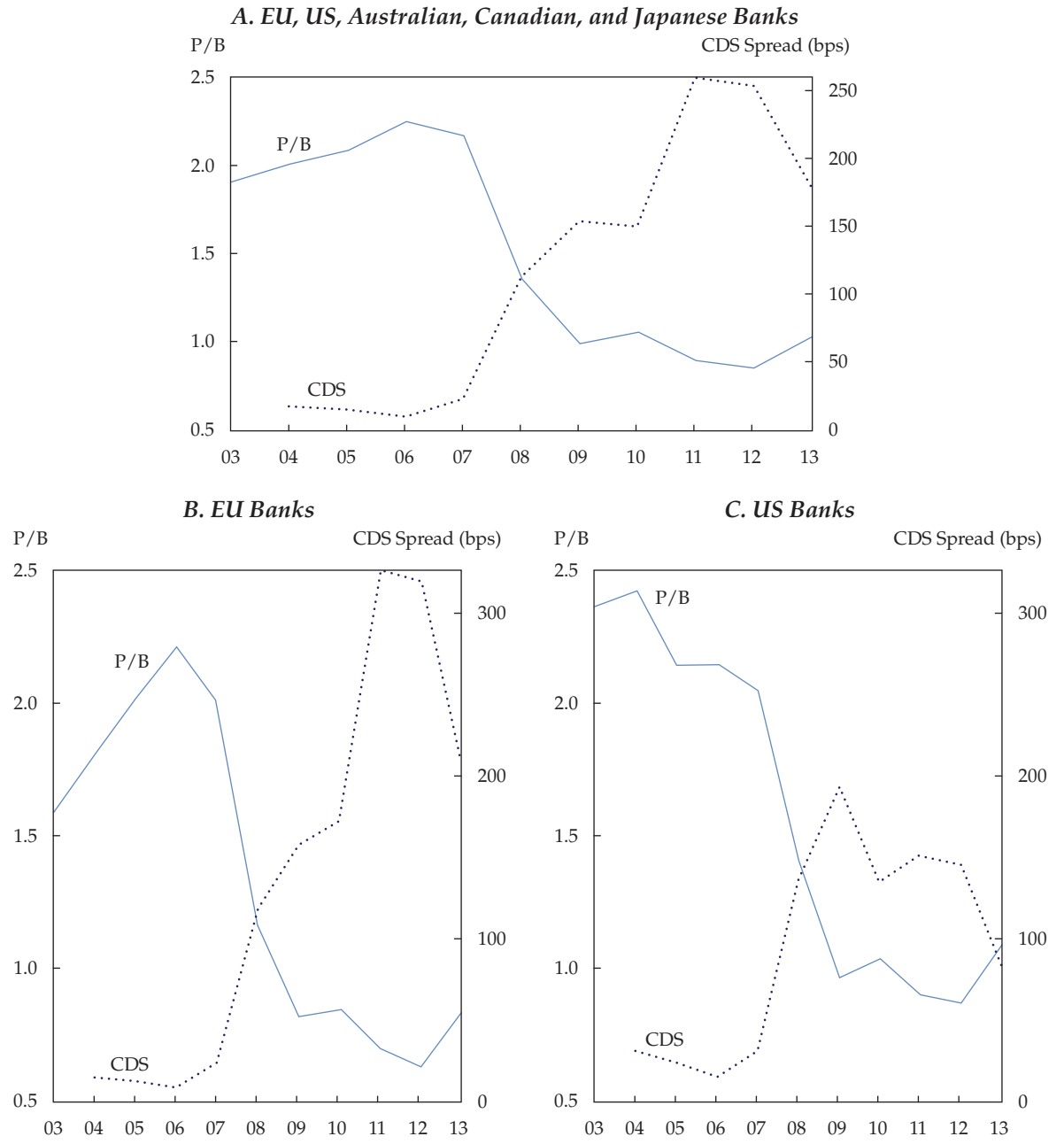


Figure 3.10. P/B vs. CDS Spread



3.4.1.1. P/B vs. Equity and Credit Market Pricing of Risk (Negative Association)

The data show that although P/B generally declined in 2008 and 2009 and remained depressed thereafter, risk measures have generally been trending in the opposite direction:

- Beta steadily increased from 2006 to 2010, with a slight drop in 2011, and plateaued in 2012 and 2013.
- COE increased from 2007 to 2010 and declined in 2011, 2012, and 2013. That said, COE remains much higher than it was before the crisis.
- CDS spreads also increased during the financial crisis, with significant increases in 2008, a peak in 2011, and decreases in 2012 and 2013. That said, CDS spreads remain much higher than their pre-crisis levels.

In general, these multi-period trends suggest a negative association between P/B and the measures of market pricing of entity risk.

3.4.1.2. Market Pricing of Risk Measures (Differing Patterns for EU vs. US Banks)

US banks had higher COE and CDS spreads than EU banks before the crisis and until 2009. However, from 2010 onward, EU banks had higher COE and CDS spreads than US banks.

The higher perceived risk of EU banks since 2010 is attributable to the challenging economic environments that prevailed in the European periphery countries (Greece, Ireland, Italy, Portugal, and Spain), which led to the European sovereign debt crisis and left EU banks vulnerable owing to their significant sovereign exposures.[59] According to a Credit Suisse report, EU banks held €1.7 trillion (19.3%) of the €8.6 trillion of sovereign debt securities in issuance in June 2011.[60] In particular, the domestic banks of the troubled EU countries had significant sovereign exposures to European periphery countries. For example, the Credit Suisse study showed that as of 2011,

- four Spanish banks (Banco Santander, BBVA, Banco Popular,[61] and Banco Sabadell) had €115.3 billion in European periphery sovereign debt exposure, which is equal to 139.6% of tangible equity, and
- two Italian banks (Intesa Sanpaolo and UniCredit) had €79.2 billion in European periphery sovereign debt exposure, which is equivalent to 108.4% of tangible equity.

[59]The economic challenges arose because of heavy borrowing by governments, rising unemployment, and housing market crashes in such countries as Spain.
[60]The Credit Suisse (2011) study outlined four reasons that banks hold government debt: (1) for liquidity purposes, to constitute a "liquidity asset" buffer; (2) for hedging purposes, to manage interest rate positions; (3) for trading purposes when a bank is acting as a market maker; and (4) to support their domestic sovereign financing.
[61]Not included in the sample banks analyzed in this study.

The European sovereign crisis had spillover effects for banks in other EU countries (e.g., the United Kingdom, Germany, and France) owing to many of these banks having significant European periphery sovereign exposures as well. The following are examples:

- The four largest UK banks (Barclays, HSBC, the Royal Bank of Scotland, and Lloyds Banking Group) had €16.3 billion in European periphery sovereign debt exposure, which is equivalent to 6.1% of tangible equity.
- Three French banks (BNP Paribas, Crédit Agricole, and Société Générale) had €46.3 billion in European periphery sovereign debt exposure, which is equivalent to 40.8% of tangible equity.
- Two German banks (Deutsche Bank and Commerzbank) had €18.8 billion in European periphery sovereign debt exposure, which is equivalent to 32.7% of tangible equity.
- Dutch bank ING had €10.2 billion in European periphery sovereign debt exposure, which is equivalent to 24.6% of tangible equity.

3.4.1.3. P/B vs. Capital Adequacy

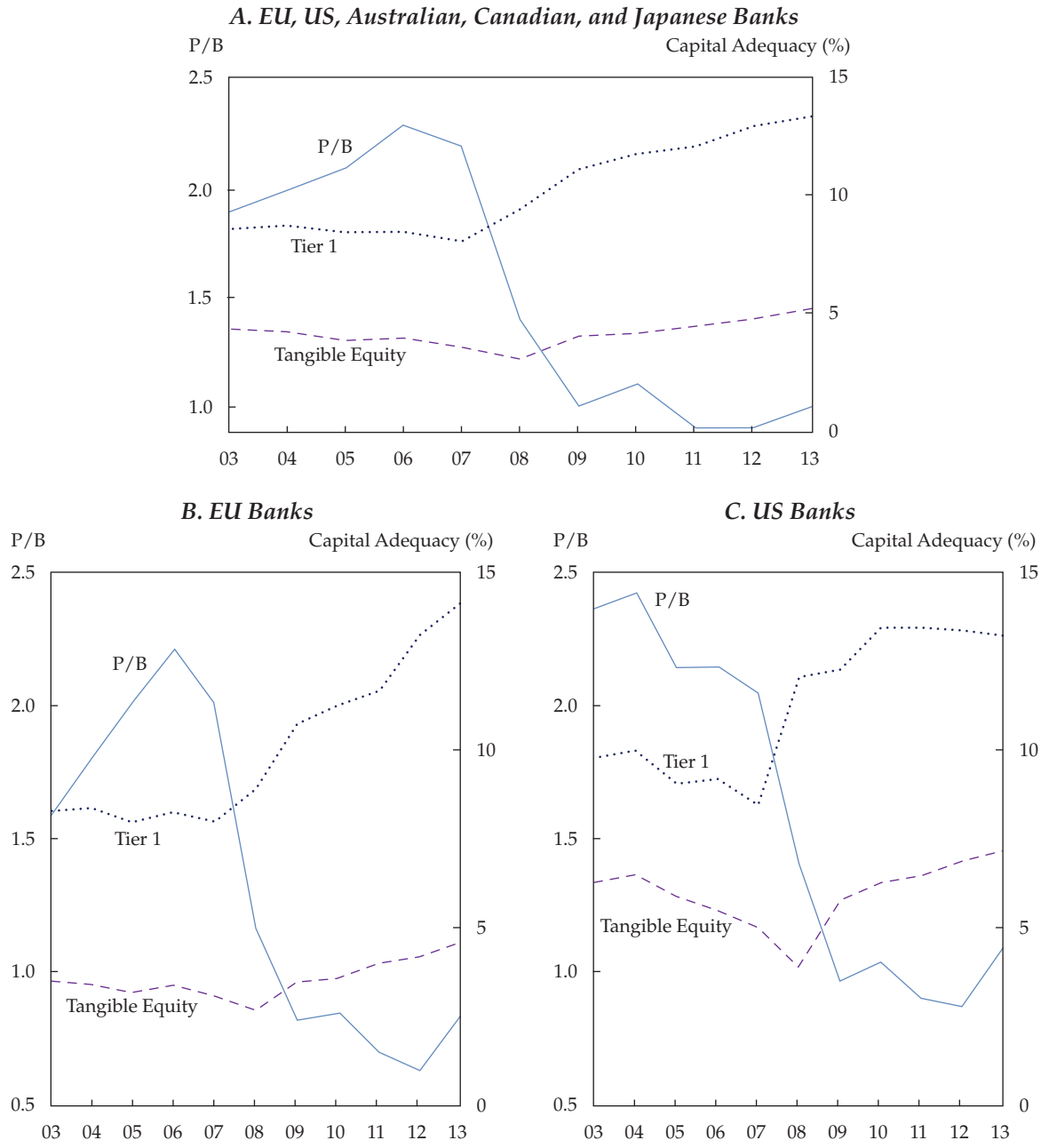
Figure 3.11 shows the P/B versus capital adequacy trends.

