The Value Relevance of Regulatory Capital Components

MARTIEN LUBBERINK[a1] and ROGER WILLETT[b2]

[1]Victoria University of Wellington

[2]University of Tasmania

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[a]*Corresponding Author*: School of Accounting and Commercial Law, Victoria University of Wellington, PO Box 600, Wellington 6140, New Zealand. W: +64 4 463 5968; M: +64 21 134 7500; F: +64 4 463 5076. Email: martien.lubberink@vuw.ac.nz.

[b]Tasmanian School of Business & Economics, University of Tasmania, Hobart. W: +61 3 6226 2192 Email: roger.willett@utas.edu.au.

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ABSTRACT This paper examines the value relevance of regulatory bank capital components. Using quarterly U.S. bank data from 2001 to 2015, we empirically examine the value relevance of the following capital components: *i*) Tier 1 capital, *ii*) regulatory adjustments, and *iii*) Tier 2 capital. Our research design relies on multiplicative regression models that mitigate shortcomings of conventional research designs. Contrary to results from studies using conventional research designs, our results show that the value relevance of components of bank capital is fairly stable over time, but diminishes slightly during the global financial crisis and increases afterwards. The regulatory adjustments generally have a negative association with market returns. If we partition the regulatory adjustments into positive and negative adjustments, our results show that relative changes in positive (negative) adjustments are negatively (positively) associated with market returns. We find mixed results for the regulatory adjustments that drive our results. Goodwill and intangibles are excluded from regulatory capital, but they are positively associated with market returns. Deferred tax assets, on the other hand, are negatively associated with market returns. Additions to capital are generally associated with negative returns. The association of Tier 2 capital with market returns becomes strongly negative after the fall of Lehman brothers. These results reveal inconsistencies in the way regulators define regulatory capital.

Keywords: *Banking, valuation, prudential filters*.

JEL codes: *E58, G21, G32, M41*.

I. Introduction

The global financial crisis prompted renewed attention to bank capital. In the wake of the crisis, rules on regulatory capital have changed. New capital rules (Basel III) have entered into force (BCBS, 2010, OCC, 2013). In anticipation of these rules, banks have been increasing the level of regulatory capital (BCBS, 2014).

The attention to bank capital is focused predominantly on the levels of capital, although opinions on the benefits and costs of bank capital vary. Whereas Mehran and Thakor (2011), Admati, DeMarzo, Hellwig, and Pfleiderer (2013), Berger and Bouwman (2013), Thakor (2014) and Admati, DeMarzo, Hellwig, and Pfleiderer (2015) highlight the benefits of increased levels of bank capital, others highlight important drawbacks (e.g., Diamond and Rajan, 2001, Kashyap, Rajan, and Stein, 2008, DeAngelo and Stulz, 2013).

Surprisingly little has been written about the structure of regulatory capital. This lack of attention to the structure of regulatory capital is surprising for four reasons.

First, regulation alters the structure of regulatory bank capital. Bank capital rules require banks to apply adjustments to book equity to calculate regulatory capital—where book equity is the starting point of the calculation of regulatory capital and solvency ratios (Federal Reserve, 2005, FDIC, 2012, OCC, 2012). The adjustments are intended to exclude from capital items that do not contribute to the safety and soundness of the banking system, and include items that do contribute to the safety and soundness of the banking system.

Examples of items that are deducted from book equity are goodwill, deferred tax assets (DTAs), mortgage servicing rights (MSRs), and unrealised gains on available-for-sale securities. Examples of items added to regulatory capital are specific perpetual securities, subordinated debt securities and unrealised losses on available-for-sale debt securities (Federal Reserve, 2005, 12 CFR 225, 2012). Consequently, regulatory capital differs from "accounting capital" or book equity.

This paper shows that various non-common equity components can increase (decrease) Tier 1 capital up to 13.4% (24.4%) of risk-weighted assets. Tier 2 capital can increase regulatory capital by up to 14.9% of risk-weighted assets. These differences are significant and warrant attention from banks and regulators.

Second, bank solvency regulation does pay attention to the structure of regulatory capital. For example, Basel III aims to raise both the *quantity* and the *quality* of regulatory capital (BCBS, 2010, sections 8 and 9).

Moreover, the discussions on the structure of capital, i.e., on which items can or cannot count as regulatory capital, are often impassioned. A case in point is the controversy around mortgage servicing rights (MSRs, Harper (2010)). Under Basel III rules, these are now deducted from capital. Banks resisted this deduction, see for example the response of Wells Fargo to the Basel III proposal:

> "[the proposal] ... would require that all intangibles be deducted from Common Equity. Although we believe there is sufficient uncertainty as to the realizable value of certain intangible assets to warrant their deduction, we do not believe that is the case for all intangible assets. Mortgage-servicing assets, nonmortgage-servicing assets and purchased credit-card relationships have shown themselves to have demonstrable realizable value over sustained periods."[1]

Only recently, the four joint agencies (Federal Reserve Board, the FDIC, the OCC and the National Credit Union Administration) issued a report defending these deductions (Federal Reserve Board, 2016).

Another example is the ongoing discussion of the inclusion of unrealised gains and losses in regulatory capital (Becker, 2013, Chircop and Novotny-Farkas, 2015).

Third, non-common equity additions to regulatory capital have been criticized for lack of an ability to absorb losses Ball (2008), Braithwaite and Sender (2010), Collins (2010). The alleged dysfunctional additions to regulatory capital were an important reason for the Basel Committee to amend the definition of capital after the onset of the global financial crisis.

Lastly, recent literature identifies the items that banks add to and deduct from regulatory capital as an area of future research (Beatty and Liao, 2014, BCBS, 2015).

The reasons above prompt the question: what do we know about the relevance of the elements that define regulatory capital? To answer that question, this paper examines the value relevance of bank capital components, where we interpret value relevance the way Barth, Beaver, and Landsman (2001) do. However, unlike Barth et al., we use a research design that relies on multiplicative regression models that mitigate shortcomings of conventional research designs. Consequently, we use the market elasticity of various regulatory capital components as our measure of value relevance.

[1] See www.bis.org/publ/bcbs165/wellsfargo.pdf

Using data of U.S. banks covering the quarters from 2001 to 2015, we empirically examine the market elasticities of the following capital components: *i*) Tier 1 capital, *ii*) regulatory adjustments, and *iii*) Tier 2 capital. We compare the elasticities of these components to those of the book value of equity, given that holders of common equity have the residual claim on the future cash-flows of the entity in which they invest.

The main results of our paper show that components such as the book value of equity and the Tier 1 explain well over 87% of the variation in market returns, that is, in regressions that pool observations over quarters. Coefficients of determination raise to 94% (93%) for book value of equity (Tier 1) when we rely on quarterly regressions (untabulated). These R^2s are high compared to similar studies that use additive regression models.

In addition, we show that the market elasticity of book values stays close to the predicted value of one (1), with a pooled average of 1.03. The market elasticity of Total capital (Tier 1 and Tier 2 capital) generally exceeds the market elasticity of book values, and the market elasticity of Tier 1 exceeds the market elasticity of Total capital. Still, these elasticity values are much more stable than those reported by conventional research designs, of which we replicate one (see Appendix).

When we separate the book value of equity into Tier 1 capital and net regulatory adjustments, our results show that the market elasticity of Tier 1 capital rises after the global financial crisis (albeit that this rise is temporary). This indicates that increases in Tier 1 are associated with increases in market returns, a result one would expect to find during the aftermath of a banking crisis.

The market elasticity of the net regulatory adjustments are generally negative, especially after the collapse of Lehman (2008Q4). However, if we partition the regulatory adjustments into positive and negative adjustments, our results show that positive regulatory adjustments are associated with the negative market elasticities. Apparently, an increase of non-common equity capital components is associated with negative returns: non-common equity or hybrid capital instruments are bad news apparently. On the other hand, the market elasticities of negative regulatory adjustments (e.g. excluded goodwill) are generally positive. These results reveal a tension between prudential rules and investors' interests: the market has a negative view on non-common equity items that increase regulatory capital, but it has a positive view on elements (e.g. goodwill) that the regulator deducts from capital.

We then drill down into five particular regulatory adjustments: *i*) the deduction of goodwill and intangibles, *ii*) the deduction of deferred tax assets (DTAs), *iii*) the deduction of mortgage servicing rights (MSRs), *iv*) the prudential filter on unrealised gains and losses on available for sale (AFS) securities, and *v*) the inclusion of minority interests. These regulatory adjustments are the most significant adjustments. Moreover, these adjustments were all the subject of intensive discussions between regulators before the finalization of Basel III (Simonian, 2010, BCBS, 2009, Enrich and Paletta, 2010).

Our results show mixed evidence on the relevance of the four regulatory adjustments. On the deduction form capital of DTAs, investors and prudential rules agree: this deduction has a negative market elasticity. Investors discount these assets, thus indicating that banks are not able to generate sufficient profits to amortise these assets on time. The market elasticity of goodwill and intangibles is positive. Investors value these adjustments positively, even though regulators deduct them form equity. The coefficient on MSRs is insignificant, which is a surprise given that Basel III created the same exemption for this item as for DTAs.

Results on the prudential filter on unrealised gains and losses on AFS securities are mixed: the results from pooled regressions show positive market elasticities for the filter on unrealised gain and unrealised losses, but these coefficients are close to zero and marginally significant. Results from aggregated cross-sectional regressions confirm these positive coefficients but support them with significant t-statistics calculated according to Fama and MacBeth (1973).

The market elasticity of minority interests is negative, albeit that the economic and statistical significance of the results on minority interests is limited.

Lastly, we examine the market elasticity of Tier 2 capital. The coefficient on this component of regulatory capital declines during the global financial crisis. This is likely the result of increases in banks' loan loss reserves, which predict future losses (Ng and Roychowdhury, 2014). This result is also in line with Badertscher, Burks, and Easton (2014), who document that banks' Other than Temporary Impairments (OTTI) predict future losses.

Additional tests show that the market elasticity of Tier 1 capital increases with bank leverage: an increase in Tier 1 capital is associated with good news, in particular when a bank is highly levered. We also compare our results of the market elasticities of bank preferred stock with preferred stock of non-financial firms. The

results generally show positive signs on the market elasticities of preferred stock of non-financials, whereas the coefficients for banks' preferred stock are generally negative.

This paper contributes to the literature by documenting the value relevance of regulatory capital components. Our research design also shows the benefits of a multiplicative regression model. The coefficient estimates of elasticities that our research design produces are generally consistent with results from existing studies but are much clearer in their policy implications and show stable patterns over time corresponding to what we would expect based upon events occurring in the wider economy.

Our results may have policy implications in that they show that not all regulatory adjustments are equally relevant. For example, the deduction of goodwill and intangibles is taken for granted, but its market elasticity is significant and positive. On the other hand, the deduction of mortgage servicing rights was controversial, but its market elasticity is marginally significant.

With the Basel Committee on Banking Supervision gathering views on leverage ratio, which relies on a numerator that includes non-common equity capital components, this paper may contribute to the debate on the definition of capital ratios (BCBS, 2016).

II. Literature

The existing literature on components of regulatory capital originates mainly from accounting studies that focus on the allowance for loan and lease losses includible in Tier 2 capital. See, for example, Kim and Kross (1998) and Ramesh and Revsine (2000). Ng and Roychowdhury (2014) document a positive association between the allowance for loan and lease losses includible in Tier 2 capital, an "add-back" to capital, and the risk of bank failure. Their study confirms the results of Laeven and Majnoni (2003), who show that banks tend to postpone provisioning. Gebhardt and Novotny-Farkas (2011) show that accounting rules that rely on the recognition of incurred losses (instead of expected losses) are an incentive to postpone provisioning. In doing so, accounting rules may frustrate the prudential objectives of Tier 2 capital.

Results of studies examining Tier 2 capital may not be generalizable for all banks, in particular for going-concern banks. Tier 2 capital is increasingly seen as "gone concern" capital. Its role in going concern is limited and diminishing. As opposed to Tier 1 capital, which absorbs losses in going concern by the deduction of losses from book equity, Tier 2 capital acts as a buffer that can be drawn down to limit "losses given default." Tier 1, on the other hand, should reduce the probability of a bank defaulting. New bank

solvency rules, e.g., Basel III, formalize these two separate roles of Tier 1 and Tier 2. The former has a going-concern role, and the latter has a gone-concern role (BCBS, 2010, 2011).

In the literature on regulatory capital, there is broad agreement that bank capital is expensive. Two important factors that drive the high cost of bank capital are subsidized debt and the benefits forgone by less-intense creditor monitoring.

Tax deductibility of debt increases firm value with leverage (Modigliani and Miller, 1963). As the probability of default increases with leverage, banks may limit their indebtedness to the levels observed in corporate firms. However, in the presence of a regulatory safety net that mitigates the effects of bank failure on the financial system, banks may increase leverage beyond corporate levels. Berger, Herring, and Szegö (1995) document that the leverage of banks has increased since the nineteenth century. Equity to asset ratios rose from about 1:1 in 1840 to about 14:1 at the end of the twentieth century. Moreover, the increases in leverage documented by Berger et al. coincide with regulatory initiatives that "widened" the safety net for banks. Poole (2009) and Admati et al. (2015) show that subsidized debt is distortive.

The literature on creditor monitoring highlights the special role of banks in society as financial intermediaries. This literature acknowledges the limits of high solvency levels. More capital may "crowd out" creditors and depositors, which diminishes their role of monitoring bank managers. This may lower managerial effort levels, or it may lower managers' commitment to collect cash flows from debtors (Diamond and Rajan, 2001).

Another paper that relies on monitoring by creditors is that by Kashyap et al. (2008), who advance the idea of capital buffers that vary with the business cycle. In good times, the capital requirement should be set at a relatively high level such as 10%. In a crisis, this requirement should be lowered to 8%. This idea is now part of the Basel III capital rules, which introduce a countercyclical buffer that will be deployed in times of excess aggregate credit growth (BCBS, 2010, sections 3 and 4). Whether these buffers will work remains to be seen. The capital requirements in good times may be set too high for monitoring purposes, and the low capital requirements in a crisis may be set too low to deter managerial risk taking (Acharya, Mehran, and Thakor, 2010).

Admati et al. (2013) argue that the global financial crisis has demonstrated the limits of creditor monitoring. Creditors might not monitor because they feel protected by, for example, depositor insurance.

Moreover, banks might choose to not impose losses on subordinated debt holders, to protect future access to the market of subordinated debt.

