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Proposed Basel III Rules on Mortgage Servicing Rights

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# Responding to Regulatory Uncertainty: Evidence from the Proposed Basel III Rules on Mortgage Servicing Rights

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## **Abstract**

This paper examines how firms respond to *proposed* regulation. Specifically, we utilize the time period that the Federal Reserve used to adopt Basel III to examine how quickly firms adjusted their financial reporting and/or business model decisions in response to the proposed regulatory framework. Our results suggest that firms alter their business models and make strategic financial reporting changes before regulators even agree on the final regulatory terms. We also provide evidence that firms are more likely to make these anticipatory changes when they are more certain that they will eventually be subjected to the proposed regulation. These findings combine to suggest that firms often anticipate and prepare for regulatory changes well in advance of the official implementation date.

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## 1. Introduction

Regulation is frequently born of financial crises. This relationship stems from regulators' attempts to change firm behavior so that similar crises do not recur in the future (Calomiris and Gorton 1991). While prior research shows that investors immediately react to proposed regulatory changes (Lev 1979), managers must also decide when and how they will respond to the uncertainty that the proposed regulation introduces into their operating environment. In this paper, we utilize the time period that the Federal Reserve used to adopt and implement the Third Basel Accord ("Basel III") to examine how firms respond to *proposed* regulation. This is an attractive setting to examine this research question because we are able to observe both financial reporting and operating decisions that banks would be unlikely to make unless they were responding to specific provisions included in Basel III. Accordingly, we examine the timing and extent to which banks made these decisions prior to the adoption and implementation of Basel III.

Several academic studies, as well as industry experts, indicate that banks' reliance on the originate-to-distribute ("OTD") model significantly contributed to the onset of the recent financial crisis (Ashcraft and Schuermann 2008; Acharya and Richardson 2009; Crotty 2009; Wilmarth 2009; Allen and Carletti 2010). The underlying premise of this argument is that the OTD model reduces a bank's incentives to adequately screen or monitor borrowers (Keys et al. 2010; Purnanandam 2011).<sup>1</sup> Further, Nadauld and Weisbach (2012) provide evidence that banks offer lower spreads on loans that are subsequently securitized compared to those that are not

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<sup>1</sup> Consistent with this conjecture, the Board of Governors of the Federal Reserve System authored the "Report to the Congress on Risk Retention" in regards to the securitization of loans. In their report, they note that securitization "displayed significant vulnerabilities to informational and incentive problems among various parties involved in the process. The ramifications of these problems have had and continue to have profound effects on many American households" (Board of Governors of the Federal Reserve 2010).

subsequently securitized. These results combine to suggest that securitized loans have lower compensation per unit of risk than similar loans that are not securitized. Additionally, the OTD model provides banks with the flexibility to quickly ramp up or ramp down their mortgage lending without affecting the other parts of their operations. Rosen (2011) provides evidence that this flexibility increases the systemic risk of the financial system as banks ramp up their lending to include lower-quality borrowers during boom periods (Ruckes 2004; Bushman et al. 2015).

Given these concerns that link the OTD lending model with increased systemic risk, it's not surprising that the announcement of Basel III included several new provisions that increased the regulatory capital requirements associated with its use. One such provision increases the risk-weighting of mortgage-servicing rights ("MSRs") to 250% from their previous 100% risk-weighting *and* by capping a bank's MSRs at 10% of its common equity component of Tier 1 capital (Basel Committee 2010).<sup>2</sup> These proposed changes would increase the regulatory costs associated with holding MSRs by an estimated 63% *before* taking into consideration the 10% limitation (Mortgage Bankers Association 2012).<sup>3</sup> Assuming the 10% limitation is breached, the new regulatory costs would be considerably higher than 63%.