The multi-period analysis shows that banks increased their Tier 1 capital during the financial crisis, and this rising trend can be explained by regulatory and market discipline pressures. There was also a slight improvement in tangible equity levels. However, the improvement in equity capital levels has not resulted in recovery of P/Bs to their pre-crisis levels. It may be the case that the counteracting effects of poor asset quality and bleak investor outlooks for future profitability of banks outweigh the benefits of reduced risk associated with increased equity levels. Or this finding may simply reflect that investors did not adequately penalize banks for the high leverage levels that prevailed before the crisis and that bank P/Bs should have been lower than they were before the crisis.

3.4.1.4. Capital Adequacy and Leverage (EU vs. US Banks)

Although US banks seem to have higher levels of tangible equity (Tangible equity/Tangible assets), it is difficult to compare the unweighted accounting leverage of banks in different jurisdictions (e.g., US versus EU banks) owing to different derivatives offsetting requirements. These different requirements would affect reported total assets and thus accounting leverage. Limited comparability diminishes the information content of reported accounting leverage because different levels of leverage (Assets/Equity) could simply be a reflection of different ways of calculating assets.

Figure 3.11. P/B vs. Capital Adequacy



3.4.2. Risk Measures for Annual Bank Observations with Different P/B Characteristics

Similar to the approach used for loan impairments and profitability metrics, we analyzed the difference between means of risk measures for the following P/B-differentiated sample categories: low- versus high-P/B groups and decreasing- versus increasing-P/B groups.

3.4.2.1. Low-P/B Banks Have Higher Risk Measures than High-P/B Banks

The results from an analysis of differences in arithmetic means of risk measures for two P/B-differentiated (low- versus high-P/B) samples of annual bank observations are reported in **Table 3.16**. The results show that low-P/B banks have higher COE, stock price beta, and CDS spreads than high-P/B banks. These findings are evidence of a negative association between risk and P/B.

Table 3.16. Difference between Means: Risk Measures for Low- vs. High-P/B Groups

Risk Measure	Low-P/B Banks (< 1.44)	*N*	High-P/B Banks (≥ 1.44)	*N*	Statistically Significant Difference?
COE (%)	15.1	267	10.9	242	Yes
Beta	1.34	269	1.00	257	Yes
CDS spread (bps)	174	232	52	175	Yes

Notes: The number of observations varies for different profitability metrics depending on available data for the respective metric of risk. The data are for the 2003–13 period. *N* is the number of firm-year observations. "Statistically significant difference" indicates significance at $p = 0.01$.

3.4.2.2. Year-to-Year Changes: Decreasing-P/B Annual Bank Observations Have Higher Increases in Risk Measures than Increasing-P/B Observations

The results in **Table 3.17** show that the annual bank observations with a year-to-year decrease in P/B also had yearly increases in the three risk measures: COE increased by 0.8%, beta increased by 0.03, and CDS spread increased by 46 bps per year.

The increasing-P/B observations also had a year-to-year increase in two of the risk measures (COE and beta), albeit at a lower magnitude than for the decreasing-P/B group. The increasing-P/B observations had an average yearly CDS spread drop of 18 bps per year, which contrasts with the CDS spread increase for decreasing-P/B observations. Furthermore, the yearly change in beta and CDS spread is statistically significant for decreasing- versus increasing-P/B annual bank observations. The combination of these results provides further evidence of the negative association between risk and P/B.

Table 3.17. Difference between Means of Changes in Risk Metrics for Increasing- vs. Decreasing-P/B Groups

Year-to-Year Change in Risk Measure	Decreasing-P/B Banks	*N*	Increasing-P/B Banks	*N*	Statistically Significant Difference?
COE (%)	0.8	263	0.4	188	No
Beta	0.06	275	0.03	193	Yes
CDS spread (bps)	46	229	–18	140	Yes

Notes: The number of observations varies for different loan impairments metrics depending on whether banks had available data for the respective loan impairments metric within each sample. The data are for the 2003–13 period. There are fewer observations for year-to-year changes compared with low- versus high-P/B groups because we did not obtain data for the year before the first year of analysis (i.e., 2003). *N* is the number of firm-year observations. "Statistically significant difference" indicates significance at $p = 0.01$.

3.5. Conclusion

In this section, we presented the findings from a combination of tests—multi-period trend analysis and analysis of loan impairments, profitability, and risk characteristics of different P/B samples. These tests unanimously show that reported loan impairments are negatively associated with P/Bs of banks. Similarly, the tests show that profitability is positively associated with P/B and risk is negatively associated with P/B. These findings informed the key findings articulated in Section 1.2 and are the basis for the policy recommendations made in Section 2. In the next section, we further assess the relative effects of loan impairments, profitability, and risk on P/B through correlation analysis and regression model testing.

4. Appendix A. Correlation Analysis and Regression Models

The combination of correlation analysis (Section 4.1) and regression models (Section 4.2) allows for the testing of relative effects of the various factors influencing P/B. Correlation analysis informs on one-to-one relationships (direction and strength of relationship) between variables, whereas the regression models inform on "many-to-one" relationships (i.e., how several variables all at the same time influence a single variable).

4.1. Correlation Analysis

Correlation analysis shows the extent to which two quantitative variables vary together, including the strength and direction of their relationship. Correlation coefficients convey the following.

- Statistical significance: The results convey whether there is a statistically significant relationship (i.e., whether there is a relationship or not). If a coefficient is not statistically significant, an assumption of no correlation can be made.
- Direction of co-movement: Direction of co-movement indicates the direction of the relationship between variables; a positive coefficient means increases in one variable occur at the same time as increases in the other variable.
- Magnitude of co-movement/correlation: Correlation coefficients can range from 0 (no correlation) to 1 in absolute magnitude (–1 indicates very strong correlation but opposite direction of co-movement, whereas 1 indicates very strong correlation with the same direction of co-movement).

The results of correlations of P/B, previous-period P/B (PBLAG), and the possible influencing variables (loan impairments, profitability, and risk) are reported in **Table 4.1**. We assessed the correlation of variables included in Section 3, except for capital adequacy measures. As noted earlier, there was no meaningful, discernible relationship between capital adequacy measures and P/B.

Table 4.1. Correlation of P/B and Impairments, Profitability, and Risk Measures

	P/B	*N*	PBLAG	*N*	
Impairments measures					
IMPCHG	–0.29*	524	–0.23*	454	Negative association
ALLWLN	–0.29*	532	–0.39*	463	Negative association, stronger association with PBLAG than with P/B
CHGOFF	–0.21*	488	–0.22*	423	Negative association
NPL	–0.36*	505	–0.41*	444	Negative association
Profitability measures					
ROE	0.40*	544	0.28*	470	Positive association
ROA	0.45*	542	0.33*	468	Positive association
PPIE	0.32*	529	0.19*	453	Positive association

(continued)

Table 4.1. Correlation of P/B and Impairments, Profitability, and Risk Measures (continued)

	P/B	*N*	PBLAG	*N*	
Risk measures					
Beta	–0.53*	547	–0.47*	475	Negative association
COE	–0.57*	530	–0.48*	459	Negative association
CDS spread	–0.54*	419	–0.42*	403	Negative association

Notes: *N* represents matching pairwise firm-year observations. IMPCHG = Impairments charge/Net interest income; ALLWLN = Allowance for loan losses/Gross loans; CHGOFF = Charge-off/Net interest income; NPL = Nonperforming loans/Gross loans; PPIE = Pre-provision income/Equity.

*Connotes statistical significance at a 95% confidence level.

The correlation coefficients reported in Table 4.1 show the following.