Admati et al. therefore highlight the benefits of high levels of capital, even if they may require the regulator to devise policies that force banks to issue shares as banks resist voluntary issuances of shares. Empirical papers supporting Admati et al. (2013) include that by Mehran and Thakor (2011), who show that bank value increases with capital and thus respond to Modigliani and Miller (1958) and Miller (1995), who cling to capital structure irrelevance. Berger and Bouwman (2013) show that banks' odds of surviving a crisis increase with capital.

No empirical studies thus far have examined the relevance of separate components of regulatory capital. Although pre-Basel Accord studies have investigated items that now belong to Tier 1 capital, these papers report inconsistent results. Nor do these papers examine components of regulatory capital—the papers predominantly examine levels of capital and the management thereof. For example, in a study of commercial banks, Beatty, Chamberlain, and Magliolo (1995) used a simultaneous equation approach applied to factors that banks may use to manage tax, regulatory capital, and earnings. They found inconsistent results regarding capital management. Collins, Shackelford, and Wahlen (1995), using data around the implementation of the first Basel Accord, found similar inconsistent evidence regarding capital management. Moyer (1990), in a study on loan losses, charge-offs, and gains and losses on securities over the years 1981–1983, found inconsistent, and in some cases insignificant results regarding the use of adjustments applied to regulatory capital. Studies by Begley, Chamberlain, and Li (2006) and Skinner (2008) focus on single items only: goodwill, respectively deferred tax assets of Japanese banks, which for the sample period were not deducted from capital.

Recent literature recognizes prudential filters as an area of future research (Beatty and Liao, 2014, BCBS, 2015), which is surprising given the attention prudential filters have attracted in the past. For example, the prudential filter on fair value gains and losses due to changes in own credit standing was the subject of controversy around the introduction of IFRS in 2005 (EC, 2005). Another prudential filter that attracted controversy is the filter on deferred tax assets (DTAs). These assets were known to contribute to banking crises Skinner (2008) and were (and still are) controversial (Simonian, 2010, Enrich and Paletta, 2010, Merler, 2015, Sebag and Brunsden, 2015).

Studies on bank capital ratios employ research designs that use ratios to adjust variables by a measure of scale. For example Demirgüç-Kunt, Detragiache, and Merrouche (2013) look at the link between different solvency ratio definitions and stock market performance. Their explanatory variables are all deflated by a scale factor. Another paper is Yang (2016), Vallascas and Hagendorff (2013), who compare the leverage ratio with the risk-weighted capital ratio, to examine which ratio is a better predictor of failure. The problems of statistical specification introduced by deflated variables are well-known and we avoid these in our research design.

Studies that use "un-scaled" variables can be found in the accounting literature, see for example Ali and Zarowin (1992) who show that earnings levels explain returns. Subsequent studies e.g. Barth (1994), Dhaliwal, Subramanyam, and Trezevant (1999) (and many others) document the relevance of accounting information using variations of the following model:

$$M_{i,t} \quad = \quad \beta_0 + \sum_{n=1}^{N} \beta_j \cdot A_{n,i,t} + \varepsilon_{(i,t)} \tag{1}$$

where $M_{i,t}$ is the market value and $A_{n,i,t}$ a list of n fundamental accounting variables for the i^{th} firm all at, or in the year (or quarter) to, time t. The intercept term, β_0, and the slope coefficients, β_n, are assumed constant in the simplest models, interpreted as averages across firms, with the error term, $\varepsilon_{(i,t)}$, assumed to be approximately normally distributed for inferential purposes. The explanatory variables in the most basic fundamental analysis are the net book value of firm assets (BV) and firm earnings (E). Sometimes dividends (D) are included in the model, especially when deriving a returns model is the focus of interest (e.g. Easton and Harris (1991)).

These additive "un-scaled" models are also not free of problems, as documented by Easton (1998), who shows that the coefficients of these models too suffer from problems related to scale and recommends using scaled variables. However, the appendix to our paper shows that these models may also suffer from mis-specification problems.

A paper that uses a multiplicative approach similar to ours is Gambacorta and Shin (2016) who examine the effects of bank capital on bank activities. However, they do not examine the structure of regulatory capital or the components of regulatory capital.

Hypotheses

Based on Willett (2015) and Clout and Willett (2016) we expect the market elasticity of the book value of equity for firms in general to be positive and near to 1. This indicates that these accounting based measures of capital are sufficient by themselves to explain the greater part of market returns in the long-run.

Interest in this paper focuses on the elasticity of Tier 1 and Total capital relative to the book value of equity in banks. If either Tier 1 or Total capital exhibit elasticities significantly closer to 1 than the book value of equity, it implies the information in the bank adjusted capital variables has value relevance. Formally, therefore the first two hypotheses are:

Hypothesis 1 *The Tier 1 elasticity of market value is closer to one than the book equity elasticity of market value.*

Hypothesis 2 *The Total capital elasticity of market value is closer to one than the book equity elasticity of market value.*

When we disaggregate book value into Tier 1 and net adjustments (where net adjustments equals Tier 1 minus the book value of equity), we expect the market elasticity of adjustments that decrease Tier 1 relative to equity to be positive given that banks need to replenish any deduction by new capital. This lowers a bank's probability of default.

Hypothesis 3 *Negative adjustments to Tier 1 capital have positive elasticities of market value.*

We have no expectation regarding the sign of the market elasticity of adjustments that increase Tier 1 relative to equity. On the one hand, these adjustments should lower a bank's probability of default. On the other hand, these adjustments are often hybrid capital instruments that are equity in all but name, and because they dilute equity, they may not be valued by holders of common stock. For reasons of symmetry with hypothesis 3, our next hypothesis is:

Hypothesis 4 *Positive adjustments to Tier 1 capital have negative elasticities of market value.*

We expect the market elasticity of Tier 2 to be negative, given that this component of regulatory capital is gone concern capital, and that it is for a significant part determined by loan loss reserves (i.e. expected losses), as shown by Ng and Roychowdhury (2014).

Hypothesis 5 *The Tier 2 elasticity of market value is negative.*

III. Research design

Our choice of the research design departs from existing literature examining the relationship between stock price returns (or stock prices) and fundamental values. That literature almost invariantly relies on linear models. However, Willett (2015) shows that the market-book relation takes the form of a power law and that distributions of fundamental accounting variables such as earnings and dividends are close to being jointly lognormal. This implies the relation between market and fundamental accounting values is multiplicative rather than additive, and of the following form:

$$M_i = e^k \Pi_n |X_{i,n}|^{\beta_n} + \omega_i \tag{2}$$

where M_i is the market value of a bank at the end of a quarter and $X_{i,n}$ is a set of fundamental values. The distribution of ω_i is lognormal. To estimate this model we convert it to a linear model where the variables are the logs of the absolute values of $X_{i,n}$:

$$m_{i,t} = \beta_0 + \sum_{n=1}^{N} \beta_n \cdot x_{n,i,t} + \varepsilon_{i,t} \tag{3}$$

where $x_{n,i,t}$ comprises the following (N) variables: *i*) *BV*. This is book value excluding perpetual preferred stock at the end of the quarter [3210]–[3283][2]; *ii*) *Tier 1*. This is Tier 1 capital [8274] for pre-Basel III quarters and the Common Equity Tier 1 capital [P859] under Basel III; *iii*) *Tier 2*. This is (Supplementary) Capital [5311]; *iv*) *Net Adjustments*. These are net prudential adjustments, defined as Tier 1 minus BV, both as previously defined; *v*) *Pos Adjustments*. These are adjustments that increase Tier 1 relative to equity; and *vi*) *Neg Adjustments*. These are adjustments that decrease Tier 1 relative to equity.

[2]The mnemonics in square brackets refer to the item codes from the Consolidated Financial Statements for Bank Holding Companies (FR Y-9C); their definitions are from https://www.federalreserve.gov/apps/mdrm/data-dictionary

We use logs of absolute values because their elasticities that are close to averages of the elasticities of the positive and negative values weighted by the relative numbers of observations of each, as shown by Clout and Willett (2016).

The regulatory adjustments are taken from Schedule HC-R–Regulatory Capital of the FR Y-9C. Table 1 specifies the adjustments, as well as the their average impact on regulatory capital. The table shows that non-common equity instruments (e.g. Trust Preferred Securities and Perpetual Stock) and minority interests dominate the positive adjustments.

[Table 1 about here]

The negative adjustments are dominated by Goodwill and Intangibles, Unrealized gains on Available-For-Sale (AFS) securities, Deferred Tax Assets (DTAs), and Mortgage Servicing Rights (MSRs).[3]

IV. Sample selection and data

Our main sample uses quarterly data from U.S. bank holding companies submitted on report FR Y-9C to the Federal Reserve System.[4] We use market data for bank holding companies with a link to Center for Research in Security Prices (CRSP) data obtained via the New York Federal Reserve Banking Research Dataset website.[5]

The starting point of the sample is the first quarter of 2001. From that quarter onward, the reporting schedule for regulatory capital on FR Y-9C retained its current structure with only minor changes. The sample includes observations up to the last quarter of December 2015. All observations have December 31 year-ends.

[Table 2 about here]

[3]We ignore, for now the Additional Tier 1 capital deductions, as these have been only recently introduced by Basel III and originate from few observations

[4]To compare our results against data from non-financial companies, we also use data from Compustat where we exclude firms with SIC codes between 6000 and 6799 (financials) and between 4000 and 4999 (regulated industries). However, we will focus on the bank holding companies.

[5]See: www.newyorkfed.org/research/banking_research/datasets.html

The table shows that size variables (market value (M), book value of equity (BV), Total Assets are skewed, with the largest banks more than 25 times larger than the bank at percentile 95.

A comparison of Tier 1 values to BV shows that the former is generally smaller than the latter, which is the result of regulatory adjustments. Of the prudential adjustments, the deductions ($850M) are on average larger than positive adjustments ($394M), leading to an average net deduction from equity of $457M.

The Tier 1 ratio is 12.2%, which is comparable to existing studies. Under pre-Basel III rules, banks were allowed to report the same amount of Tier 2 capital as Tier 1 capital. In practice, however, the ratio of Tier 1 to Tier 2 capital is more prudent: the average Tier 1 amount ($1,987M) is significantly larger than the average Tier 2 amount ($585M). In addition, the Tier 1 ratio (12.2%) is also higher that the Tier 2 ratio (1.65%).

The average regulatory adjustments are relatively small. The average net adjustment is –0.79% of RWA, with negative adjustments depressing the Tier 1 ratio by 2.71% of RWA. However, maximum and minimum values of the adjustments and values at the outer percentiles show that the regulatory adjustments can have a significant effect on regulatory capital.

Our sample contains 20,328 quarterly observations, with the number of observations varying from 1,560 in 2001 to 653 in 2015, with a peak of 1,682 in 2003. The primary cause of the drop in the number of banks after 2005 is a change in the filing requirements for bank holding companies: in 2006, the threshold for filing a FR Y-9C report changed from $150 million of total assets to $500 million of total assets (Federal Reserve, 2006). The low number of observations in 2015 is because of yet to include market data from CRSP.

During the sample period, the Tier 1 ratio ranges between 10.7% and 14.4%, with lows during crises. The last rows of Table 2 shows the effect of Basel III: deductions are significantly higher and positive adjustments are significantly lower than under pre-Basel III rules.

V. Results

A. Main Results

Table 3 shows the main results of our analysis. The first row of this table shows a highly significant coefficient value of 1.03 on book value of bank equity (BV). This indicates a one percent change in book value

is associated with a 1.03 percent change in market value. The second row of Table 3 shows book value elasticities for non-financial firms. These are also close to but lower than 1.

[Table 3 about here]

The third and fourth rows show results of regressions of market values on bank Tier 1 and Total capital (TC). The elasticity on Tier 1 is greater than that on the book value of equity, which is evidence supporting the rejection of hypothesis 1. The coefficient on Total capital, is lower than Tier 1 but still higher than that on equity, although the difference in the latter case is small. This is evidence for rejecting hypothesis 2. From these results we infer that the adjustments to the accounting book value of equity, in total, do not improve the value relevance of bank measures of capital. We will revisit this result and the question of why all of the bank elasticities appear to signal an overreaction of the market to changes in Section C.

Figure 1 summarizes estimates of the elasticities of market value for the book value of bank equity, the book value of non-financials equity, bank Tier 1 capital and bank Total capital, in quarterly cross sections for the period 2001–2015. Here it is clear that the elasticity on Tier 1 Capital is usually greater than that on the book value of equity, giving greater force to the rejection of hypothesis 2. The figure shows that in the years before the global financial crisis: (the area between the two grey bands), the market elasticities of book values, Tier 1, and Total capital remained relatively stable.

[Figure 1 about here]

During the global financial crisis, however, the elasticities drop to values closer to one. From the second quarter of 2009 onward, the elasticities rise. From mid-2010 onward, the elasticities converge to 1. This may be associated with improvements in the capitalization of banks.

The dotted line shows that the market elasticities of book values of non-financial firms are more stable over all years, and slightly below one.[6] This result is what one would expect: relative to financial firms, much of the value of non-financial firms depends on future earnings, which are not reflected in the contemporaneous book value of equity (Ohlson, García-Lara, Walker, and Christodoulou, 2015).

[6]The greater stability of the non-financial elasticities is also to an extent a function of the larger sample sizes.

During the global financial crisis, the elasticities of the variables of banks converge. However, after the global financial crisis, the regulatory capital variables move in sync and separately from the book value of bank equity, which converges to 1 faster. At the end of our sample period, however, all bank variables have converged to 1. Again, Section C will discuss the divergence of elasticities from one.

The fifth row of Table 3 shows results of a pooled regression where we split the book value of equity into Tier 1 capital and net regulatory adjustments. The market elasticity of net regulatory adjustments is negative and significant. A similar result is reflected in the quarterly cross-section elasticities shown in Figure 2:

[Figure 2 about here]

The figure shows that net regulatory adjustments were not associated with market returns in the lead up to the global financial crisis. Only during the fourth quarter of 2008, the market elasticities of net regulatory adjustments start to turn negative. The adjustments turn to positive values in 2015, which we see as a manifestation of Basel III's drive to curb positive regulatory capital additions.

Row VI shows a negative coefficient on positive regulatory adjustments (–0.14) and a positive coefficient on negative regulatory adjustments (0.07). Consequently we cannot reject hypothesis 3 and hypothesis 4. The coefficients are significant and show that a relative increase of negative (positive) adjustments is associated with positive (negative) returns. A relative increase in items that augment Tier 1 capital is associated with negative market returns, which suggests that investors discount banks' efforts to increase Tier 1 by way of increasing non-common equity. The positive adjustments more than offset the deductions, leading to a negative coefficient on net regulatory adjustments. Figure 3 shows the values of the cross section estimates of elasticities on additions and deductions over time.