- *P/B and loan impairments measures (negative association):* All four loan impairments measures have a significant negative association with P/B, further showing the likelihood that loan impairments have an effect on P/B.
- *Allowance for loan losses and previous-period P/B (negative association):* Interestingly, both ALLWLN and NPL have stronger correlations with PBLAG than with P/B, showing that the balance-sheet representation of loan impairments during a particular period is more strongly correlated with investors' previous-period market value write-downs due to loan impairments. We interpret this result as further evidence of delayed loan impairments representation on the balance sheet.
- *Profitability measures and P/B (positive association):* The profitability measures (ROE, ROA, and PPIE) have a significant positive association with P/B. This finding further shows the likelihood that profitability has an effect on P/B.
- *Risk measures and P/B (negative association):* The risk measures (COE, beta, and CDS spread) have a significant negative association with P/B. This finding is further evidence that risk has an effect on P/B.

These results are consistent with the findings reported in Section 3 based on the analysis of multi-period trends and differences in measures of loan impairments, profitability, and risk for annual bank observation subsamples with different P/B characteristics.

4.2. Regression Models

We assessed the relative effects of loan impairments on P/B using regression models. Regression models are generally used to investigate relationships between multiple factors or variables by assessing how they vary relative to each other compared with the variable being examined (in this study, P/B).

In the following sections, we outline the methodology, variable definitions, model specification, and results.

4.2.1. Methodology

Given the nature of the data (i.e., panel data consisting of observations from 51 banks as described in Section 3.1, with each bank having multi-period data from 2003 to 2013), we conducted panel regression tests.[62] Panel regression tests are appropriate for panel data because they account for company- or time-specific factors that influence P/B that may not be included in the regression model. Examples of company-specific factors that may be difficult to include in a regression model owing to measurement difficulties are other internally generated intangible assets and management quality. Factors that are difficult to observe and measure (i.e., those with unobservable heterogeneity) could be explanatory factors for superior stock price performance and high P/Bs but are hard to include in the regression models. Panel regression methods correspondingly adjust test results to prevent erroneous inferences being made as a result of variables that are not included in the regression model and create unobservable heterogeneity that influences the regression results.

Two commonly used panel regression approaches are the random-effect and the fixed-effect tests.[63] These approaches differ on the basis of the assumption of where the unobservable heterogeneity across companies is reflected within the regression model (error term or intercept). We conducted both tests to assess the sensitivity of the findings.

4.2.2. Definition of Variables

The variables included in the regression models are defined in **Exhibit 4.1**.

Exhibit 4.1. Definition of Variables

Factor	Explanation of the Variables Included in the Regression Models
General financial crisis factors	The crisis indicator variable (CRSIND) conveys whether a particular bank's data points are related to the pre-crisis period (with 2003–2007 represented by 0) or the crisis/post-crisis period (with 2008–2013 represented by 1).[a] The crisis indicator variable is a proxy for macroeconomic and other factors that would have had an effect on bank stock prices during, but not before, the financial crisis but that have not been explicitly included in the regression model.
Loan impairments	Impairments charge/Net interest income (IMPCHG) is a measure of income statement representation of loan impairments. Allowance for loan losses/Gross loans (ALLWLN) is a measure of balance-sheet representation of loan impairments. An interaction variable between impairments measures and the crisis indicator variable (IMPCHG * CRSIND) allows for an assessment of whether the effect of loan impairments measures on P/B changed since the beginning of the financial crisis.[b] An interaction variable between the loan impairments measures and the low- versus high-P/B indicator (IMPCHG * LOWPBIND) assesses whether the effect of loan impairments measures on P/B differed for low-P/B and high-P/B firms.[c]

(continued)

[62]Panel data combine cross-sectional and time-series data. Cross-sectional data cover multiple entities (e.g., companies, countries, or persons) for a single time period. Time-series data pertain to a single entity (e.g., companies, countries, or persons) over multiple time periods.

[63]The fixed-effect model is structured to reflect the company-specific unobservable difference in the constant or intercept of the predicted linear relationship. The random-effect model is structured to reflect the company-specific unobservable difference in the error term of the predicted linear relationship.

Exhibit 4.1. Definition of Variables (continued)

Factor	Explanation of the Variables Included in the Regression Models
Profitability	We used Pre-provision income/Equity (PPIE) when IMPCHG was the impairments measure within the model to avoid double counting the effects of impairments charge due to ROE being influenced by impairments charge. If we include ROE as the profitability measure alongside impairments charge (IMPCHG) within the same model, we would effectively end up double counting the effects of impairments charge on the dependent variable (P/B). ROE was included in the models where ALLWLN was the impairments measure. The combination of ROE and ALLWLN is less prone to the period-specific double counting of impairments charge because the balance-sheet representation of impairments via ALLWLN reflects the cumulative impairments across multiple periods rather than a single-period impairments charge. In other words, ROE should be less correlated with ALLWLN than with IMPCHG.[d] We also ran but do not report on models with ROA as the profitability measure. To assess the effect of the financial crisis period on the relationship between profitability metrics and P/B, we used interaction variables (PPIE * CRSIND and ROE * CRSIND). We included them because, as discussed in Section 1.2.2, we expected that structural, value chain, and regulatory reform of the banking sector during the financial crisis would have reduced the predictive value of reported ROE.
Risk	Cost of equity (COE) represents the measure of market pricing of risk. We also ran but do not report on models with CDS spread and stock price (beta) as alternate measures of market pricing of risk. We did not include capital adequacy risk measures in the regression models because in the multi-period trend analysis in Section 3, there was no discernible economically meaningful relationship between capital adequacy and P/B over the period of analysis.

[a]Indicator variables or dummy variables are applied for factors that may influence the relationship being tested and for which the underlying data are categorical in nature (e.g., binary data values, such as male or female). An indicator variable would typically have a value of 1 signifying one category (e.g., female) and 0 signifying the other category (e.g., male).

[b]Interaction variables allow the regression method testing of the interaction between the indicator variable and other variables. For example, in our study, it allowed us to test whether a particular time period influenced the relationship between loan impairments and P/B. Interaction variables are calculated as the product of the indicator variable and the independent variable.

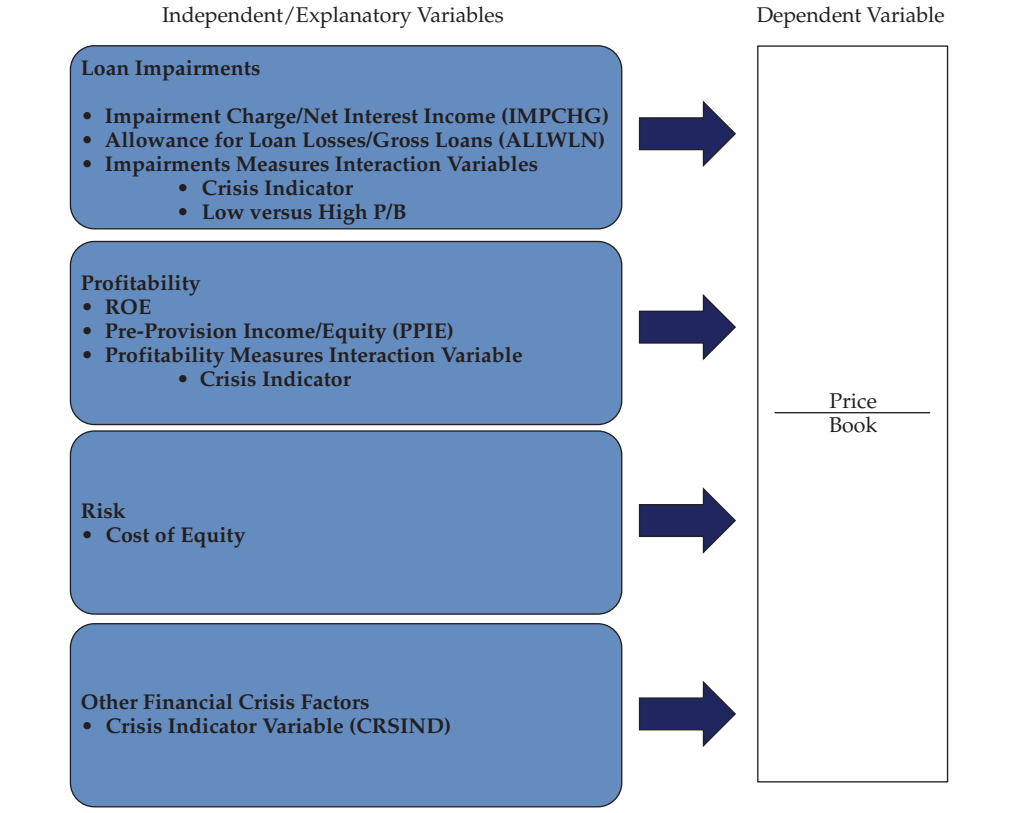
[c]Pae et al. (2005) contended that low-P/B firms are likely to be distressed and have economic characteristics different from those of high-P/B firms and, as a result, are more likely to have conservative earnings. They proposed distinguishing low- and high-P/B firms in a multiple regression setting to ensure correct inferences regarding the determinants of P/B.

[d]The correlation coefficients back our assumption. The correlation between ROE and IMPCHG is –0.55, while the correlation between ROE and ALLWLN is –0.34.

4.2.3. Regression Model Specification

P/B, the primary factor being explained in this study, is the dependent variable. P/B is influenced by or is a function of loan impairments, profitability, and risk measures, as shown in **Figure 4.1**, and is based on the variables defined in Exhibit 4.1.

Figure 4.1. **Factors Included in the Regression Models**



To make reliable inferences regarding the tested relationships (i.e., P/B versus loan impairments, profitability, and risk measures), it was necessary to run several regression tests. We report results from six regression models, which are specified by the factors shown in Figure 4.1, and the differences in the models are as follows:

- Model 1 uses P/B as the dependent variable. Regarding the independent variables, the distinguishing features are that the loan impairments measure is IMPCHG and the profitability measure is PPIE—to avoid double counting the impairments charge, which would occur if ROE were used as the model's profitability measure along with IMPCHG.

- Models 2 and 4 use the same independent variables as Model 1, but PBLAG, instead of P/B, is the dependent variable. These two models test whether loan impairments measures have a relationship with previous-period P/B, and this is one way of testing whether changes in loan impairments measures lagged the changes in P/B.

- Models 3 and 4 are based on the same independent variables as Model 1 except ALLWLN, instead of IMPCHG, is the loan impairments measure and ROE, instead of PPIE, is the profitability measure.

- Models 5 and 6 are based on EU banks only because they constitute about 60% of the sample and mostly apply the same accounting standards (IFRS). These two models enabled us to assess whether the same inferences drawn from the global sample can be made on the basis of data derived from the same accounting regime. We also reported on EU banks

as a distinctive sample because the sample banks from other countries (the United States, Canada, Japan, and Australia) did not have sufficient observations to warrant separate regression models. Apart from differences in sample composition, Models 5 and 6 are similar to Models 1 and 3, respectively.

4.2.4. Regression Model Results

Table 4.2 outlines the results from the six models.

Table 4.2. Panel Regression Fixed-Effect Models: Key Factors Influencing P/B

	Expected Association	Model 1	Model 2	Model 3	Model 4	Model 5 (EU Only)	Model 6 (EU Only)
Dependent variable		P/B	PBLAG	P/B	PBLAG	P/B	P/B
Impairments charge							
IMPCHG	Negative	–1.16**	0.12			–1.22***	
IMPCHG * CRSIND (2003–2007 = 0; 2008–2013 = 1)	Positive	0.65	–0.18			0.65	
IMPCHG * LOWPBIND (low P/B = 0; high P/B = 1)	Positive	0.79***	0.16			0.81***	
Allowance for loan losses							
ALLWLN	Negative			–20.60***	–26.99***		–21.17***
ALLWLN * CRSIND (2003–2007 = 0; 2008–2013 = 1)	Positive			11.62***	7.61		10.65*
ALLWLN * LOWPBIND (low P/B = 0; high P/B = 1)	Positive			16.32***	13.66***		17.80***
Profitability variables							
PPIE	Positive	2.45***	0.22			2.76***	
PPIE * CRSIND (2003–2007 = 0; 2008–2013 = 1)		–2.51***	–0.27			–3.16***	
ROE	Positive			3.22***	–0.23		3.78**
ROE * CRSIND (2003–2007 = 0; 2008–2013 = 1)				–3.07***	–0.21		–3.70**
Risk indicator variables							
COE	Negative	–1.49**	–6.71***	–0.52	–4.37**	–1.33*	–0.51
Other variables							
CRSIND (2003–2007 = 0; 2008–2013 = 1)	Negative	–0.33*	–0.24	–0.55***	0.25	–0.22	–0.41
Constant		1.71***	2.71***	1.78***	2.72***	1.51***	1.54***
Observations		471	416	498	440	287	298
Adjusted R^2		56.2%	24.7%	59.0%	32.7%	62.8%	66.9%
F-statistic		69.9***	34.8***	115.1***	32.1***	48.1***	99.2***

Notes: The reported observations reflect the annual bank observations that had data for all the variables being tested in the model. The variables are defined in Exhibit 4.1. PPIE, instead of ROE, is used in Models 1 and 2, with IMPCHG as the impairments measure, to avoid double counting the impairments effects on ROE during particular periods. Low P/B (high P/B) means less than 1 (greater than or equal to 1). See the definition of variables in Exhibit 4.1.

*Statistically significant at the 90% confidence level.

**Statistically significant at the 95% confidence level.

***Statistically significant at the 99% confidence level.

The regression results in Table 4.2 are explained in detail below.

4.2.4.1. Overall Reliability of Regression Models

The reported regression models in Table 4.2 had adjusted R^2 (i.e., the goodness-of-fit measure) statistics ranging from 24.7% to 66.9%. The reported R^2 statistics for all the models compare well with many finance and accounting empirical studies. The *F*-test is a measure of whether inferences can be made from the regression model.[64] The *F*-statistics show that valid inferences can be made from the reported regression models. The statistical significance of the reported coefficients are based on robust standard errors—clustered around individual banks so as to minimize the risk of wrong inferences being drawn owing to violations of the conditions necessary for linear regression models to produce reliable results.[65]

4.2.4.2. Analyzing the Regression Coefficients

Table 4.2 consists of results from the six models based on different dependent variables (P/B versus PBLAG), different loan impairments measures (IMPCHG versus ALLWLN), and different samples (all banks versus EU banks). **Table 4.3** provides an illustrative interpretation of the regression coefficients reported in Table 4.2. Regression coefficients reflect the relative impact of an explanatory variable (e.g., ROE, loan impairments) on the dependent variable (in our study, P/B and PBLAG). For example, a coefficient of 0.8 would mean that a unit change in the explanatory variable of 1 would result in a unit change in the dependent variable of 0.8.

Table 4.3. Illustrative Interpretation of Regression Coefficients from Table 4.2

	Model 1	Model 3	Explanation of the Regression Coefficients
Impairments variables			
IMPCHG	–1.16**		This regression coefficient shows that an additional loan impairments charge of 0.1 (i.e., 10%) would result in P/B declining by 0.116 (0.1 × 1.16), which is proof of the negative association between the impairments charge and P/B.
IMPCHG * CRSIND	0.65		The coefficient of the interaction variable with the crisis indicator is not statistically significant.
IMPCHG * LOWPBIND	0.79***		The positive coefficient of this interaction variable shows that there was a more pronounced effect of loan impairments on low-P/B banks than on high-P/B banks. It shows that the negative coefficient is offset by the positive coefficient for the high-P/B banks.
ALLWLN		–20.60***	This regression coefficient shows that an additional loan loss allowance of 0.01 (i.e., 1%) would result in P/B declining by 0.21 (0.01 × 20.60), which is proof of the negative association between the allowance for loan losses and P/B.
ALLWLN * CRSIND		11.62***	The coefficient of the interaction variable with the crisis indicator is positive and statistically significant, showing that the financial crisis periods had offsetting effects on the negative association between ALLWLN and P/B.

(continued)

[64]The *F*-statistic is a ratio of the explained variability to the unexplained variability. Thus, a larger *F*-statistic indicates that more of the total variability is accounted for by the model. The appropriateness of the *F*-statistic is judged in conjunction with the *p*-value, which indicates whether the *F*-statistic is statistically significantly different from zero. The *F*-test is used to assess the fixed-effect panel regression models.

[65]One such condition is heteroscedasticity, which is the violation of the condition of homoscedasticity (i.e., same variance of the error term). Heteroscedasticity means that the variance of the error term differs across observations.

Table 4.3. Illustrative Interpretation of Regression Coefficients from Table 4.2 (continued)

	Model 1	Model 3	Explanation of the Regression Coefficients
ALLWLN * LOWPBIND		16.32***	The positive coefficient of this interaction variable shows that there was a more pronounced effect of loan impairments on low-P/B banks than on high-P/B banks. It shows that the negative coefficient gets offset by the positive coefficient for the high-P/B banks.
Profitability variables			
PPIE	2.45***		The coefficient shows that a decrease (increase) in PPIE of 0.1 (i.e., 10%) would result in a P/B decrease (increase) of 0.245 (i.e., 10% × 2.45). This result shows a positive association between profitability measures and P/B.
PPIE * CRSIND	–2.51***		This finding shows that the positive association of profitability and P/B weakened during the crisis.
ROE		3.22***	The coefficient shows that an increase in ROE of 0.1 (i.e., 10%) would result in a P/B increase of 0.32 (i.e., 10% × 3.22). This result shows a positive association and is robust across different models whose dependent variable is P/B.
ROE * CRSIND		–3.07***	This finding shows that the positive association of profitability and P/B weakened during the crisis.
Risk indicator variable			
COE	–1.49**	–0.52	COE is statistically significant and negatively associated in Model 1 (the impairments charge model) but not in Model 3 (the loan loss allowance model). The result in Model 1 shows that a 0.1 change in COE results in a decline of 0.15 (0.1 × 1.49).
Other variable			
CRSIND	–0.33***	–0.55***	The coefficient in Model 1 shows that there was a decline in P/B of 0.57, relative to the pre-crisis periods, from 2008 forward.

*Statistically significant at the 90% confidence level.
**Statistically significant at the 95% confidence level.
***Statistically significant at the 99% confidence level.

The regression coefficients are interpreted on the basis of their statistical significance, magnitude, and sign (+/–). The following inferences can be made from the different models.[66]

- *Loan impairments measures and P/B (negative association):* There is a negative association between the impairments measures (IMPCHG and ALLWLN) and P/B, as is evident from the statistically significant negative regression coefficients in Models 1, 3, 5, and 6, where P/B is the dependent variable. These results show that loan impairments had an effect on P/B.