[Figure 3 about here]

The "gap" between the positive and negative adjustment elasticities widens during the global financial crisis, with a steep decline in the coefficient value for additions during the fourth quarter of 2008. However, from 2010 onward, the coefficient on positive regulatory adjustments converges to zero as bank capitalization improves.

The seventh row of Table 3 (Model VII) includes Tier 2 with Tier 1 capital as an explanatory variable. The coefficient on this variable is negative and significant. This result is as expected and we do not reject hypothesis 3. The Tier 2 elasticity is negative because banks can increase Tier 2 to compensate for recognising loan losses in Tier 1 capital. This confirms the findings reported byNg and Roychowdhury (2014), who, for a sample of failed banks, show that Tier 2 behaves like a loan loss reserve. As our estimated coefficients are long-run elasticities, this suggests that the recognition of loan losses is less transitory than the literature suggests. Our results therefore support Badertscher et al. (2014) who argue that losses recognized by banks are more permanent than losses recognized by corporates. Figure 4 shows the elasticities over time.

[Figure 4 about here]

Row VIII combines the variables for additions, deductions, and Tier 2. The results are similar, in particular with respect to the elasticities of additions and deductions. The significance of the market elasticity of Tier 2 drops, which can be explained by drop in sample size and the observation that the coefficient of Tier 2 is positive in some quarters, see Figure 4.[7]

Rows IX and X repeat the regressions and control for the change in the filing requirements for bank holding companies in 2006 (when the threshold for filing a FR Y-9C report changed from $150 million of total assets to $500 million of total assets (Federal Reserve, 2006)), and to allow us to compare our results to traditional research designs in the Appendix.

Note that the coefficients are not sensitive to size, row IX shows virtually the same coefficient values as the ones reported in rows VIII and X. These stable coefficient values contrast to those reported by Demirgüç-Kunt et al. (2013), who document coefficient values that are size-sensitive.

The summed coefficients should be closer to one than any of the single coefficients, which is the case for all regression models shown in the table. The $\overline{R}^2$ values show that our model explains at least 87% of the variation in market returns using the pooled data.

[7]The drop in sample size is because we use logged variables and some of the (gross) positive and negative adjustments are zero, where the net of both is non-zero.

Table 4 and Table 5 examine the behaviour of the main coefficients of our analysis over time more formally. Table 4 reports coefficients of regressions ran on quarterly data, whereas averages of these coefficient values are shown in Table 5.

[Table 4 about here]

Table 4 shows that elasticities for Tier 1, Positive adjustments, and Negative adjustments are generally significant, except for those on positive adjustments of 2015, when this coefficient approaches zero. The coefficient of determination for the cross section regressions is high, ranging between 0.82 and 0.98 with an average of 0.95. The sum of coefficients on average is 1.08, with a maximum (minimum) of 1.15 (0.98).

Table 5 shows average values of the cross-section coefficients shown in Table 4 for all quarters, for quarters affected by both the dot.com crisis and the global financial crisis, for quarters after the dot.com crisis and before the onset of the global financial crisis (or GFC), and for quarters after the fall of Lehman.

In defining these periods, we follow Berger and Bouwman (2013) and Demirgüç-Kunt et al. (2013) and designate non-crisis quarters as those from 2002Q4 to 2007Q2 and from 2009Q2 to the present. We designate crises quarters as those that were affected by the dot.com or market crisis ($t < 2002Q4$) and the global financial crisis: $t > 2007Q2$ and $t < 2009Q2$. We designate pre-crisis quarters as those between the dot.com crisis and the global financial crisis. Quarters after the fall of Lehman Brothers on September 15, 2008 are designated as post-Lehman quarters. The bottom rows of Table 5 show the difference of average coefficient values for the post-Lehman period and the pre-crisis period.

The t-values are Fama and MacBeth (1973) t-values. As in Ball, Kothari, and Robin (2000), they are calculated as the ratio of the sample mean to the standard deviation of the distribution of the estimated coefficients, divided by the square root of the number of quarterly cross-sections: in this case 59 for all observations, 14 for the crisis quarters, and 7 for the GFC quarters. For Tier 1 and for the summed coefficients, we use 1 (one) as a reference value to determine the t-values. For the last row, the p-values assume unequal variances.

The table confirms the main results reported above. Moreover, the results in the last row confirm significant differences in the coefficient values of regulatory adjustments before and after the fall of Lehman.

B. Results for goodwill, DTAs, MSRs, unrealised gains and losses, and for minority interests

Table 6 shows results for the regulatory adjustments that top the rows of Table 1 or that attracted regulatory attention in the time before finalization of Basel III. These are *i*) the deduction of goodwill and intangibles, *ii*) the deduction of deferred tax assets (DTAs), *iii*) the deduction of mortgage servicing rights (MSRs), *iv*) the prudential filter on unrealised gains and losses on available for sale (AFS) securities, and *v*) the inclusion of qualifying minority interests in consolidated subsidiaries. We refer to Figures 5 to 9 to illustrate our results.

[Table 6 and Figures 5 to 9 about here]

The first column of Table 6 shows that the market elasticity of goodwill based on pooled data is positive and significant (0.05, t-value of 9.30). Despite regulators excluding goodwill from equity for prudential purposes without giving that exclusion a lot of regulatory attention (the deduction has basically not changed since the first Basel accord (BCBS, 1998)), markets appear to value this item positively. This result is also noteworthy given that a large literature on accounting conservatism places low value on soft assets such as goodwill and intangibles, on the basis that these assets cannot be used for contracting purposes and do not contribute to an orderly liquidation of a company (Basu, 1997, Holthausen and Watts, 2001, Watts, 2003a,b).

The market elasticity of DTAs, on the other hand, is negative (–0.05). This appears to indicate that investors do not have a positive view on the value of DTAs, a position that they share with prudential regulators.

The coefficient on mortgage servicing rights is insignificant, which is also noteworthy given that at the time of the Basel III negotiations, MSRs were controversial. One the one hand, mortgage servicing rights (MSRs) are believed to create value, for instance,

> "Its just astonishing to me that you would give zero value to a fundamental element of the mortgage business." Harper (2010)

The American Bankers Association, in its comment on the Basel III consultative document BCBS (2009), agreed and opposed the deduction of MSRs.[8] On the other hand, a study by the Federal Reserve Board pre-

[8] See the ABA's comments on www.bis.org/publ/bcbs165/cacomments.htm

sented a more critical view on MSRs, claiming that their valuations are inherently subjective and uncertain. According to the study, MSRs were a factor contributing to the failure of four insured depositories during the recent credit cycle (Federal Reserve Board, 2016). This report thus supports the exclusion of MSRs from capital, despite being in accordance with our results that MSRs represent a small share of both the aggregate amount of total bank assets and the aggregate amount of common equity Tier 1 (CET1) capital.

The coefficient on the prudential filter on AFS securities is only significant (albeit marginally) for the add-back of unrealised losses, despite also being controversial (Ball, 2008). The deduction of unrealised gains is economically and statistically insignificant in a pooled regression. However, in applying a Fama and MacBeth approach, as in Table 5, both coefficients are significant with t-values of 9.52 for the deducted unrealised gains and 3.12 for the addition to capital of unrealised losses (note that this result is not tabulated). The fact that the market elasticities for unrealised losses on AFS securities is positive can be explained by the low incidence of impairments, as documented by Badertscher et al. (2014): banks will hold these securities until their values pull to par at maturity.

The results on minority interests are mixed. In the pooled regression, the coefficient is insignificantly different form zero. However, applying a Fama and MacBeth approach renders the coefficient negative and significant. This indicates that an increase in minority interest is associated with negative returns. This suggests that minority interests are viewed by investors as more debt-like than equity like, despite the Financial Accounting Standards Board (FASB) Statement No. 160, which classifies minority interests as equity (FASB, 2008, Frankel, Lee, and McLaughlin, 2010).

C. Additional tests

Results for Capitalisation Deciles

Table 7 and Figure 10 show the results of an examination of the effect of bank capitalisation on the coefficient values of our regression model. Initially we expected coefficient values on the main capital variables (Book Value, Tier 1, Total capital) to be close to one. However, Table 3 and Figure 1 show that these coefficients are higher than one, and higher than coefficients reported for non-financial firms. Given that banks, unlike many non-financials, are highly levered and leverage is an important driver of risk Bhagat, Bolton, and Lu (2015), we sort our sample in deciles based on their Tier 1 capital ratios for each sample quarter. All else being equal, we would expect a higher elasticity between returns and book (or Tier 1, or Total capital) values when a bank is poorly capitalised or highly levered. On the other hand, when banks are well-capitalized,

we expect elasticities to be lower, and similar to those of non-financial firms. In other words, we expect a non-linearity that confirms predictions of Merton (1974), Burgstahler and Dichev (1997) and Admati et al. (2015).

[Table 7 about here]

The results of Table 7 confirm our expectations. They show that poorly capitalized banks display higher Tier 1 elasticities of market value. The Tier 1 coefficient value is 1.18 and significant with a t-value of 141. The coefficient value then drops to 1.01 for decile 5 and stays close to this value for the remaining deciles.

[Figure 10 about here]

Figure 10 includes results from the same regressions, but now with the book values of equity and with Total capital. The figure shows that the elasticities of all three measures of capital increase with leverage.

The relevance of non-common equity for non-financials

Our results show that the market elasticities of non-common equity items (e.g. preferred stock) are generally negative. To put this result in perspective and to test if these elasticities are always negative, we examine the market elasticities of preferred stock of non-financial firms. We use CRSP and Compustat data for the same period as the one that we use for our main analyses. Specifically, we use quarterly market values from CRSP and Compustat items *ceqq* and *pstkq* for the book value of common equity and preferred stock, respectively. From the CRSP and Compustat data, we exclude firms with SIC codes between 6000 and 6799 (financials) and between 4000 and 4999 (regulated industries). Figure 11 shows the results of this examination.

[Figure 11 about here]

The figure shows positive market elasticities for preferred stock in all but three quarters (2007Q3–2008Q1). Results from an untabulated pooled regression shows that the coefficient of the book values of common equity is 0.81 with a t-value of 44, and the coefficient on preferred stock is 0.04 (t-value of 4.16). From this we conclude that bank preferred stock is different than preferred stock of non-financial firms: an increase in bank preferred stock is generally associated with negative returns, whereas an increase in preferred stock of non-financials is generally associated with positive returns.

VI. Conclusion

This paper examines the value relevance of regulatory bank capital components. Using quarterly U.S. bank data from 2001 to 2015, we empirically examine the value relevance of the following capital components: *i*) Tier 1 capital, *ii*) regulatory adjustments, and *iii*) Tier 2 capital. Our research design relies on multiplicative regression models that mitigate shortcomings of conventional research designs. Contrary to results from studies using conventional research designs, our results show that the value relevance of components of bank capital is fairly stable over time, but diminishes slightly during the global financial crisis and increases afterwards. The regulatory adjustments generally have a negative association with market returns. If we partition the regulatory adjustments into positive and negative adjustments, our results show that relative changes in positive (negative) adjustments are negatively (positively) associated with market returns. We find mixed results for the regulatory adjustments that drive our results. Goodwill and intangibles are excluded from regulatory capital, but they are positively associated with market returns. Deferred tax assets, on the other hand, are negatively associated with market returns. Additions to capital are generally associated with negative returns. The association of Tier 2 capital with market returns becomes strongly negative after the fall of Lehman brothers. These results reveal inconsistencies in the way regulators define regulatory capital.

Appendix: replication of an existing study that relies on scaled variables.

To compare our results to existing results, we replicate some of the analyses of Demirgüç-Kunt et al. (2013) (DK).[9] Note that we could have chosen to replicate Das and Sy (2012) as well, because they use a similar approach to DK. However, Das and Sy use a shorter time period than DK and we do. Our objective is to demonstrate the importance of a well-specified model and that the choice of models makes a difference. Specifically, we use the following model that regresses returns on capital components and other control variables:

$$r_{i,t} = \beta_0 + \sum_{n=1}^{N} \beta_n \cdot X_{n,i,t-1} + \varepsilon_{i,t} \tag{4}$$

where r (or *return*) is the share return over the quarter, net of the stock market value-weighted return including distributions. $X_{n,i,t-1}$ are lagged observation from the following set of (N) variables: i) *Capital* is total qualifying capital allowable under the risk-based capital guidelines [3792][10]; ii) *Tier 1 LR* is the Tier 1 Leverage Capital Ratio [7204]; iii) *Liquid Assets* is the sum of noninterest-bearing balances and currency and coin [0081], interest-bearing balances in U.S. Offices [0395], and interest-bearing balances in foreign offices edge and agreement subsidiaries and IBFS [0397], divided by total assets [2170]; iv) *Deposits* is Deposits: noninterest-bearing [6631] and total interest-bearing deposits in foreign and domestic offices [6636], divided by total assets; v) *Asset Quality* is allowance for loan and lease losses [3123], divided by total assets; vi) *Size* is the log of total assets [2170]; vii) *M2B* is the market to book ratio; $viii$) *PER* is the ratio of price to net interest income [4074]; and ix) *Beta* is a bank's stock beta, estimated using 60 monthly observations of bank returns. The regression model relies on t-values that account for two-dimensional within-cluster correlation (Petersen, 2009).

Table 8 show the descriptive statistics of the variables we use for the model above.

[9] Note that our replication is on a best efforts basis. There may be small differences between Demirgüç-Kunt et al. and our research design given that we rely on data definitions of the Federal Reserve and on CRSP, whereas Demirgüç-Kunt et al. rely on global data from Bankscope and Datastream. We deliberately depart from Demirgüç-Kunt et al. in our choice of the return metric: we use market adjusted returns to control for market wide effects. Please note that regression results from additional tests that use unadjusted returns do not significantly alter our results, nor do they change our inferences.

[10] See footnote 2.

[Table 8 about here]

The statistics are comparable to those reported by DK. The mean (median) of Capital for our sample is 13.9% (13.3%), where DK report 12.6% and 11.9%. Our Tier 1 Leverage Capital Ratio is lower than the one reported by DK: 9.17% versus 6.7%. Given that DK use a global sample, this difference is likely the result of a more intensive use of non-common equity Tier 1 capital instruments outside the U.S. The market to book ratio (1.48), Loans (65.7%), Deposits (75.3%) and Size (15) are also comparable with the ratios reported by DK (1.35, 64.3%, 73.4%, and 16 respectively). Ratios that diverge because of different definitions are those of Liquid assets and Asset quality.