- *Allowance for loan losses and P/B (stronger negative association with previous-period P/B than current-period P/B):* The regression coefficient of ALLWLN in Model 4 (–26.99) shows that there is a negative association between allowance for loan losses and PBLAG, and it has a greater magnitude than the coefficient for Model 3 (–20.60), which uses P/B as the dependent variable. This finding shows that the balance-sheet representation of loan impairments is more strongly correlated with previous-period P/B than current-period P/B

[66]The magnitude of regression coefficients of different variables cannot be used to compare the relative effect of different variables (ROE, impairments charge, etc.) because there is no equivalence in the unit change of these variables. For example, a 0.1 increase in ROE is not the same as a 0.1 increase in impairments charge.

and is indicative of a lagged relationship between the market value write-down due to deterioration of asset quality and reported impairments. We interpret this finding as further evidence of delayed loan impairments representation on the balance sheet.

- *Financial crisis effects on the relationship between loan loss allowance and P/B (weaker negative association):* There is evidence from the models that the negative association between the allowance for loan losses and P/B was weaker during the financial crisis. The interaction variable between allowance for loan losses and the financial crisis period (ALLWLN * CRSIND) has a positive coefficient in the reported models (Models 3 and 6), which offsets the overall negative association between allowance for loan losses and P/B. This finding signifies that the financial crisis period resulted in a weaker negative association between the balance-sheet representation of loan impairments and P/B. This relationship indicates that either or both of the following conditions are present.
  - Differences in timing (changes in allowance for loan losses lag changes in P/B): Reported impairments lag the market value write-downs, leading to a weakened contemporaneous relationship.
  - Differences in amounts (magnitude of reported impairments versus related market value write-downs): During a particular reporting period, the investor write-down of market value affects the change in P/B to a greater degree than do the reported loan impairments. In Section 5.1.3, we further illustrate the interrelationship of reported loan impairments, investor estimates of impairments, and changes in P/B. We show that when market value write-downs exceed reported impairments, the P/B declines because the market value of write-downs is the dominating effect on the changes in P/B.

- *Loan impairments measures and P/B (weaker negative association for high-P/B banks than low-P/B banks):* There is evidence from the six reported models that the negative association between loan impairments measures (IMPCHG and ALLWLN) and P/B is weaker for high-P/B annual bank observations than it is for low-P/B observations. For all models, the interaction variables between the impairments charge and the low-P/B versus high-P/B indicator (IMPCHG * LOWPBIND and ALLWLN * LOWPBIND) have statistically significant positive coefficients. The results show that positive coefficients for high-P/B annual bank observations offset the negative coefficients across the full sample. This finding is consistent with our expectation, as described in Section 5.1, that the magnitude of the original P/B will also determine the effect of loan impairments on P/B (i.e., magnitude of change).

- *Profitability measures and P/B (positive association):* Results from the tested models show a positive association between pre-provision income, ROE, and P/B. The same results are obtained when ROA is included as an alternative to ROE. The results show that profitability has an effect on P/B.

- *Profitability measures and P/B (positive association weakened during financial crisis):* The interaction variables between the financial crisis period and PPIE and ROE (PPIE * CRSIND and ROE * CRSIND) have a statistically significant negative coefficient. The negative coefficient signifies an offsetting effect during the financial crisis on the positive association that exists between profitability measures and P/B. This finding means that

profitability measures have had less predictive value since the beginning of the financial crisis. As explained in Section 1.2.2, we expect that structural reform and regulatory changes within the bank sector will have a limiting effect on the predictive value of ROE.

- *Risk measures and P/B (limited evidence of negative association):* With P/B as the dependent variable, we found that the COE regression coefficient is statistically significant only in Model 1 (with IMPCHG as the impairments measure), not in Model 3 (with ALLWLN as the impairments measure). However, there is a negative association between COE and PBLAG (Models 2 and 4, where previous-period P/B is the dependent variable). These results show that for our sample data, the cost of equity is more strongly associated with previous-period P/B than with current-period P/B. This finding implies that market participants' forward/future-period expectations of cost of equity were the key measure of risk applied in bank valuation.

4.2.4.3. Sensitivity Analysis

We ran several tests to conduct a sensitivity analysis and an assessment of the stability of findings. As noted, our reported results are based on panel regression fixed-effect models. We also ran tests—for which we did not tabulate results—that were based on the following alternatives to the previously specified models:

- random effects (generalized least-squares method)[67] for the same variables as in the fixed-effect model reported in Table 4.2,
- year-to-year changes in the dependent and independent variables (i.e., based on changes to, rather than the levels of, the variables), and
- alternative variables—P/TB as an alternative to P/B, ROA as an alternative profitability metric, and beta and CDS spread as alternative risk metrics.

The results from these alternative tests are consistent with the reported findings.

[67]There are two approaches to panel regression—namely, fixed effect and random effect. The fixed-effect model is structured to reflect the company-specific unobservable difference in the constant or intercept of the predicted linear relationship. The random-effect model is structured to reflect the company-specific unobservable difference in the error term of the predicted linear relationship.

5. Appendix B. Explaining the Effect of Loan Impairments, Profitability, and Risk on P/B

The empirical analysis reported in Sections 3 and 4 provides an illustration of how different factors (loan impairments, profitability, and risk) influence P/B. To augment the empirical analysis, this appendix provides a conceptual explanation of the following relationships: loan impairments and P/B (Section 5.1) and profitability, risk, and P/B (Section 5.2). In Section 5.3, we examine limitations of our study.

5.1. Loan Impairments and P/B

To assess the effect of loan impairments amounts on P/B, it is useful to assess the effect of impairments charges on the numerator and denominator of the ratio. Therefore, we will show how loan impairments influence P/B by decomposing P/B and explaining the effect of loan impairments on the numerator and denominator of P/B.

5.1.1. Effect of Loan Impairments on the Components of P/B

As described in a recent BOE report, P/B can be decomposed as follows:[68]

Equation 5.1

$$\frac{\text{Price}}{\text{Book}} = \frac{(\text{Market valuation of net assets} + \text{Market valuation of future investments})}{\text{Accounting value of net assets}}.$$

Loan impairments affect the denominator (book value of equity) as well as both components of the numerator (market value). Market value can also be thought of as the combination of liquidation value (i.e., market valuation of net assets) and going-concern value (i.e., market valuation of future investments).

5.1.1.1. Effect of Loan Impairments on Book Value of Equity

By definition, loan impairments are directly reflected in the denominator (i.e., accounting value of net assets or the book value of equity) because they are a key part of the recognition and measurement of loans on the balance sheet and income statement.

[68]Bank of England (2012a).

5.1.1.2. Effect of Loan Impairments on Market Valuation of Net Assets

When valuing banks, investors make analytical adjustments to net assets to match their assessment of the real economic value of assets and liabilities on the balance sheet. For example, they apply haircuts to the reported carrying values of items on the balance sheet (e.g., loan carrying values) during reporting periods when they consider these to be overvalued, as tends to be the case in challenging economic environments.

5.1.1.3. Effect of Loan Impairments on Going-Concern Value

Net income and residual income are key inputs to determining the going-concern value. We illustrate the effect of loan impairments on going-concern value by analyzing its effects on the building blocks of the residual income valuation approach.[69]

Equation 5.2[70]

$$\text{Going-concern value} = \sum_{t=0}^{t=n-1} \frac{(\text{Residual income})_t (1 + \text{Growth of earnings})}{(1 + \text{Discount rate})^t}.$$

Equation 5.3

Residual income = [(Net interest income – Impairments charges) + Non-interest income – Operating costs – Taxes – Cost of capital].

Equation 5.2 shows that going-concern value depends on residual income, expected growth of earnings, and the discount rate. From Equations 5.2 and 5.3, we can infer that loan impairments affect both residual income and the discount rate, which, in turn, are determinants of the going-concern value.

- ***Impairments' effect on residual income—reduced residual income:*** Equation 5.3 shows that if net interest income remains unchanged, the higher the impairments charge during a reporting period, the lower the current-period residual income.[71] In addition, the higher

[69]The appropriateness of this approach for the balance-sheet-driven bank business model was explained by Dermine (2009).
[70]Baginski, Bradshaw, and Wahlen (2011).
[71]However, if a bank's business model is to lend to risky borrowers, charge high interest rates, and derive relatively high net interest margin (e.g., Capital One's business model), a relatively higher impairments level would connote higher credit risk but would not necessarily imply lower current and future profitability. Effectively, the impact of relatively higher impairments levels on the going-concern valuation of such banks depends on the extent to which banks' net interest margin offsets the credit risk implied by the higher impairments charges. In this study, impairments charge as a proportion of net interest income represents a measure of the "net-interest-income-adjusted" cost of risk.

the impairments charge during a reporting period, the lower the expected future-period residual income because forecasts of future-period residual income depend on current-period reported amounts.

Another way of intuitively explaining the relationship between loan impairments and future profitability is to note that the lifetime profitability of impaired loans is expected to be lower than that of "good loans." Creditworthy borrowers should have a longer economic life cycle and greater revenue opportunities than delinquent borrowers; creditworthy borrowers can more easily roll over existing loans. Thus, for creditworthy customers, the effective maturity or holding period for "good loan" assets is likely to be longer than the stipulated contractual maturity of such assets. The longer effective maturity of these assets allows lending banks to earn greater amounts of interest income than if the loans were written off and the business relationship with the customer were severed.

- ***Impairments' effect on the discount rate—higher discount rate:*** The higher the impairments level, the higher the perceived credit risk and the risk premium assigned to future cash flows. A higher risk premium should translate to a higher discount rate. Our data analysis supports this notion; we found a positive and statistically significant correlation of 0.55 between cost of equity and the impairments charge measure.

Hence, lower expected future residual income and a higher discount rate due to impairments should translate to a lower going-concern value. Consequently, all things being equal, higher-than-expected impairments levels should result in reduced going-concern value.

5.1.2. Modeling the Effect of Loan Impairments on P/B

To further illustrate the relationship between loan impairments and P/B, we define the following variables:

$\frac{P_0}{B_0}$ = P/B at the beginning of the reporting period.

$\frac{P_1}{B_1}$ = P/B at the end of the reporting period.

$$\alpha = \frac{\text{Market value write-downs due to impairments}}{\text{Opening book value}}.$$

$$\beta = \frac{\text{Reported impairments}}{\text{Opening book value}}.$$

$$\Phi = \frac{\alpha}{\beta},$$

which represents the relative magnitude of market write-downs compared with the reported impairments charge. Φ can be defined as a multiplier factor that reflects the relationship between α and β. This factor is not directly observable because the precise amount of market value write-downs due to impairments is not observable.

On the basis of a simplifying assumption that only loan impairments affect the numerator and denominator of P/B, we derive the updated formula for P/B:

Equation 5.4 (Derived)

$$\frac{P_1}{B_1} = \frac{\left(\frac{P_0}{B_0} - \alpha\right)}{(1-\beta)}.$$

We can also derive the formula for the proportion of change in P/B for $\beta > 0$:

Equation 5.5 (Derived)

$$\text{Proportion of change in } P/B = \left[\frac{\beta}{(1-\beta)}\right]\left[1 - \left(\frac{B_0}{P_0}\right)\Phi\right].$$

5.1.2.1. Factors Influencing Interaction between Impairments and P/B

Equation 5.5 shows that under the assumption that reported impairments are greater than zero, there are two factors that drive the proportion of change:

$$\text{Factor 1} = \frac{\beta}{(1-\beta)},$$

and

$$\text{Factor 2} = 1 - \left(\frac{B_0}{P_0}\right)\Phi.$$

These factors affect the magnitude and direction of change for the proportion of change in P/B. Both Factors 1 and 2 affect the magnitude of change in P/B as a result of impairments. The direction of change in P/B is determined by whether Factor 2 is positive or negative, which is driven by the extent to which $\left(\frac{B_0}{P_0}\right)\Phi$ is greater or less than 1. From the formulation, we conclude that there are three drivers of the magnitude and direction of change in P/B.

- *Reported impairments:* $\frac{\beta}{(1-\beta)}$, or Factor 1, is derived from reported impairments. The greater the reported impairments, the greater this factor and the magnitude of change in P/B will be.

- *Original P/B:* $\frac{B_0}{P_0}$, a component of Factor 2, is the inverse of the original P/B, meaning that the greater the original P/B, the lower the magnitude of change in P/B will be as a result of impairments. In addition, the lower the magnitude of the original P/B, the more likely it is that $\left(\frac{B_0}{P_0}\right)\Phi > 1$. Hence, the lower the original P/B, the more likely it is that P/B will decrease as a result of impairments.

- *Magnitude of investors' independent estimate of impairments as a multiple of reported impairments:* Φ, a component of Factor 2, is defined as the extent to which investors' independent estimate of impairments is a multiple of reported impairments. The higher the magnitude of Φ, the more likely it is that $\left(\frac{B_0}{P_0}\right)\Phi > 1$ and there will be a corresponding decrease in P/B.

In sum, the direction and magnitude of change in P/B resulting from loan impairments depend on (1) reported impairments, (2) the magnitude of original P/B, and (3) the magnitude of market value write-downs due to impairments relative to reported impairments.[72]

5.1.3. Financial Crisis Effects on Impairments and P/B Interaction

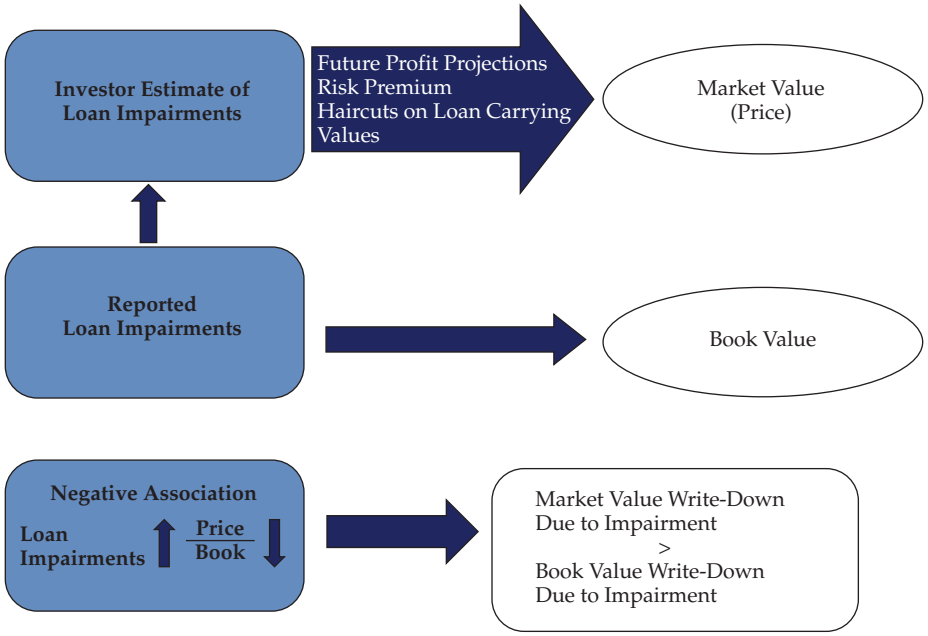
Liu and Ryan (2006) showed that banks tend to delay their recognition of loan losses in challenging economic environments. In a similar vein, we assumed that during the financial crisis periods and under the incurred-loss impairments methodology for measuring financial assets, investors' market value write-downs due to their independent assessment of impairments likely exceeded the reported loan impairments.[73] Consequently, we expected the higher magnitude of market value write-downs of net assets compared with the reported impairments during the financial crisis reporting periods to be the dominant factor influencing the magnitude and direction of change in P/B, and we expected P/B to decline during this period. **Figure 5.1** depicts the expected interaction between impairments and changes in P/B.

In addition, owing to the relatively higher magnitude of the market value write-down of assets compared with reported impairments, there was a relatively muted observable effect of reported impairments on P/B on a contemporaneous basis during the financial crisis period, as we showed in Section 4.2 by testing, via regression analysis, the contemporaneous relationships between P/B and allowance for loan losses from the same reporting period.

[72]A negative association (i.e., loan impairments increases corresponding to P/B declines) is expected for banks where the original P/B is less than 1. For observations where the original P/B is greater than 1, the expected direction of change in P/B will in part depend on the magnitude of market value write-downs related to impairments.

[73]Our assumption is consistent with the widespread assumption that there was delayed recognition under the incurred-loss methodology and is also backed by academic evidence related to the financial crisis. For example, Laux and Leuz (2010) reviewed four independent loss estimates versus the implied reported losses of the four biggest US banks. Implied losses are derived from the amortized cost carrying value, disclosure of the fair value equivalent of the loans, and the loan loss allowance. In all cases, the implied losses were significantly understated compared with the independent loss estimates.

Figure 5.1. Expected Relationship (Negative Association) between Loan Impairments and P/B



5.2. Profitability, Risk, and P/B

The going-concern value, which is a component of market value, can be decomposed as shown in Equation 5.6.[74]

Equation 5.6

$$\text{Going-concern value} = (\text{Book value})\sum_{t=0}^{t=n-1}\frac{(\text{ROE} - R)_t(1+G)}{(1+R)^t},$$

where

ROE = Return on equity

R = Required return or discount rate

G = Expected growth rate of earnings

t = Future time period being discounted to reflect the time value of money

The aforementioned decomposition effectively shows that going-concern value is a function of (1) expectations of future profitability—that is, as represented by (ROE – R)(1 + G)—and (2) the risk premium, including information risk reflected in the required return or valuation discount rate (i.e., R).

[74]Baginski et al. (2011).

5.2.1. Expectations of Future Profitability and P/B

In this study, we analyzed the effect of various profitability measures, such as ROE, on P/B and the market value of banks. The decomposition shown in Equation 5.6 shows the link between ROE and going-concern value, which is a component of market value (stock price). This link arises because expectations of future profitability (a key input in valuation) are derived from the reported profitability (e.g., ROE) and the expected growth or decline of reported profitability (*G*). The aforementioned decomposition shows that, all things being equal, incremental ROE should result in increased going-concern and market values.[75] Correspondingly, a higher ROE should result in a higher P/B. In other words, ROE and other measures of profitability should have a positive association with stock price and P/B.

That said, one inherent flaw in applying ROE as an indicator of value-relevant future profitability is that under the prevailing capital adequacy determination regime, it could fail to reflect differential returns derived purely from different risk-weighted assets. It is plausible that investors blindly trusted the reported aggregate ROE as an indicator of future profitability without sufficiently considering whether the sources of income had adequate levels of risk-weighted equity capital. Furthermore, as discussed in Section 1.2.2, there could be phases where the relationship between realized/reported profitability and future profitability or stock price would be broken (e.g., owing to regulatory changes). Notwithstanding these shortcomings, analyzing the relationship between ROE, ROA, stock price, and P/B is necessary for building an understanding of the overall factors influencing P/B.

5.2.2. Risk and P/B

Equation 5.6 shows that the market value of banks also depends on the risk premium, as reflected in the discount rate (i.e., *R*). According to financial economic theory (i.e., the capital asset pricing model), aggregate risk can be decomposed into systematic or undiversifiable risk and unsystematic, idiosyncratic, or diversifiable risk.