Given the similarities between our data and the data reported by DK, we are confident that we can compare our results to those of DK. Table 9 reports the regression results, which we compare to those reported in Table 2 of DK, the full sample.

[Table 9 about here]

Most of our results differ from those reported by DK. For example, we find that the coefficient of the Risk Weighted Capital ratio is positive (0.241) and significant, whereas DK report an insignificant coefficient with a value of 0.023. The capital coefficients that interact with the Crisis variable are both negative and significant (-0.259 and -1.215). However, DK positive values (0.114 and 0.124) with only the former being significant.

Figure 12 reports the behaviour of coefficient values of the main capital ratios over time. The figure includes two additional ratios, the ratio of book value of equity over total assets (BV over TA) and the Tangible Equity ratio defined as book equity minus goodwill and intangibles divided by total assets minus goodwill and intangibles.

[Figure 12 about here]

The figure shows that the four bank capital ratios move with a large amplitude and display swings that are difficult to explain. For example, the maximum value for the leverage ratio coefficient is 4.43 for the second quarter of 2009, and –1.59 for the fourth quarter of 2009. It is unclear what would cause such a swing in coefficient values. It is also unclear why such a change would manifest itself in such a short time period. A

similar swing occurs during the dot.com crisis, where the coefficient value of BV over TA is 1.67 in 2001Q1 and –2.45 in 2001Q4.

The figure also shows that the four capital ratios move in sync. Consequently, none of the ratios clearly dominates the other. Despite existing research that shows that the leverage ratio should be preferred over risk weighted ratios, the figure shows less conclusive evidence.

Figure 13 shows the behaviour of the coefficient on the Tier 2 ratio. Again, there are large swings that are difficult to explain.

[Figure 13 about here]

The spikes appear to display a seasonal pattern driven by forth quarter observations. However, a verification of the data shows that of the 14 Q4 observations, seven are higher than the values of the previous quarter (Q3) and next quarter (Q1). Five of the Q4 observations are lower than the values of the previous and next quarter, and two Q4 observations are between Q3 and Q1 values. We therefore rule out a seasonal pattern driving the swings of the Tier 2 coefficient.

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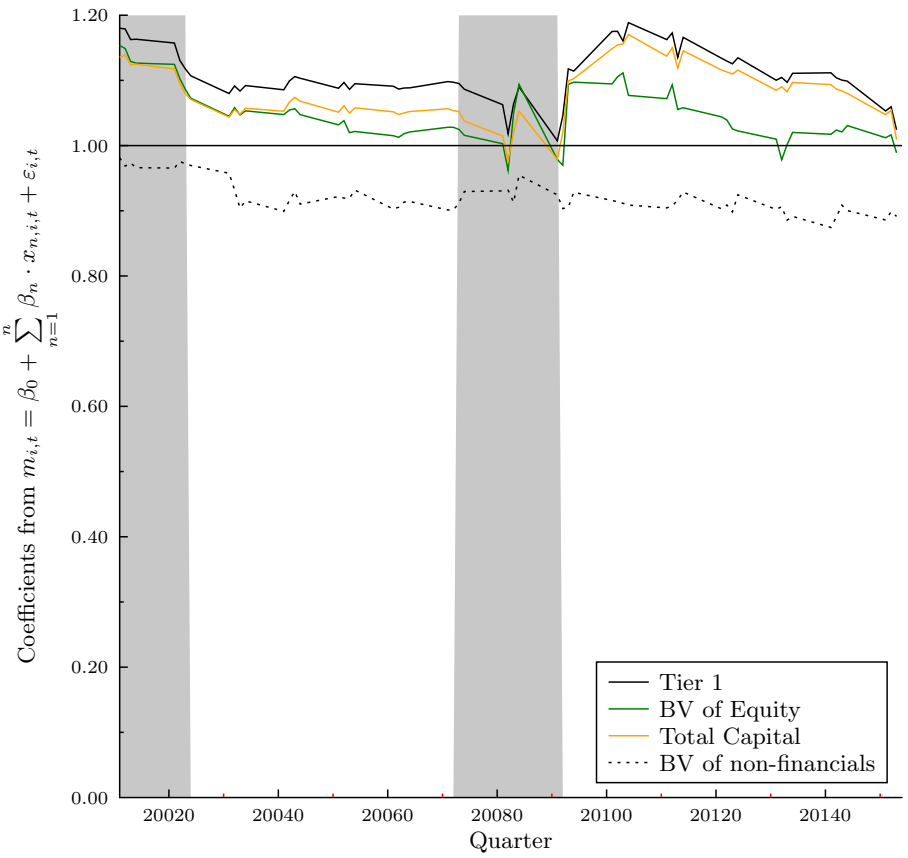

Figure 1: Comparison of market elasticities for various capital ratios

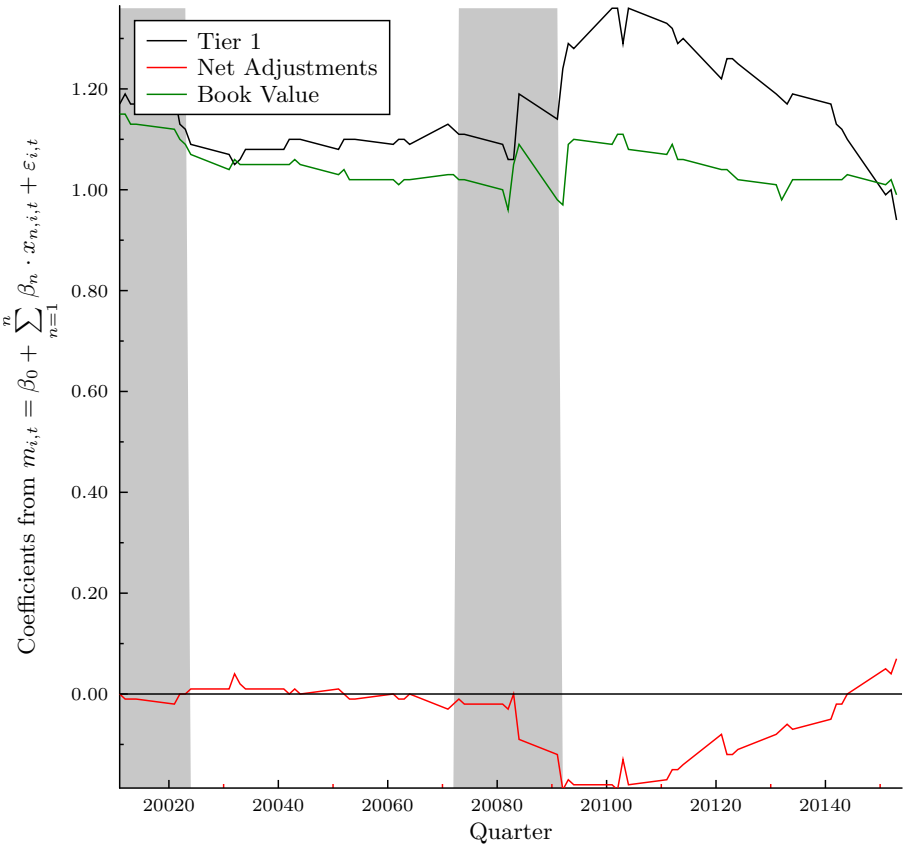

Figure 2: Comparison of market elasticities for $m = f(bv)$ and $m = f(t1, \Delta)$