Systematic risk reflects the vulnerability of a company's stock price to general macroeconomic risk factors (e.g., GDP growth rates, interest rates, and currency exchange rates). Systematic risk is measured by stock price beta and is considered to be the relevant valuation risk metric under the capital asset pricing model. However, this viewpoint—that systematic risk is the only relevant risk factor for entity valuation—has been challenged by research that shows that beta measures derived from fundamental reported attributes (e.g., ROE) have a bearing on valuation.[76] That said, it is difficult to measure the unsystematic risk for banks. This type of risk is shaped by bank-specific characteristics, including the business model, human capital, and risk management capabilities. Risk associated with the business model encapsulates the following risk categories:

- financial instrument risk (e.g., credit, liquidity, funding, and market risk);
- balance-sheet management risk, including asset/liability management;

[75]Incremental ROE would have an effect on both the book value and the market value of equity. However, owing to its impact on the going-concern value, incremental ROE would have a greater effect on the market value of equity than on the book value of equity. Stated differently, all things being equal, an accretion of firm value will arise from the anticipated recurrence of the incremental ROE during future periods.
[76]Nekrasov and Shroff (2009).

- strategic risk arising from capital investment and operational choices (e.g., product mix, customer mix, branch and other distribution networks, technology); and
- operational risk arising from human capital, technology, and internal processes.

Overall, it is challenging to meaningfully measure and aggregate all these risk categories into a single firm-wide measure. The difficulty in measuring entity-specific aggregate risk is exacerbated by the limited availability of comparable time-series data across banks related to the different categories of risk. Because of the difficulties in measuring aggregate risk, we confined our risk measures to stock price beta (i.e., systematic risk) and cost of equity.

5.3. Limitations of Study

Our study has the following limitations.

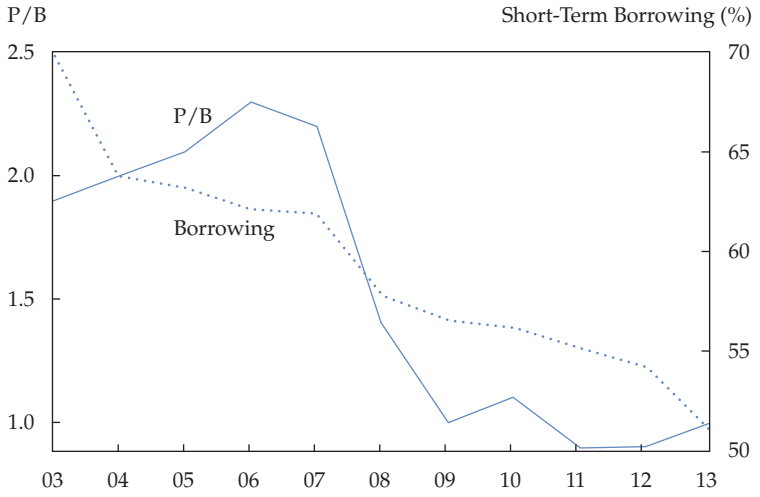
- *Sample size:* The sample of 51 banks is relatively small for the purpose of generalizing our findings for the entire population of banks around the world. Nevertheless, our findings pertain to and sufficiently shed light on the characteristics of large, complex banking groups, including SIFIs, from key jurisdictions around the world. Our sample includes 72.5% (29 of 40) of the banks identified as large, complex banking groups by the 2013 European Financial Stability report.[77]
- *Exclusion of macroeconomic factors:* Our study primarily focuses on the effects of loan impairments on P/B but also includes the effects of profitability and company-specific risk. That said, there is a broad range of country-specific factors that could influence stock price and P/B, including GDP growth rates, interest rates, unemployment rates, housing market bubbles, and central bank interventions, such as the ECB monetary operations and quantitative easing.

  Owing to constraints in sourcing readily available macroeconomic data, which would be relevant for each analyzed bank, we captured these factors in a relatively simplistic way—specifically, by using a crisis period indicator variable (i.e., pre-2008 = 0 and 2008–2013 = 1).

  A detailed examination of the effects of macroeconomic factors on P/B was outside the scope of this study. As noted previously, the primary objective of this study was to assess how loan impairments affected P/B. That said, there is an opportunity for further studies to investigate P/B changes based on the inclusion of precise measures of macroeconomic factors.
- *Exclusion of fundamental bank attributes that affect value:* The CAMELS framework is widely used in bank valuation and risk analysis, and it focuses on capital adequacy, asset quality, management quality, earnings, liquidity, and sensitivity to interest rate changes. Of these attributes, we assessed only asset quality, earnings, and capital adequacy. We also assessed loan-to-deposit ratios and the proportion of short-term borrowing, which are measures for funding risk, but there was no discernible, economically meaningful relationship between these factors and P/B. For example, as **Figure 5.2** shows, the level of short-term borrowing has fallen since the beginning of the crisis, but this trend has not translated to discernible improvement in P/Bs.

[77]European Central Bank (2013).

Figure 5.2. P/B vs. Short-Term Borrowing



However, we did not assess management quality or conduct interest rate sensitivity analysis (gap analysis of excess of fixed-rate assets over fixed-rate liabilities subject to re-pricing within one year).[78] We excluded these factors in our study because of difficulties in obtaining robust and comparable data across our global sample of banks.

- *Limitations in comparability of impairments, P/B, and other ratios:* As discussed in the supplemental paper to this study, inconsistency is likely in the determination of impairments across banks and across countries.[79] This inconsistency alongside other differences in accounting treatment could mean that P/B and the reported book values of loans and equity are not fully comparable. That said, the issue of limited comparability arises for all reported information (e.g., earnings and revenue) and other ratios (e.g., P/E, ROE) derived under the existing financial reporting framework. However, such information is still used for analytical and general comparison purposes.

- *Limitations due to the efficient market hypothesis not necessarily holding:* One of the foundational assumptions of value relevance studies is that stock prices principally reflect all available fundamental information on economic attributes and that all such information is rapidly reflected in prices by rational capital market participants. In other words, stock prices reflect all fundamental information completely and quickly. Needless to say, there is abundant evidence of situations where stock prices do not reflect rational expectations of capital market participants but instead reflect market panic, risk aversion, and behavioral biases. These three factors may have been influential during the financial crisis and could account for the low P/Bs of banks. Although it is hard to precisely model behavioral factors, we included a crisis indicator variable in the regression tests to capture such factors.

[78]Gap analysis is a technique of asset/liability management that can be used to assess interest rate risk or liquidity risk.
[79]CFA Institute (Forthcoming 2014b).

Glossary of Selected Terms

Accounting Terms

Amortized Cost of a Financial Asset or Liability: The amount at which the financial asset or liability is measured at initial recognition minus the principal repayments plus or minus the cumulative amortization, using the effective interest method, of any difference between the initial amount and the maturity amount and, for financial assets, adjusted for any loss allowance.

Effective Interest Method: The method that is used in the calculation of the amortized cost of a financial asset or liability and in the allocation and recognition of the interest revenue or expense in profit or loss over the relevant period.

Expected-Loss Method of Impairments: In the expected-loss method, an impairments loss reflects all possible default events over a particular period in the future, which may be the life of the financial instrument.

Fair Value: Both IFRS and US GAAP define fair value on the basis of the notion of an exit price. Exit price is defined as the price that would be received when selling an asset or paid when transferring a liability in an orderly transaction between market participants.

Gross Carrying Amount of Loans: The amortized cost amount of loans, prior to any deductions for allowance for losses.

Impairments Loss or Impairments Charge: Loan impairments primarily represent the write-downs in the carrying value of loans due to the deterioration in the ability of banks' borrowers to fulfill their contractual payment obligations to the bank. In other words, loan impairments should occur when there is a decline in the expected recoverable cash flows from bank borrowers.

Incurred-Loss Method of Impairments: In the incurred-loss method, an impairments loss is recognized upon the occurrence of a triggering event that is considered to be objective evidence of a deterioration in credit quality.

Loan Loss Provision or Allowance for Loan Losses: A reserve created to provide for losses that a bank expects to take as a result of uncollectable or troubled loans. It results in a noncash charge to earnings and includes transfers to bad debt reserves due to write-offs (in Japan), impairments charges, and impairments reversals.

Net Asset Value: The value of a firm's assets minus the value of its liabilities. It is equivalent to the book value of equity or shareholders' equity.

Net Carrying Amount of Loans: Gross carrying amount less any loss allowance and other adjustments.

Nonperforming Loans: Loans for which contractual payments are delinquent, usually defined as being overdue for more than a certain number of days (e.g., more than 30, 60, or 90 days). The NPL ratio is the amount of nonperforming loans as a percentage of gross loans.

Tangible Assets: Total assets less intangible assets, such as goodwill and deferred tax assets.

Tangible Book Value of Equity: Shareholder value of equity less intangible assets, such as goodwill.

Financial Terms

Performance Metrics

Net Interest Margin (NIM): This measure of the profitability of bank lending is shown by the following ratio:

$$\frac{(\text{Interest income} - \text{Interest expense})}{\text{Interest-earning assets}}.$$

Return on Assets (ROA): ROA (Net income ÷ Total assets) is another commonly used measure of profitability. Relative to ROE, ROA is a more comparable measure of profitability across banks because it is based on profitability relative to total capital employed and does not portray a better profitability picture for banks that derive extra return purely from having higher leverage. However, similar to ROE, it does not account for the risk weights of assets, and as noted in our findings, ROA is not comparable for EU and US banks owing to differing derivatives offsetting requirements in their respective accounting standards (IFRS and US GAAP).