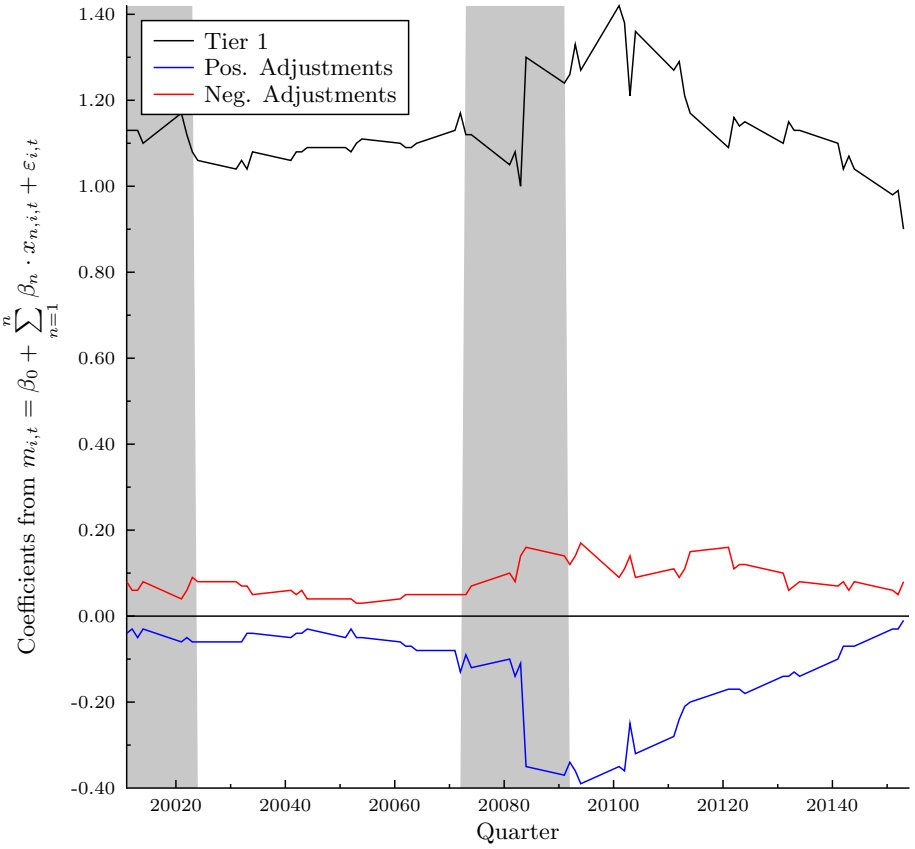

Figure 3: Comparison of market elasticities for $m = f(t1, \Delta^+, \Delta^-)$

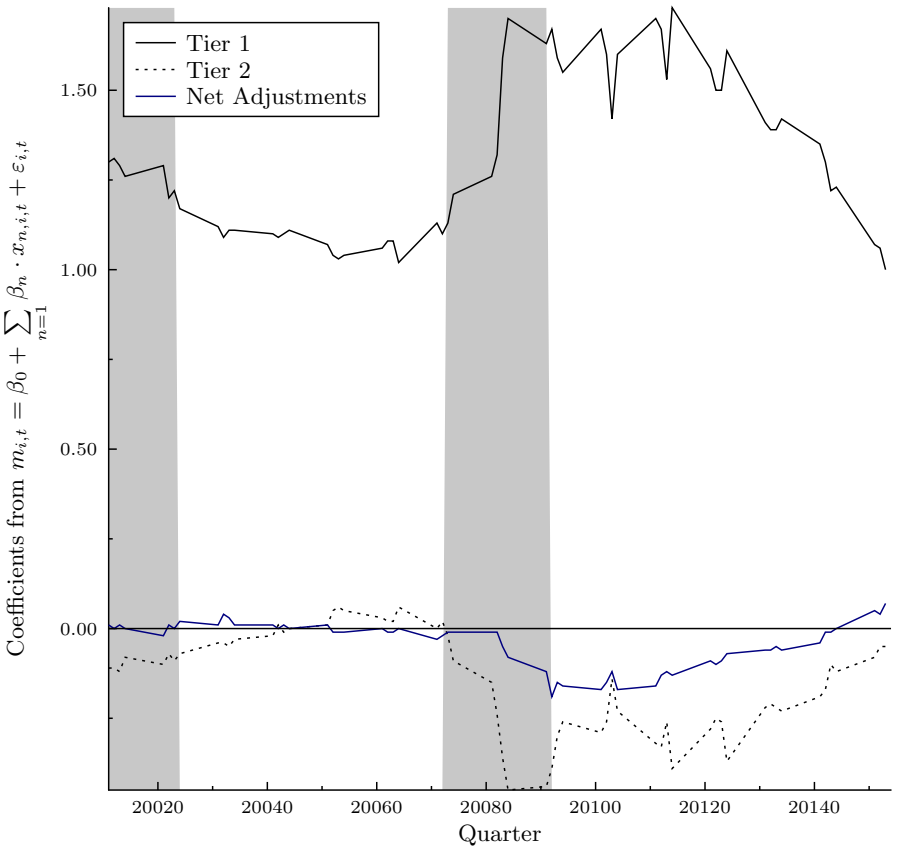

Figure 4: Comparison of market elasticities for $m = f(t1,\ t2, \Delta)$

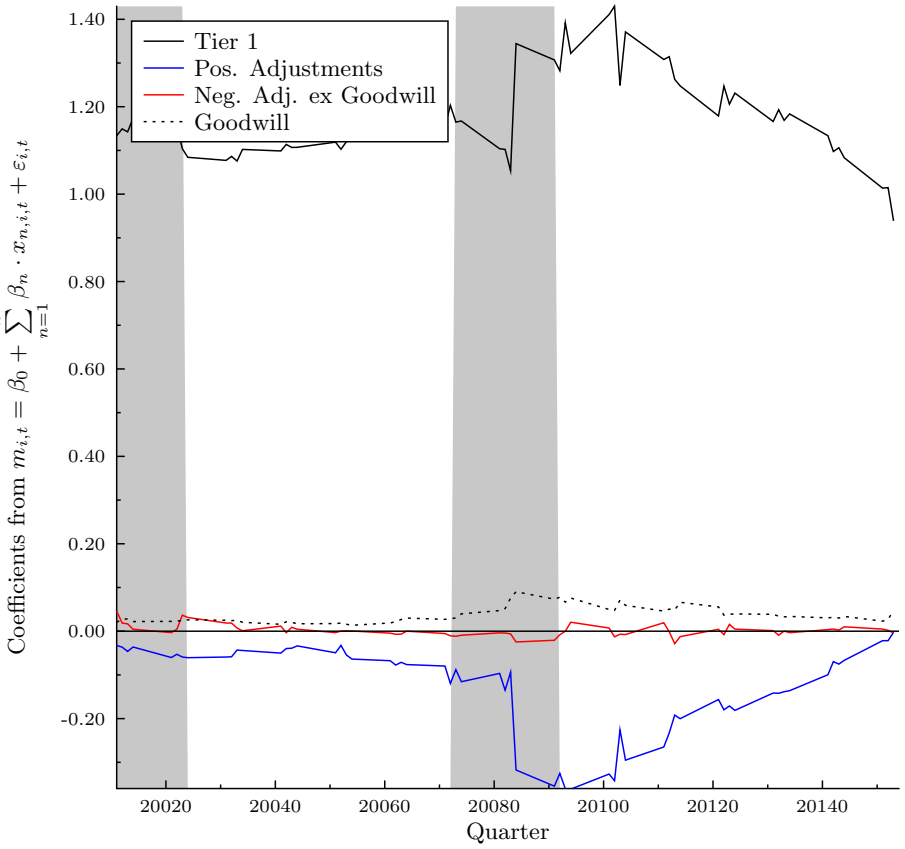

Figure 5: Market elasticities - Goodwill

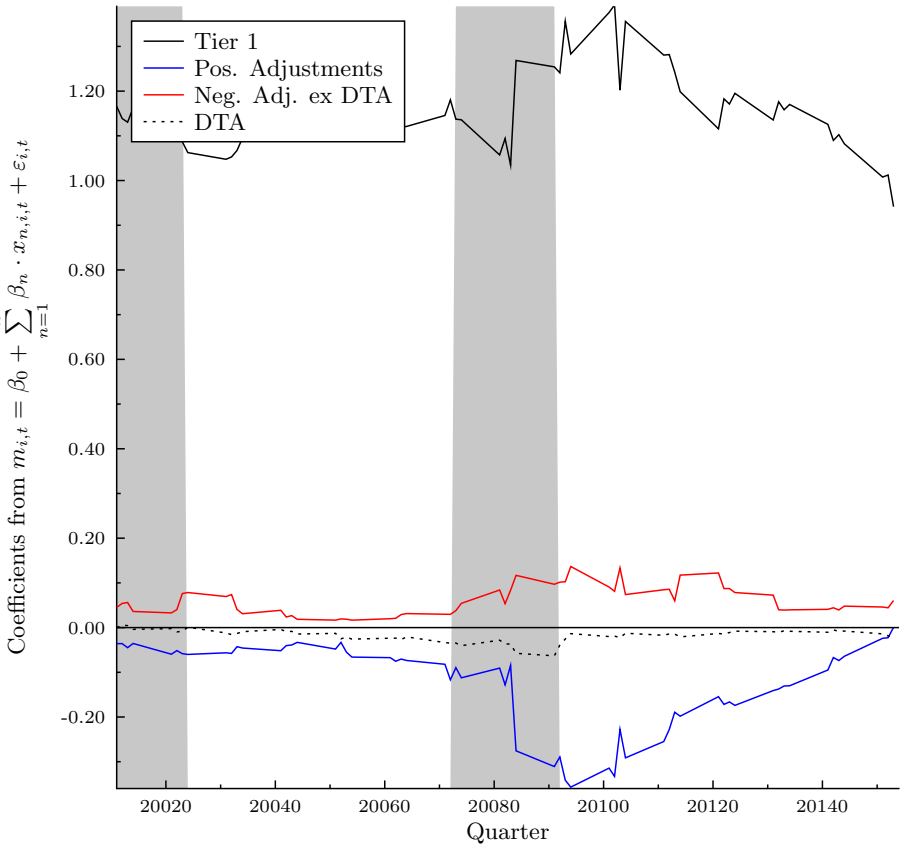

Figure 6: Market elasticities - DTA

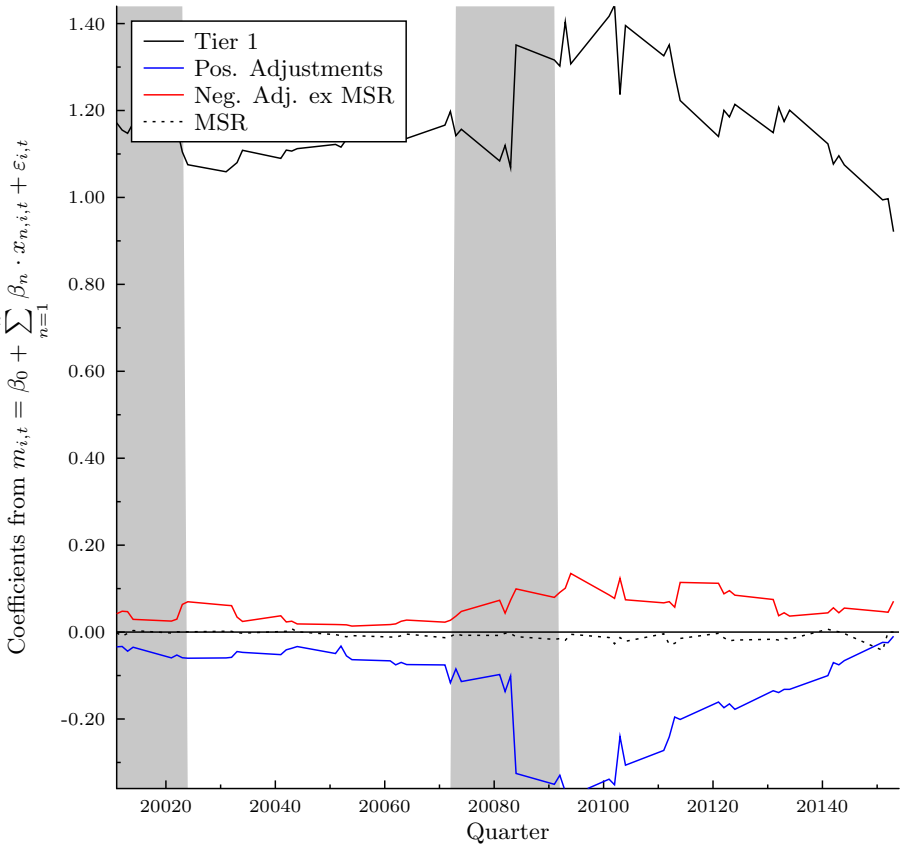

Figure 7: Market elasticities - Mortgage Servicing Rights

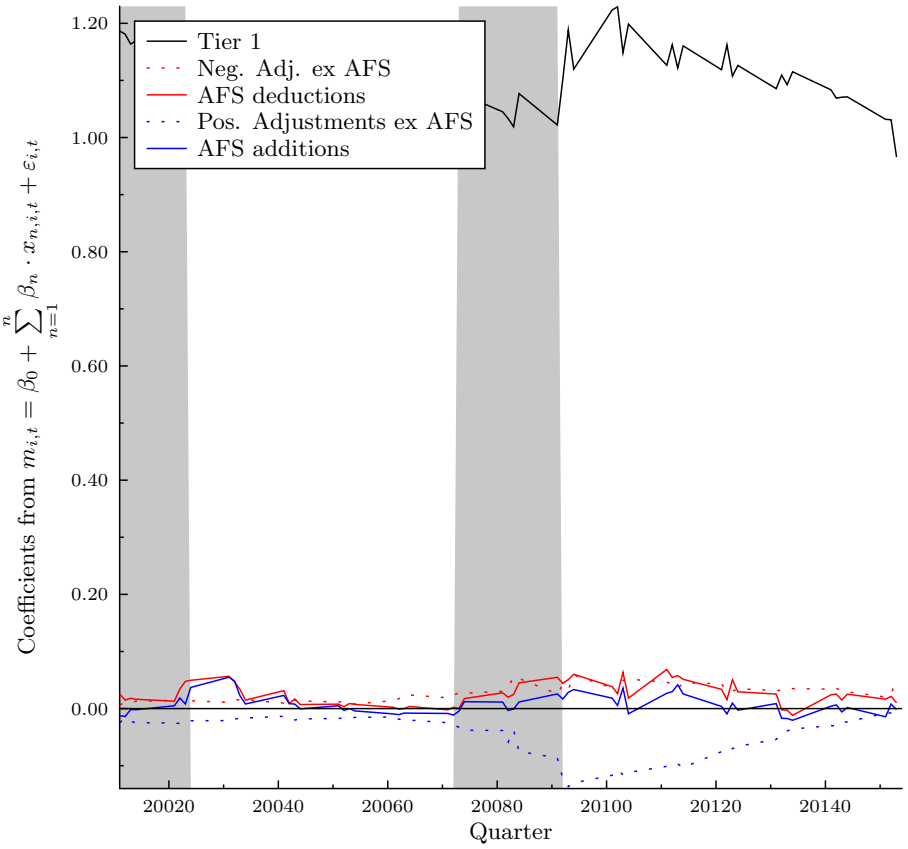

Figure 8: Market elasticities - AFS

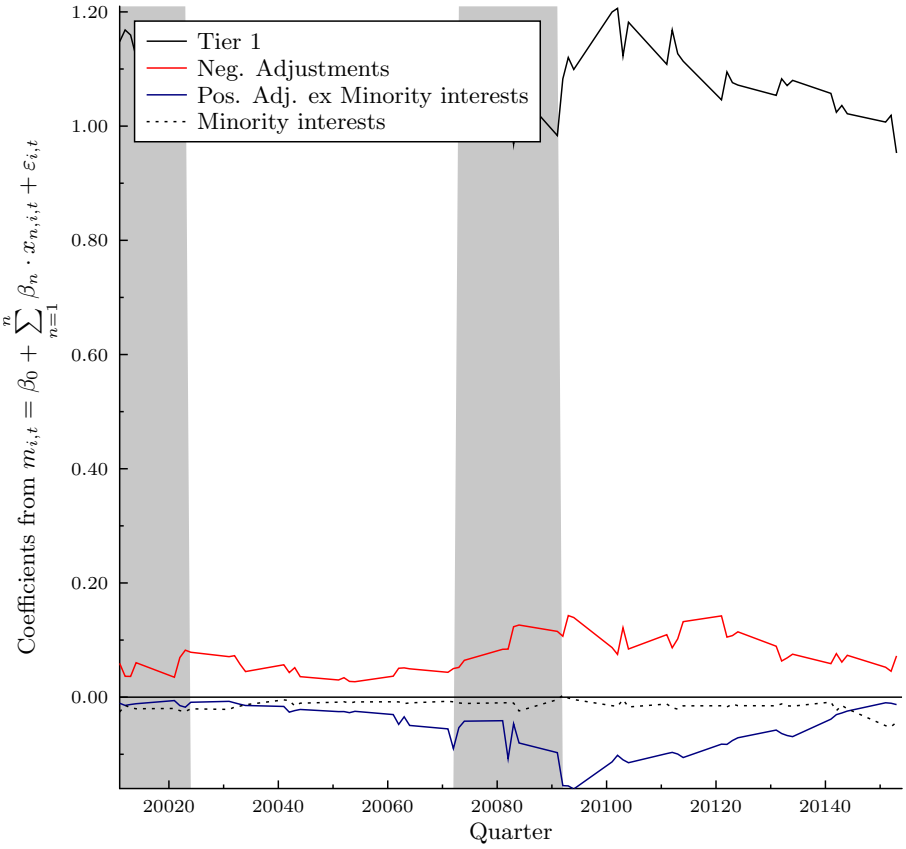

Figure 9: Market elasticities - Minority interests

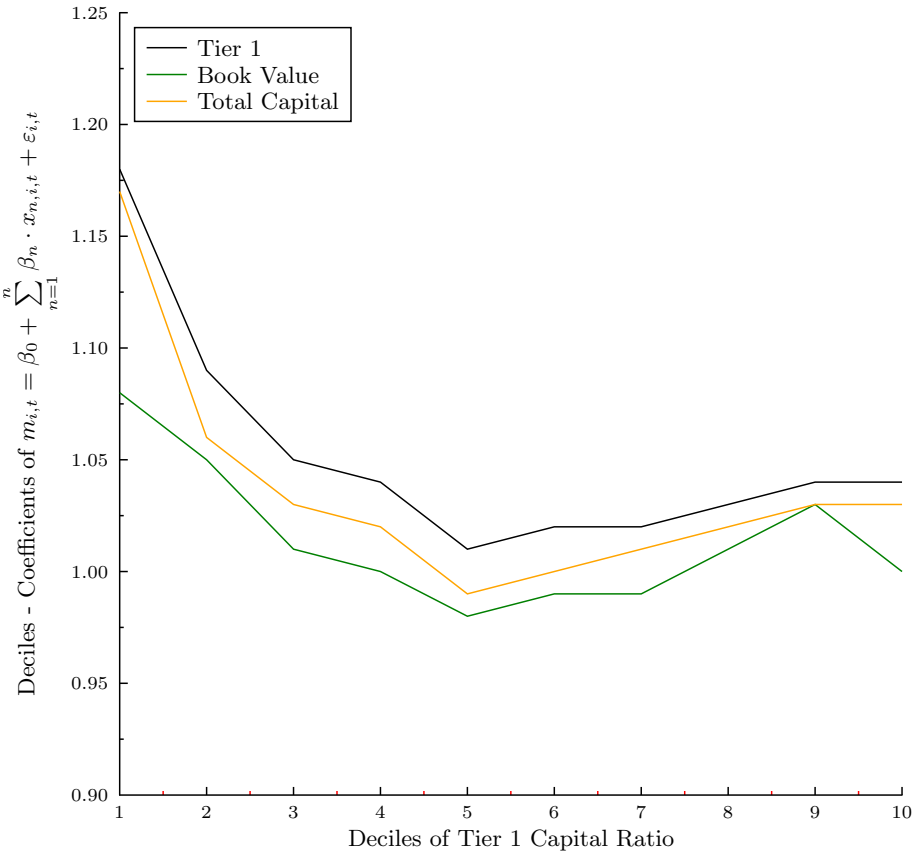

Figure 10: Comparison of market elasticities for $m = f(t1)$, $m = f(bv)$, $m = f(tc)$

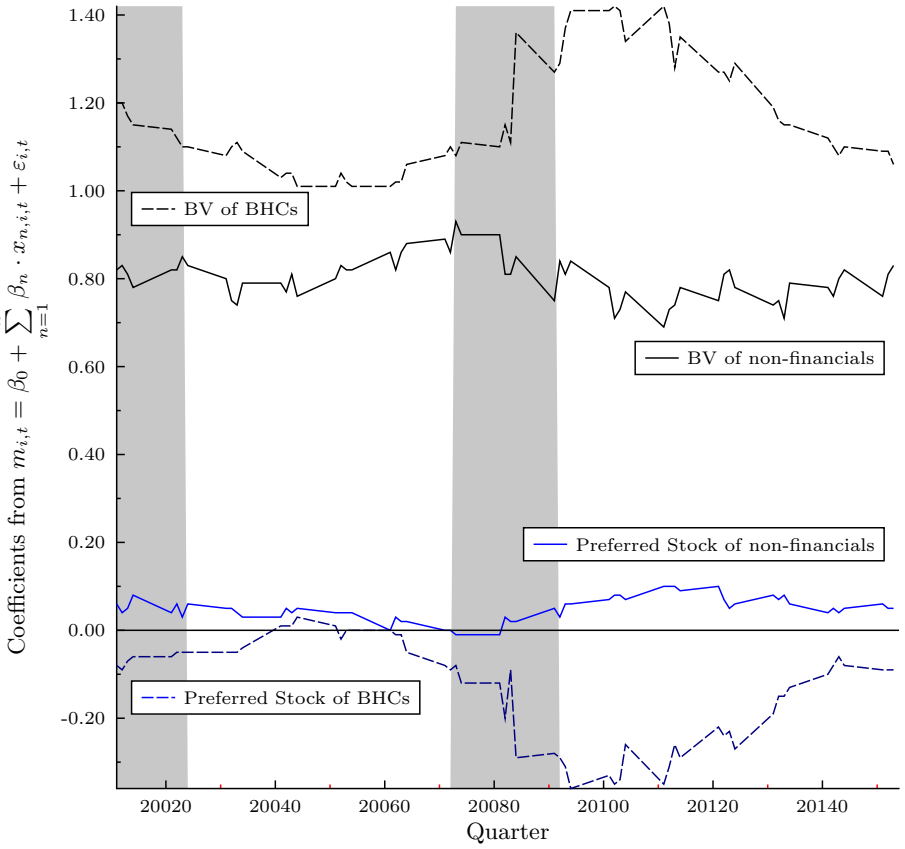

Figure 11: Market elasticities - Book Values and preferred stock for banks (BHCs) and non-financials

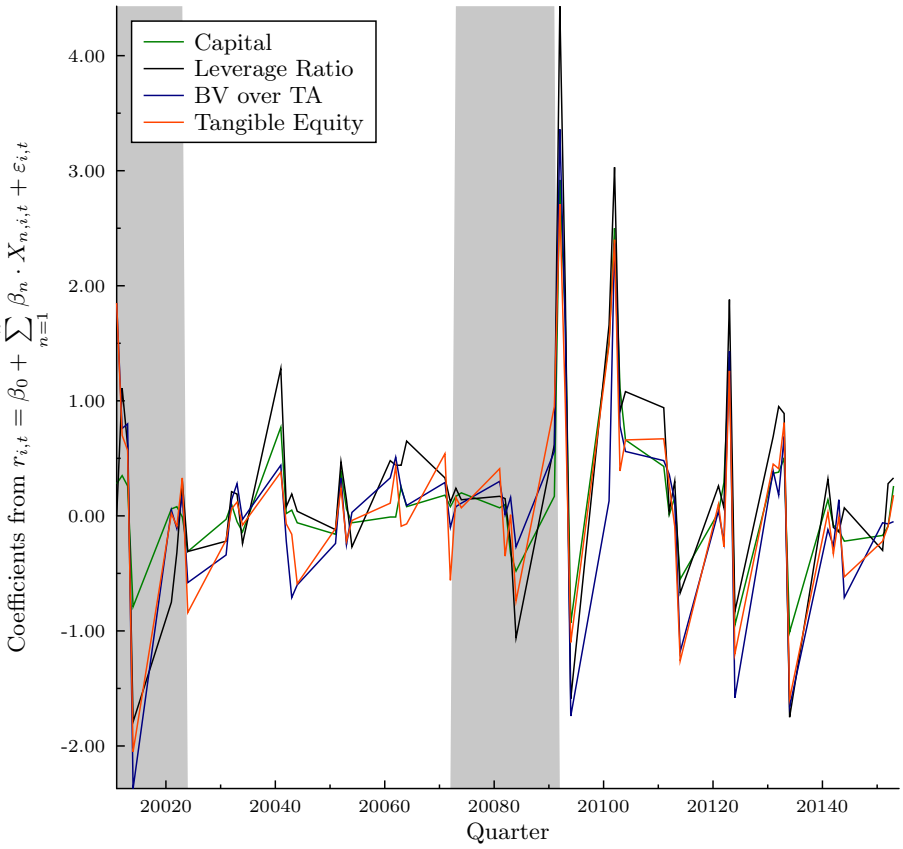

Figure 12: Comparison of response coefficients of capital ratios

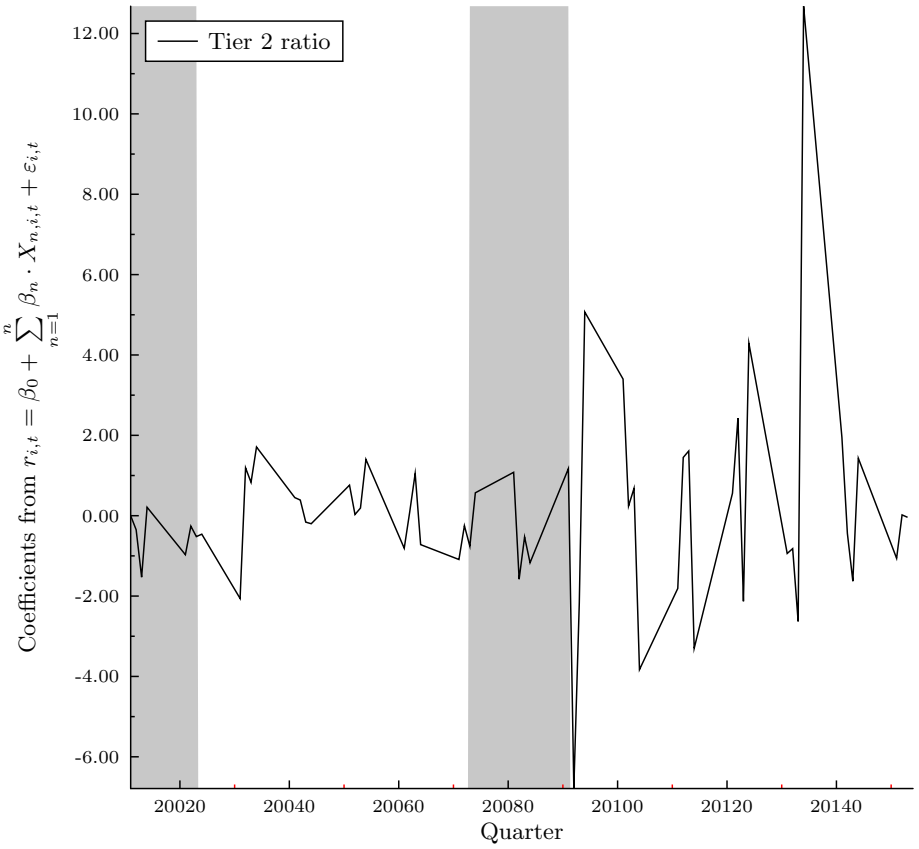

Figure 13: Response coefficients of the Tier 2 ratio

TABLE 1

Regulatory Adjustments

Regulatory adjustments for U.S. bank holding companies covering the quarters 2001Q1–2015Q4. *Additions* increase, and *Deductions* decrease *Tier 1 capital [8274]* relative to the book value of common equity. The items are sorted on the mean values of these items over risk weighted assets (*RWA*, the rightmost column). *bp* is basis points. The mnemonics in square brackets refer to the item codes from the Consolidated Financial Statements for Bank Holding Companies (FR Y-9C); their definitions are from https://www.federalreserve.gov/apps/mdrm/data-dictionary.

Postive adjustments are:	Impact on Tier 1, in bp of RWA
Qualifying Trust Preferred Securities [C502], Qualifying restricted core capital elements [G215]	112.4
Perpetual Preferred Stock including Related Surplus [3283]	40.0
Minority interests in consolidated subsidiaries [G214], [B589], [P839], and [P862]	30.4
Net unrealised holding losses on Available-For-Sale securities [8434]	10.5
Accumulated loss on cash-flow hedges and Defined benefit post-retirement plans [4336], [P846], [P847) and [P849]	6.94
Tier 1 Minority Interest Not Included In Common Equity Tier 1 Capital	5.24
Additional Tier 1 capital instruments plus related surplus [P860]	3.98
Non-qualifying capital instruments subject to phase out from Additional Tier 1 capital [P861]	0.94
Qualifying mandatory convertible preferred securities of internationally active bank holding companies [G216]	0.09
Net unrealised losses on held-to-maturity securities that are included in AOCI [P848]	0.05
Unrealized loss in fair valued financial liabilities attributable to changes in own creditworthiness [F264] and [Q258]	0.03
Other	3.15
Negative adjustments are:	**Impact on Tier 1, in bp of RWA**
Goodwill and Intangibles [B590], [P842], [P841]	198.3
Net unrealised holding gains on Available-For-Sale securities [8434], [A221], and [P845]	19.6
Additional Tier 1 capital deductions, [P864]	13.2
Deferred Tax Assets [5610], [P843], [P855]	11.9
Mortgage servicing rights and purchased credit card relationships [P854], [B591]	1.02
Non-qualifying Perpetual Preferred Stock [B588]	0.65
Accumulated gains on cash-flow hedges and Defined benefit post-retirement plans [4336], [P846], [P847) and [P849]	0.56
Unrealized gain in fair valued financial liabilities attributable to changes in own creditworthiness [F264] and [Q258]	0.08
Net unrealised gains on held-to-maturity securities that are included in AOCI [P848]	0.01
Significant investments in financial institutions, MSR, and DTAs over the 15 % CET1 deduction threshold [P856]	0.00
Investments in the capital of unconsolidated financial institutions that exceed the relevant 10 % threshold [P851] and [P853]	0.00
Other	1.84

TABLE 2

Descriptive Statistics.

The table presents descriptive statistics of variables from U.S. bank holding companies over the 2001Q1 to 2015Q4. The mnemonics in square brackets refer to the item codes from the Consolidated Financial Statements for Bank Holding Companies (FR Y-9C); their definitions are from https://www.federalreserve.gov/apps/mdrm/data-dictionary. *M* is market value at the end the quarter. *BV* is book value excluding perpetual preferred stock at the end of the quarter [3210] – [3283]. *Tier 1* is either Tier 1 [8274] or Common Equity Tier 1 [P859], the latter as defined by the U.S. implementation of Basel III. *Tier 2* is Tier 2 (Supplementary) Capital [5311]. *Net Adjustments* is the net of prudential adjustments, defined as *T1* minus *BV*, both as previously defined. *Pos Adjustments* is adjustments that increase *T1* relative to equity. *Neg Adjustments* is adjustments that decrease *T1* relative to equity. *Total assets* is item [2170]. *RWA* is Risk-Weighted Assets (net of allowances and other deductions) [A223]. Amounts are in millions of USD. The number of observations reported in a row is the sum of the quarterly observations.

$n = 20,328$	Mean	Min	p5	p25	p50	p75	p95	Max	StDev
M	3,294	1.00	26.6	78.6	209	743	9,427	289,368	17,897
BV	2,443	-510	27.3	65.4	138	485	5,907	233,632	15,143
Tier 1	1,987	-505	30.1	70.0	146	448	5,447	193,089	11,972
Tier 2	585	0.00	2.64	7.03	15.6	50.3	1,401	66,951	3,776
Net Adjustments	-457	-72,477	-801	-32.0	-1.02	13.16	96.8	52,237	3,669
Pos Adjustments	394	0.00	0.00	4.33	22.1	72.7	740	116,129	3,173
Neg Adjustments	850	0.00	0.05	3.31	17.6	100	1,322	106,128	5,791
Total Assets	27,459	141	352	788	1,643	5,060	58,664	2,577,148	174,954
Tier 1 over RWA	12.2	0.03	8.16	10.2	11.8	13.7	17.9	51.0	3.29
Tier 2 over RWA (%)	1.65	0.00	0.86	1.17	1.26	1.85	3.72	14.9	0.95
Net Adj over RWA (%)	-0.79	-21.8	-5.49	-2.10	-0.38	1.09	2.73	13.3	2.87
Pos Adj over RWA (%)	1.92	-0.32	0.06	0.92	1.91	2.75	4.03	13.4	1.29
Neg Adj over RWA (%)	2.71	0.00	0.07	0.73	1.95	3.90	7.42	24.4	2.77

Year	M	BV	Tier 1	Tier 2	Net Adj	Pos Adj	Neg Adj	$\frac{\text{Tier 1}}{RWA}$ (%)	$\frac{\text{Tier 2}}{RWA}$ (%)	$\frac{\text{NetAdj}}{RWA}$ (%)	$\frac{\text{Pos}}{RWA}$ (%)	$\frac{\text{Neg}}{RWA}$ (%)	# of obs.
2001	2,790	1,103	943	348	-154	131	283	10.8	1.92	-0.18	1.67	1.85	1,560
2002	2,601	1,173	989	357	-181	153	332	11.3	1.86	-0.31	1.82	2.13	1,640
2003	2,711	1,250	1,057	373	-192	165	357	11.4	1.85	-0.32	1.98	2.30	1,682
2004	3,172	1,443	1,132	387	-311	184	495	11.6	1.79	-0.38	2.11	2.50	1,648
2005	3,147	1,639	1,231	421	-408	213	621	11.7	1.61	-0.58	2.04	2.63	1,658
2006	3,955	2,058	1,542	534	-516	298	814	11.6	1.56	-0.73	2.17	2.90	1,482
2007	3,732	2,259	1,642	657	-617	371	988	11.2	1.53	-1.10	2.04	3.14	1,410
2008	2,524	2,288	1,989	792	-299	831	1,130	10.7	1.63	-0.93	2.11	3.04	1,334
2009	2,201	2,606	2,582	836	-23	1,141	1,164	11.7	1.75	-0.57	2.10	2.68	1,285
2010	2,987	3,102	2,600	799	-503	711	1,214	12.8	1.79	-0.67	2.06	2.73	1,273
2011	2,867	3,546	2,907	787	-639	652	1,291	14.1	1.69	-0.74	2.09	2.83	1,195
2012	3,335	3,895	3,124	703	-771	567	1,338	14.3	1.60	-0.99	1.98	2.97	1,167
2013	4,269	4,091	3,296	687	-795	491	1,287	14.4	1.50	-0.96	1.73	2.69	1,167
2014	5,033	4,342	3,407	685	-935	142	1,077	13.8	1.38	-1.25	1.39	2.65	1,174
2015	6,705	5,935	4,575	955	-1360	63	1,423	11.9	1.43	-2.89	0.28	3.16	653

TABLE 3

Log Model

The table reports results of regressions that rely on U.S. bank holding companies over the 2001Q1 to 2015Q4, where the dependent variable (m) is the log of the Market Value of the bank at the end the quarter:

$$m_{i,t} = \beta_0 + \sum_{n=1}^{N} \beta_n \cdot x_{n,i,t} + \varepsilon_{i,t} \tag{5}$$

$x_{n,i,j}$ is from the following list of (N) regressors, which are all logged absolute values of the underlying values: *BV* is book value excluding perpetual preferred stock at the end of the quarter [3210]–[3283]. For non-financials, this is item common/ordinary equity $(ceqq)$ from the CRSP-Compustat merged quarterly database. *Tier 1* is either Tier 1 [8274] or Common Equity Tier 1 [P859], the latter as defined by the U.S. implementation of Basel III. *TC* is total qualifying capital allowable under the risk-based capital guidelines [3792]. *Net Adj* is the net of prudential adjustments, defined as *Tier 1* minus *BV*, both as previously defined. *Pos Adj* is adjustments that increase *Tier 1* relative to equity. *Neg Adj* is adjustments that decrease *Tier 1* relative to equity. *Tier 2* is Tier 2 (Supplementary) Capital [5311]. $\Sigma\beta_{1..n}$ is the sum of the coefficients, excluding the intercept. The mnemonics in square brackets refer to the item codes from the Consolidated Financial Statements for Bank Holding Companies (FR Y-9C); their definitions are from https://www.federalreserve.gov/apps/mdrm/data-dictionary. The regression model relies on t-values that account for two-dimensional within-cluster correlation (Petersen, 2009).
Note *: Non-financial firms only: all Compustat firms excluding those with SIC codes between 6000 and 6799 (financials) and between 4000 and 4999 (regulated industries).
Note **: Only banks with Total Assets $>$ \$500M.
Note ***: Ibid and same sample as replication of Demirgüç-Kunt et al. (2013).