Return on Equity (ROE): ROE (Net income ÷ Equity) is a commonly applied measure of profitability. This metric has several limitations, including potentially overstating the profitability of highly leveraged firms owing to failing to adjust for profitability derived from excess leverage. During exuberant market environments, banks with high leverage could appear to be more profitable than those with low leverage. ROE also fails to adjust for other forms of excess risk taking and does not account for the relative risk weights of assets used. For example, banks could derive additional returns simply from holding relatively riskier assets.

Valuation-Related Terms

Capital Asset Pricing Model (CAPM): The CAPM is one of the key asset pricing theorems in financial economics. It posits that investors get rewarded only for taking undiversifiable risk. The formulation determines required return by determining excess return. Excess required return for individual stocks is determined by considering the risk-free rate, the market risk premium (i.e., the long-term additional return of a diversified index relative to the risk-free rate), and the individual stock price beta.

Credit Default Swap (CDS) Spread: A CDS is a credit derivative designed to provide credit protection to the buyer or seller of the derivative. The payout is triggered by a credit event (e.g., default by the underlying credit or one of the counterparties). The CDS spread is the premium

paid by the buyer to the seller of the CDS and reflects the price of the credit risk for the particular counterparties. CDS spreads are available for reference entities or companies and are an indicator of credit market investors' views on credit risk.

Efficient Market Hypothesis (EMH): The EMH is a key foundational financial economic theorem, and it is one of the key pillars of modern finance. The EMH holds that all available information is reflected in financial asset prices (e.g., equity prices) by rational investors.

Franchise Value: Franchise value is another way of describing the going-concern portion of a company's overall market value.

Going-Concern Value: This is the underlying value of a business as a result of it being a going concern. In other words, it is the value that will arise as a result of future profitability derived from a company employing its assets, including both those that are recognized on the balance sheet and those that are not.

Liquidation Value: This is the breakup value of a company, or the value that could be received if the company's assets were sold and its debts were paid. Theoretically, the tangible book value of a bank should reflect its breakup or liquidation value. However, differences between liquidation and tangible book values occur because (1) some assets and liabilities are reported at amortized cost and not at market (or fair) values, (2) book value does not incorporate the costs of liquidation, and (3) there could be assets and liabilities that are off balance sheet (e.g., assets and liabilities related to unconsolidated structured entities or unrecognized intangible assets).

Price-to-Book Ratio (P/B): P/B is one of the key valuation metrics (a measure of relative value) and is particularly relevant for the banking industry. A similar metric is the price-to-tangible-book ratio (P/TB). P/B is determined by dividing the current closing price of a stock by the recent closing book value per share.

Residual Income Valuation Method: This is one of the fundamental valuation approaches. It is based on forecasting and discounting future residual income, with the company's reported earnings as the starting point. It differs from other fundamental valuation methods, such as the discounted cash flow method, which is based on forecasting and discounting future cash flows.

Systematic Risk: This form of risk is the non-diversifiable component of a company's overall risk. It reflects the uncontrollable impacts of the external market environment on the company's stock price. It is measured by the covariance of the stock price relative to the movement in the market index (i.e., stock price beta). The asset pricing framework in financial economic theory holds that investors get rewarded only for bearing the non-diversifiable component of risk.

Unsystematic or Idiosyncratic Risk: This form of risk is the diversifiable component of a company's overall risk.

Terms Related to the Bank Business Model

Large, Complex Financial Institution (LCFI): LCFIs are systemically important financial institutions that are involved in a diverse range of financial activities and geographical areas. Typically, they are interconnected with other financial institutions.

Systemically Important Financial Institution (SIFI): SIFIs are financial institutions that are considered to bear systemic risk.

Statistical and Mathematical Terms

Descriptive Statistics: Statistical measures used for describing and analyzing data that enable the researcher to summarize and organize data in an effective and meaningful way. They include such statistics as mean, median, and standard deviation.

Statistical Regression: This is a method for analyzing the relationship between selected values of independent variables, x, and observed values of the dependent variable, y (from which the most probable value of y can be predicted for any value of x). Regression analysis is the use of regression models to make quantitative predictions about one variable from the values of another.

Statistical Measures

Correlation: Correlation is a measure of the interrelatedness of two or more variables.

Mean or Arithmetic Mean: This is the sum total of all observations divided by the number of observations.

Median: This measure of central tendency is defined as the point above and below which 50% of observations fall.

Standard Deviation: This is a commonly used measure of variability whose size indicates the dispersion of a distribution.

Inputs to Regression Models

Dependent or Outcome Variable: In the context of regression testing, this is the variable that is influenced by other variables. It is often the primary factor being investigated. In this study, P/B is the dependent variable.

Independent or Predictor Variable: These variables influence the dependent variable. In this study, loan impairments are the primary independent variable. Other independent variables include profitability and risk measures. Independent variables are alternatively called explanatory variables, predictor variables, or regressors.

Indicator or Dummy Variable: An indicator variable is used for factors that may influence the relationship being tested and where the underlying data are categorical in nature (e.g., binary data values, such as male or female). An indicator variable typically has a value of 1 signifying one category (e.g., female) and 0 signifying the other category (e.g., male). For example, in this study, the crisis indicator variable is assigned a value of 1 for the crisis period (2008–2013) and 0 for the pre-crisis period (before 2008).

Interaction Variable: Interaction variables allow for the regression method testing of the interaction between an indicator variable and other variables. For example, in this study, an interaction variable allowed us to test whether a particular time period influenced the relationship between loan impairments and P/B. Interaction variables are derived as the product of the indicator variable and the independent variable and are then included in the regression specification.

Panel Data: Panel data combine cross-sectional and time-series data. Cross-sectional data are data across multiple entities (e.g., companies, countries, or people) for a single time period. Time-series data are data pertaining to a single entity (e.g., a company, country, or person) over multiple time periods. The panel data format is fairly common in finance and accounting research studies.

Other Regression Model Terms

***F*-Test:** This is one of the key measures of whether inferences can be made from the regression model. Before assessing the beta coefficients, it is necessary to assess the *F*-statistic of the regression model. If the *F*-statistic is statistically insignificant, the model cannot be relied on for any further inferences. The *F*-statistic is essentially a ratio of the explained variability to the unexplained variability. Thus, a larger *F*-statistic indicates that more of the total variability is accounted for by the model (which is a good thing).

Homoscedasticity: Homoscedasticity is one of the necessary conditions for reliable linear regression results. It means that the variance of the error term is the same for all observations.

Measures of Statistical Significance of Regression Coefficient: The statistical significance of the beta coefficients is assessed by the *t*-statistic. The *t*-statistic is a measure of the level of confidence that the beta coefficient is not zero. The regression model tests the null hypothesis that the beta coefficient is zero. The *t*-statistic and the standard error terms inform on the number of standard deviations the beta coefficient estimator is from zero. If it is one, two, or three standard deviations away, there is 90%, 95%, and 99% confidence, respectively, that the beta coefficient is not equal to zero. Consequently, the *t*-statistic enables researchers to judge whether they can make inferences from regression coefficients.

Multicollinearity: Multicollinearity is a statistical phenomenon in which two or more predictor variables in a multiple regression are highly correlated. When multicollinearity exists, coefficient estimates of the multiple regression may change erratically in response to small changes in the model or the data.

Ordinary Least-Squares (OLS) Regression: This is one of the most commonly used regression models, and it is common in studies that investigate the economic relationships between different factors/attributes across companies. OLS regression assumes linear relationships between

the dependent and independent variables. It is described as "least-squares" because its estimation method minimizes the sum of squared vertical distances between the observed responses in the data being tested and the responses predicted by the linear approximation. However, OLS regression is not always appropriate. For example, applying OLS regression for panel data can result in false inferences being made regarding relationships between particular independent variables and the dependent variable.

Panel Regression: This is one of the appropriate regression approaches for panel data. It presupposes and makes adjustments for the existence of unobservable firm- or time-specific factors that could influence the relationship between the tested dependent and independent variables. Consequently, it leads to more accurate regression coefficients and accompanying measures of statistical significance (e.g., *t*-statistics). There are two commonly applied forms of panel regression tests: fixed effect and random effect.

***R^2*:** Measured in percentage terms, R^2 is described as a goodness-of-fit measure. It conveys the extent to which the relationship being tested is adequately explained by the regression model.

Regression Coefficient (Beta Coefficient): Regression or beta coefficients for each independent or predictor variable are part of the key outcome of the regression model. These coefficients are estimators of the relationship between the independent and dependent variables. A beta coefficient of 0.8 would indicate that a change in one unit of the independent variable would result in a change of 0.8 unit of the dependent variable.

Statistical Significance: Statistical significance describes an outcome that is not merely the result of chance. In a regression model, the hypothesis tested (i.e., the null hypothesis) is that the regression coefficient is equal to zero. If the regression coefficient is unlikely to be equal to zero, then it can be considered an appropriate estimate.

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[80]The objective of the Corporate Disclosure Policy Council (CDPC) is to foster the integrity of financial markets through efforts to address issues affecting the quality of financial reporting and disclosure worldwide. The CDPC comprises investment professionals with extensive expertise and experience in the global capital markets, some of whom are also CFA Institute member volunteers. In this capacity, the CDPC provides the practitioner's perspective in the promotion of high-quality financial reporting and disclosure that meet the needs of investors.

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