		BV	Tier 1	TC	Net Adj	Pos Adj	Neg Adj	Tier 2	Intercept	$\Sigma\beta_{1..N}$	$\overline{R}^2$	# of obs.
I	β	1.03							-0.01	1.03	0.91	20,328
	(t)	(99.9)							-0.04			
II*	β	0.94							1.21	0.94	0.80	184,756
	(t)	(124)							20.3			
III	β		1.07						-0.57	1.07	0.88	20,328
	(t)		(97.0)						-3.87			
IV	β			1.04					-0.38	1.04	0.87	20,328
	(t)			(92.9)					-2.48			
V	β		1.16		-0.08				-0.90	1.08	0.88	20,328
	(t)		(48.9)		(-4.37)				-4.87			
VI	β		1.14			-0.14	0.07		-0.67	1.06	0.89	16,895
	(t)		(43.2)			(-6.46)	(6.59)		-3.64			
VII	β		1.25		-0.07			-0.09	-1.21	1.09	0.88	20,328
	(t)		(23.9)		(-4.4)			(-2.29)	-4.75			
VIII	β		1.20			-0.14	0.07	-0.06	-0.89	1.07	0.89	16,623
	(t)		(23.1)			(-6.62)	(6.51)	(-1.59)	-3.61			
IX**	β		1.20			-0.14	0.08	-0.06	-0.97	1.08	0.89	15,856
	(t)		(22.3)			(-6.50)	(6.98)	(-1.72)	-3.62			
X***	β		1.20			-0.15	0.08	-0.06	-0.90	1.07	0.89	15,072
	(t)		(21.3)			(-6.46)	(6.99)	(-1.62)	-3.28			

TABLE 4
Log Model – Cross Section Regressions

The table reports results of regressions that rely on U.S. bank holding companies over the 2001Q1 to 2015Q4, where the dependent variable (m) is the log of the Market Value of the bank at the end the quarter:

$$m_{i,t} = \beta_0 + \sum_{n=1}^{N} \beta_n \cdot x_{n,i,t} + \varepsilon_{i,t} \tag{6}$$

$x_{n,i,j}$ is from the following list of (N) regressors, which are all logged absolute values of the underlying values: *Tier 1* is either Tier 1 [8274] or Common Equity Tier 1 [P859], the latter as defined by the U.S. implementation of Basel III. *Pos (Neg)* is adjustments that increase (decrease) *Tier 1* relative to equity. $\Sigma\beta_{1..n}$ is the sum of the coefficients, excluding the intercept. *Crisis* designates crises quarters as those that were affected by the dot.com crisis ($t < 2002Q4$) and the global financial crisis: $t > 2007Q2$ and $t < 2009Q2$. *Post-Lehman* is the period from 2008Q3 onward.

Qtr	Crisis	Tier 1	t	Pos	t	Neg	t	$\Sigma\beta_{1..n}$	β_0	t	$\overline{R}^2$	# of obs.
20011	dot.com	1.13	31.64	-0.04	-3.26	0.08	3.55	1.17	-1.59	-6.15	0.97	178
20012	dot.com	1.13	35.59	-0.03	-3.10	0.06	3.31	1.16	-1.32	-5.69	0.97	222
20013	dot.com	1.13	27.52	-0.05	-3.94	0.06	1.94	1.15	-1.25	-4.89	0.97	212
20014	dot.com	1.10	21.57	-0.03	-2.51	0.08	2.60	1.15	-1.13	-3.63	0.96	233
20021	dot.com	1.17	38.10	-0.06	-4.72	0.04	2.70	1.15	-1.30	-5.62	0.97	268
20022	dot.com	1.12	30.28	-0.05	-4.46	0.06	2.91	1.13	-0.91	-3.75	0.97	243
20023	dot.com	1.08	31.94	-0.06	-4.76	0.09	4.63	1.10	-0.70	-2.96	0.97	254
20024		1.06	37.80	-0.06	-5.57	0.08	5.46	1.08	-0.40	-2.08	0.97	271
20031		1.04	38.51	-0.06	-5.28	0.08	5.11	1.06	-0.16	-0.88	0.97	277
20032		1.06	43.69	-0.06	-5.31	0.07	5.53	1.07	-0.20	-1.21	0.97	286
20033		1.04	43.91	-0.04	-3.63	0.07	5.28	1.06	-0.05	-0.32	0.97	297
20034		1.08	49.95	-0.04	-4.38	0.05	3.67	1.08	-0.20	-1.24	0.97	314
20041		1.06	44.12	-0.05	-3.24	0.06	4.28	1.07	-0.11	-0.70	0.97	301
20042		1.08	52.45	-0.04	-3.36	0.05	5.78	1.09	-0.32	-2.24	0.97	349
20043		1.08	49.95	-0.04	-3.26	0.06	5.23	1.09	-0.40	-2.52	0.97	314
20044		1.09	53.33	-0.03	-2.36	0.04	3.73	1.09	-0.35	-2.25	0.97	326
20051		1.09	54.59	-0.05	-3.55	0.04	4.09	1.08	-0.29	-1.97	0.97	354
20052		1.08	59.20	-0.03	-2.67	0.04	4.33	1.09	-0.37	-2.48	0.97	343
20053		1.10	58.36	-0.05	-4.19	0.03	4.04	1.08	-0.32	-2.15	0.97	362
20054		1.11	54.97	-0.05	-3.55	0.03	3.54	1.09	-0.43	-2.88	0.97	366
20061		1.10	51.16	-0.06	-3.80	0.04	4.00	1.08	-0.34	-2.06	0.97	339
20062		1.09	47.44	-0.07	-3.68	0.05	4.83	1.07	-0.25	-1.52	0.96	345
20063		1.09	47.43	-0.07	-3.92	0.05	4.74	1.08	-0.29	-1.73	0.96	339
20064		1.10	31.97	-0.08	-4.52	0.05	4.09	1.08	-0.33	-1.41	0.96	337
20071		1.13	47.52	-0.08	-4.46	0.05	5.21	1.09	-0.64	-3.83	0.96	339
20072		1.17	43.94	-0.13	-5.92	0.05	4.39	1.09	-0.75	-4.46	0.96	333
20073	GFC	1.12	45.83	-0.09	-4.83	0.05	4.12	1.09	-0.69	-3.85	0.96	331
20074	GFC	1.12	38.44	-0.12	-5.41	0.07	4.71	1.08	-0.73	-3.44	0.95	313
20081	GFC	1.05	30.40	-0.10	-3.97	0.10	5.37	1.04	-0.33	-1.46	0.94	307
20082	GFC	1.08	25.95	-0.14	-5.32	0.08	4.14	1.02	-0.39	-1.32	0.89	316
20083	GFC Post-Lehman	1.00	6.89	-0.11	-1.62	0.14	3.55	1.03	-0.18	-0.20	0.86	303
20084	GFC Post-Lehman	1.30	17.90	-0.35	-5.99	0.16	4.78	1.10	-1.73	-4.22	0.85	305
20091	GFC Post-Lehman	1.24	14.16	-0.37	-4.77	0.14	4.13	1.01	-1.00	-2.26	0.82	308
20092	Post-Lehman	1.26	13.79	-0.34	-4.58	0.12	3.12	1.04	-1.24	-2.84	0.84	305
20093	Post-Lehman	1.33	17.42	-0.36	-5.37	0.14	4.51	1.11	-2.03	-6.02	0.90	301
20094	Post-Lehman	1.27	12.51	-0.39	-5.96	0.17	4.02	1.05	-1.27	-2.09	0.90	296
20101	Post-Lehman	1.42	20.43	-0.35	-5.74	0.09	2.91	1.15	-2.51	-7.78	0.93	299
20102	Post-Lehman	1.38	23.49	-0.36	-6.56	0.11	3.65	1.13	-2.31	-7.85	0.93	298
20103	Post-Lehman	1.21	17.99	-0.25	-5.37	0.14	4.27	1.10	-1.74	-4.98	0.91	302
20104	Post-Lehman	1.36	21.33	-0.32	-6.92	0.09	3.49	1.13	-2.17	-5.94	0.92	287
20111	Post-Lehman	1.27	10.59	-0.28	-5.54	0.11	2.71	1.10	-1.69	-2.25	0.91	284
20112	Post-Lehman	1.29	26.33	-0.24	-5.50	0.09	4.17	1.14	-2.24	-7.47	0.92	282
20113	Post-Lehman	1.21	24.30	-0.21	-6.67	0.11	3.81	1.11	-2.06	-5.60	0.91	281
20114	Post-Lehman	1.17	16.54	-0.20	-5.60	0.15	4.16	1.11	-1.82	-3.81	0.91	275
20121	Post-Lehman	1.09	11.97	-0.17	-4.99	0.16	3.81	1.08	-1.14	-1.98	0.93	277
20122	Post-Lehman	1.16	23.16	-0.17	-5.98	0.11	4.10	1.09	-1.45	-4.35	0.94	274
20123	Post-Lehman	1.14	22.88	-0.17	-5.66	0.12	4.07	1.09	-1.28	-3.98	0.94	271
20124	Post-Lehman	1.15	22.59	-0.18	-5.04	0.12	4.45	1.09	-1.36	-4.31	0.94	266
20131	Post-Lehman	1.10	26.54	-0.14	-5.76	0.10	4.44	1.06	-0.81	-2.91	0.96	268
20132	Post-Lehman	1.15	30.82	-0.14	-5.85	0.06	3.20	1.07	-0.97	-3.82	0.96	272
20133	Post-Lehman	1.13	31.09	-0.13	-4.76	0.07	4.82	1.06	-0.72	-3.09	0.96	275
20134	Post-Lehman	1.13	32.06	-0.14	-4.96	0.08	4.77	1.07	-0.76	-2.96	0.96	274
20141	Post-Lehman	1.10	29.84	-0.10	-4.39	0.07	4.21	1.06	-0.62	-2.13	0.96	272
20142	Post-Lehman	1.04	32.61	-0.07	-4.05	0.08	5.83	1.06	-0.46	-1.70	0.96	267
20143	Post-Lehman	1.07	36.40	-0.07	-4.67	0.06	5.40	1.06	-0.61	-2.50	0.97	263
20144	Post-Lehman	1.04	34.96	-0.07	-3.97	0.08	6.23	1.05	-0.41	-1.60	0.96	267
20151	Post-Lehman	0.98	31.05	-0.03	-1.76	0.06	3.61	1.01	0.23	0.90	0.97	170
20152	Post-Lehman	0.99	35.43	-0.03	-1.92	0.05	4.16	1.02	0.23	0.91	0.97	178
20153	Post-Lehman	0.90	24.63	-0.01	-0.52	0.08	4.59	0.98	0.82	2.77	0.98	106

TABLE 5

Log Model – Summary Cross Section Regressions

The table reports averages of coefficient values of regressions shown in the Table 4. $\overline{\text{Tier 1}}$ is the average value of the coefficient on Tier 1. $\overline{Pos}$ ($\overline{Neg}$) is the average value of the coefficient adjustments that increase (decrease) Tier 1 relative to equity. $\Sigma\beta_{1..n}$ is the average of the sum of the coefficients, excluding the intercept (β_0). $\bar{t}$ is the average t-value. Crises quarters as those that were affected by the dot.com or market crisis ($t < 2002Q4$) and the global financial crisis: $t > 2007Q2$ and $t < 2009Q2$. *Pre-Crisis* is the period 2002Q4 to 2007Q2. *Post-Lehman* is the period from 2008Q3 onward. *Post Lehman – pre-crisis* is the difference in coefficient values between values for the pre-crisis period and the Post Lehman period. t-values are Fama and MacBeth (1973) t-values calculated as the ratio of the sample mean to the standard deviation of the distribution of the estimated coefficients, divided by the square root of the number of quarterly cross-sections. For $\overline{\text{Tier 1}}$ and for $\Sigma\beta_{1..n}$ we use 1 (one) as a reference value to determine the t-values. The p-values assume unequal sample distributions.

Averages	$\overline{Tier1}$	$\bar{t}$	$\overline{Pos}$	$\bar{t}$	$\overline{Neg}$	$\bar{t}$	$\overline{t\Sigma\beta_{1..n}}$	$\overline{\beta_0}$	$\bar{t}$	$\overline{R^2}$	# of obs.
All	1.13	32.8	-0.13	-4.46	0.08	4.21	1.08	-0.85	-2.96	0.95	16,895
t-value	10.1		-9.11		17.7		16.7	-19.9		201	
In both crises	1.13	28.3	-0.11	-4.19	0.09	3.75	1.10	-0.95	-3.53	0.93	3,793
t-value	6.33		-3.95		9.16		6.63			67.7	
Pre-Crisis	1.09	47.9	-0.06	-4.03	0.05	4.60	1.08	-0.33	-2.00	0.97	6,192
t-value	19.1		-17.16		22.6		53.2			1394	
Post Lehman	1.17	23.1	-0.20	-4.84	0.11	4.17	1.08	-1.15	-3.24	0.93	7,826
t-value	3.43		-4.44		8.45		4.81			60.1	
Post Lehman – pre-crisis	0.08		-0.14		0.05		-0.01	-0.82		-0.04	
t-value	1.69		-3.20		4.32		-0.34	-2.65		-2.85	
p-value	0.05		0.00		0.00		0.37	0.01		0.00	

TABLE 6

Log Model – Goodwill, DTA, MSR, Unrealised Gains and Losses, Minority Interests

The table reports results of regressions that rely on U.S. bank holding companies over the 2001Q1 to 2015Q4, where the dependent variable (m) is the log of the Market Value of the bank at the end the quarter:

$$m_{i,t} = \beta_0 + \sum_{n=1}^{N} \beta_n \cdot x_{n,i,t} + \varepsilon_{i,t} \tag{7}$$

$x_{n,i,j}$ is from the following list of (N) regressors, which are all logged absolute values of the underlying values: *Tier 1* is either Tier 1 [8274] or Common Equity Tier 1 [P859], the latter as defined by the U.S. implementation of Basel III. *Positive Adjustments* is adjustments that increase *T1* relative to equity. *Negative Adjustments* is adjustments that decrease *T1* relative to equity. *Goodwill* is disallowed Goodwill and intangibles [B590], [P842], [P841]. *Deferred Tax Assets* is Deferred Tax Assets disallowed for regulatory capital purposes [5610, P843, P855]. *Mortgage Servicing Rights* (MSR) is disallowed mortgage servicing rights and purchased credit card relationships [P854], [B591]. *Unrealised Gains (Losses)* represent the prudential filter on net unrealised holding gains (losses) on Available-For-Sale securities [8434], [A221], and [P845]. *Minors* is qualifying minority interests in consolidated subsidiaries. The mnemonics in square brackets refer to the item codes from the Consolidated Financial Statements for Bank Holding Companies (FR Y-9C); their definitions are from https://www.federalreserve.gov/apps/mdrm/data-dictionary. The regression model relies on t-values that account for two-dimensional within-cluster correlation (Petersen, 2009).

	Goodwill		DTA		MSR		UR Gain & Loss		Minors	
	β	*t*	β	*t*	β	*t*	β	*t*	β	*t*
Tier 1	1.19	45.2	1.17	51.7	1.18	43.3	1.10	63.3	1.07	55.8
Positive adjustments	-0.14	-6.89	-0.14	-7.07	-0.14	-6.56				
Negative adjustments (ex Goodwill, DTA, MSR)	-0.04	-4.72	0.05	6.35	0.03	4.58				
Goodwill	0.05	9.30								
Deferred Tax Assets			-0.05	-9.06						
Mortgage Servicing Rights					0.00	0.08				
Negative adjustments									0.06	6.00
Positive adjustments (ex unrealised losses, minors)							-0.06	-7.63	-0.06	-7.10
Unrealised losses							0.01	1.96		
Negative adjustments (ex unrealised gains)							0.03	5.25		
Unrealised gains							0.00	0.60		
Minority interests									0.00	-0.37
Intercept	-0.85	-4.57	-0.78	-4.67	-0.83	-4.10	-0.78	-4.40	-0.74	-3.87
$\Sigma\beta_{1..n}$	1.06		1.03		1.07		1.09		1.07	
$\overline{R}^2$		0.90		0.90		0.89		0.89		0.89
# of obs.		17,636		17,636		17,636		17,636		17,636

TABLE 7

Log Model – Deciles

The table reports results of regressions of data sorted on a bank's quarterly Tier 1 ratio: Tier 1 capital divided by risk-weighted assets. The regressions rely on U.S. bank holding companies over the 2001Q1 to 2015Q4, where the dependent variable (m) is the log of the Market Value of the bank at the end the quarter:

$$m_{i,t} = \beta_0 + \sum_{n=1}^{N} \beta_n \cdot x_{n,i,t} + \varepsilon_{i,t} \tag{8}$$

$x_{n,i,j}$ is from the following list of (N) regressors, which are all logged absolute values of the underlying values: *Tier 1* is either Tier 1 [8274] or Common Equity Tier 1 [P859], the latter as defined by the U.S. implementation of Basel III. *Average Total Assets* is the average of Total Assets [2170], in millions of USD. The mnemonics in square brackets refer to the item codes from the Consolidated Financial Statements for Bank Holding Companies (FR Y-9C); their definitions are from https://www.federalreserve.gov/apps/mdrm/data-dictionary. The regression model relies on t-values that account for two-dimensional within-cluster correlation (Petersen, 2009).

Decile	Tier 1 Ratio	Average Total Assets	Tier 1	t	Intercept	t	$\overline{R}^2$	# of obs.
1	7.91%	107,410	1.18	141	-2.17	-18.0	0.91	2,070
2	9.82%	35,434	1.09	129	-0.79	-7.25	0.86	2,042
3	10.53%	33,326	1.05	121	-0.28	-2.57	0.87	2,047
4	11.09%	30,787	1.04	114	-0.17	-1.54	0.87	2,043
5	11.62%	23,729	1.01	105	0.20	1.71	0.85	2,032
6	12.21%	15,683	1.02	95.5	0.09	0.68	0.86	2,052
7	12.89%	10,203	1.02	89.1	0.06	0.43	0.85	2,047
8	13.72%	4,761	1.03	100	-0.07	-0.56	0.84	2,041
9	15.14%	6,475	1.04	115	-0.16	-1.58	0.86	2,044
10	20.65%	5,561	1.04	121	-0.18	-1.72	0.89	2,019

TABLE 8

Descriptive Statistics – Traditional Approach.

The table presents descriptive statistics of variables from U.S. bank holding companies over the 2001Q1 to 2015Q4. The mnemonics in square brackets refer to the item codes from the Consolidated Financial Statements for Bank Holding Companies (FR Y-9C); their definitions are from https://www.federalreserve.gov/apps/mdrm/data-dictionary. *Return* is the share return over the quarter net of the stock market value-weighted return including distributions. *Capital* is Total Qualifying Capital Allowable under the Risk-based Capital Guidelines [3792]. *Tier 1 LR* is the Tier 1 Leverage Capital Ratio [7204]. *Liquid Assets* is the sum of Noninterest-bearing Balances and Currency and Coin [0081], Interest-bearing Balances in U.S. Offices [0395], and Interest-bearing Balances in Foreign Offices Edge and Agreement Subsidiaries and IBFS [0397], divided by total assets [2170]. *Deposits* is Deposits: Noninterest-bearing [6631] and Total Interest-bearing Deposits in Foreign and Domestic Offices [6636], divided by total assets. *Asset Quality (%)* is Allowance for Loan and Lease Losses [3123] divided by total Assets [2170]. *Size* is the log of Total Assets [2170]. *M2B* is the market to book ratio. *PER* is the ratio of Price to Net Interest Income [4074]. *Beta* is a bank's stock beta, estimated using 60 monthly observations of bank returns and the Datastream EU market index.

$n = 15,081$	Mean	Min	p5	p25	p50	p75	p95	Max	StDev
Return (%)	0.32	-86.5	-24.9	-7.98	-0.75	7.78	27.9	263	17.4
Capital (%)	13.9	0.90	10.5	11.9	13.3	15.3	19.3	49.7	3.09
Tier 1 LR (%)	9.17	0.34	6.41	7.92	8.95	10.2	12.6	33.7	2.05
Liquid Assets (%)	4.23	0.02	1.31	2.20	3.05	4.63	10.9	44.0	3.99
Deposits (%)	75.3	5.37	57.9	70.4	77.2	82.1	87.2	95.2	9.7
Loans (%)	65.7	1.20	43.0	59.9	67.2	73.6	82.7	95.5	12.2
Asset Quality (%)	1.07	0.00	0.49	0.76	0.95	1.24	2.07	7.20	0.54
Size	15.0	12.7	13.3	13.9	14.6	15.7	18.3	21.7	1.57
M2B	1.48	0.03	0.37	0.94	1.37	1.93	2.85	8.96	0.77
PER	8.61	0.09	1.50	4.07	6.50	11.1	22.6	49.4	6.74
Beta	0.69	-1.40	-0.13	0.27	0.62	1.02	1.69	5.13	0.59

Year	Return (%)	Capital (%)	Tier 1 LR (%)	Liq. Assets (%)	Deposits (%)	Loans (%)	AQ (%)	Size	M2B	PER	Beta	# of obs.
2001	17.7	12.7	7.88	3.80	72.0	63.5	0.92	15.2	1.89	10.02	0.13	502
2002	6.31	13.1	8.23	3.87	72.9	63.4	0.94	15.0	1.95	9.12	0.16	845
2003	8.15	13.1	8.26	3.92	73.0	62.7	0.94	15.0	1.92	9.52	0.34	979
2004	0.24	13.5	8.68	3.48	73.2	63.8	0.90	14.9	2.18	11.8	0.40	1079
2005	-0.19	13.3	8.81	3.20	74.0	65.9	0.85	14.9	2.10	11.0	0.64	1198
2006	-0.65	13.1	8.99	3.10	74.5	67.9	0.83	14.9	2.01	11.0	0.79	1265
2007	-2.74	12.9	9.08	2.79	74.4	69.8	0.84	14.9	1.75	10.3	0.67	1253
2008	-5.30	12.2	8.64	2.86	72.3	71.2	0.99	15.0	1.22	7.31	0.48	1178
2009	-1.45	13.4	9.17	4.29	74.2	68.9	1.37	15.0	0.79	4.79	0.67	1129
2010	-5.83	14.4	9.23	5.83	77.0	65.2	1.58	15.0	0.83	5.32	0.78	1100
2011	-3.59	15.6	9.8	5.69	78.0	63.1	1.48	15.1	0.90	5.91	0.95	1039
2012	1.51	15.9	10.0	5.78	78.5	62.3	1.30	15.1	0.94	6.44	0.99	1022
2013	2.37	15.9	10.3	5.76	79.2	63.2	1.15	15.1	1.13	7.98	1.04	1034
2014	1.73	15.3	10.4	5.19	79.0	65.1	0.98	15.2	1.29	9.14	0.98	1014
2015	-2.12	14.6	10.1	4.70	77.3	66.3	0.84	15.7	1.30	11.2	1.16	444

TABLE 9

Traditional Model–Results

The table reports results of regressions that rely U.S. Bank Holding Companies over the 2001Q1 to 2015Q4, where the dependent variable r or *return* is the share return over the quarter, net of the stock market value-weighted return including distributions:

$$r_{i,t} = \beta_0 + \sum_{n=1}^{N} \beta_n \cdot X_{n,i,t-1} + \varepsilon_{i,t} \tag{9}$$

where $X_{n,i,t-1}$ are lagged observation from the following set of variables: *Capital* is Total Qualifying Capital Allowable under the Risk-based Capital Guidelines [3792]. *Tier 1 LR* is the Tier 1 Leverage Capital Ratio [7204]. *Liquid Assets* is the sum of Noninterest-bearing Balances and Currency and Coin [0081], Interest-bearing Balances in U.S. Offices [0395], and Interest-bearing Balances in Foreign Offices Edge and Agreement Subsidiaries and IBFS [0397], divided by total assets [2170]. *Deposits* is Deposits: Noninterest-bearing [6631] and Total Interest-bearing Deposits in Foreign and Domestic Offices [6636], divided by total assets. *Asset Quality* is Allowance for Loan and Lease Losses [3123], divided by total assets. *Size* is the log of Total Assets [2170]. *M2B* is the market to book ratio. *PER* is the ratio of Price to Net Interest Income [4074]. *Beta* is a bank's stock beta, estimated using 60 monthly observations of bank returns. Some regressors interact with a *Crisis* indicator variable, which is set to one (1) if ($t < 2002Q4$) and ($t > 2007Q2$ and $t < 2009Q2$). The mnemonics in square brackets refer to the item codes from the Consolidated Financial Statements for Bank Holding Companies (FR Y-9C); their definitions are from https://www.federalreserve.gov/apps/mdrm/data-dictionary. The regression model relies on t-values that account for two-dimensional within-cluster correlation (Petersen, 2009). The sample contains only banks with Total Assets > \$500M, this is because in 2006, the threshold for filing a FR Y-9C report changed from \$150 million of total assets to \$500 million of total assets (Federal Reserve, 2006).

	β	t	β	t	β	t	β	t
Capital	0.313	2.442			0.355	2.393		
Tier 1 LR			0.503	2.971			0.595	3.095
Liquid Assets	-0.111	-2.163	-0.115	-2.225	-0.112	-2.252	-0.117	-2.313
Deposits	-0.006	-0.307	-0.009	-0.464	0.008	0.353	0.006	0.273
Loans	0.068	2.968	0.024	1.615	0.087	3.387	0.034	2.333
Asset Quality (bp)	-2.168	-2.454	-2.193	-2.506	-1.787	-1.893	-1.799	-1.943
Size	-0.001	-0.320	-0.001	-0.250	0.001	0.179	0.001	0.248
M2B	0.024	3.924	0.026	3.995	0.023	3.717	0.025	3.921
PER	0.001	1.183	0.000	0.576	0.001	0.861	0.000	0.186
Beta	0.001	0.077	0.000	0.022	0.005	0.495	0.005	0.454
Capital · Crisis					-0.264	-1.241		
Tier 1 LR · Crisis							-0.483	-1.353
Liquid Assets · Crisis					-0.004	-0.023	0.001	0.008
Deposits · Crisis					-0.041	-1.316	-0.041	-1.312
Loans · Crisis					-0.070	-1.400	-0.028	-0.709
Asset Quality (bp) · Crisis					-3.885	-1.686	-3.905	-1.661
Size · Crisis					-0.007	-1.302	-0.007	-1.303
M2B · Crisis					-0.001	-0.081	-0.003	-0.193
PER · Crisis					0.002	1.084	0.002	1.245
Beta · Crisis					-0.033	-1.704	-0.033	-1.704
Intercept	-0.036	-0.405	-0.009	-0.121	-0.096	-0.914	-0.068	-0.749
Year fixed-effects	Y	Y	Y	Y	Y	Y	Y	Y
$\overline{R}^2$		0.291		0.291		0.294		0.295
# of obs.		15,081		15,081		15,081		15,081