Bank managers, upon learning of this proposed cost structure, face a tradeoff deciding when to respond to the proposed regulation. Managers would seemingly prefer to wait until the regulatory terms are finalized before making significant changes to their business, but in doing so are then forced to make the requisite changes over a shorter time period. If there are

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<sup>2</sup> Mortgage-servicing rights are intangible assets that arise from the originate-to-distribute lending model. These assets arise because, historically, parties interested in purchasing these loans have only been interested in receiving the contractual cash flows associated with repayment but not in managing the relationship with the borrowers.

<sup>3</sup> In Appendix B, we include a simple example from the Mortgage Banking Association's comment letter to regulators that details how these changes result in a 63% increase in the regulatory capital associated with MSRs.

significant costs associated with making the proposed changes, then managers that delay making them may increase the volatility of their firms' financial performance as they are forced to recognize these costs over a shorter period of time. Further, by waiting to make the proposed changes, managers delay sending a valuable signal to investors and regulators that they are compliant with the proposed regulatory standard (Akerlof 1970). These advantages may lead managers to make the proposed regulatory changes before the regulation is finalized. While short-window event studies that examine the impact of new regulations generally assume that firms don't behave in this manner, firms' disclosures often suggest otherwise. For example, and specific to our setting, Wells Fargo reported in its 2010 annual report that they were "*well underway towards Basel II and III implementation...and expect to be above a 7% Tier 1 common equity ratio under Basel III within the next few quarters.*" Considering the Basel Committee did not finalize Basel III until June, 2011, and the Board of Governors of the Federal Reserve System didn't actually approve Basel III until July, 2013, this disclosure indicates that firms may be making significant anticipatory changes in response to *proposed* regulations.

To determine whether firms are actually responding to the MSR provisions, we utilize the initially proposed 10% limitation allowed for MSRs in a bank's common equity component of Tier 1 capital to capture the differential pressure applied to each bank as a result of the proposed regulation. Specifically, we use each bank's value of MSR/Tier 1 capital and designate the banks with ratios above or approaching the 10% threshold as being placed under greater regulatory pressure ("High Pressure") from these new provisions. Given that the High Pressure banks face greater costs for holding MSRs in the proposed regulatory environment relative to other banks, the High Pressure banks have a greater incentive to alter their operations and/or their financial reporting decisions in response to the proposed regulation. In particular, managers could reduce

their use of the OTD lending model or even sell a portion of their servicing portfolios to get below the 10% threshold. Alternatively, or even simultaneously to these operational changes, MSR valuations are generally classified as a Level 3 asset so managers could reduce their exposure to the proposed regulatory costs by utilizing their financial reporting discretion to lower their MSR valuations (Altamuro and Zhang 2013) and lessen the impact of the regulation on the reported financial statements.

We begin our empirical analysis by validating our identification strategy. If the MSR provisions actually put increased regulatory pressure on the High Pressure banks, then we would expect that these banks would have responded through at least one of the previously identified channels at some point following the announcement of the first consultative documents. Using bank fixed effects to create a within-bank research design, we find that the High Pressure banks reduced their use of the OTD model, the size of their servicing portfolios, and the valuation multiples applied to their MSRs to a greater extent than other banks after the initial consultative documents were released. These results provide support for our identification strategy by showing that the banks facing increased regulatory costs from the new provisions engaged in specific actions that would reduce those costs.

Having shown that the High Pressure banks altered their behavior after Basel III was announced, we then attempt to identify the time period in which these banks responded to the regulation. Understanding the timing of the response provides unique insights into management's trade-off between certainty over the details of the regulation and potential financial statement volatility. To do so, we divide our post-announcement period into two separate time periods, namely: 1) "Proposed", and 2) "Adopted". The Proposed time period begins after the Basel Committee released the initial consultative documents for Basel III in December, 2009 and ends

in December, 2011 when the Federal Reserve issued a press release indicating that they planned to implement the Basel III reforms in the United States. The Adopted period begins immediately after the Proposed period ends and extends through the final mandatory compliance date for FDIC-supervised banks (January 1, 2015). We find that the previously identified differential behavior among the High Pressure banks did not wait until the regulation was adopted, but rather that it began during the Proposed time period. Further, we find that this differential behavior continued into the Adopted time period, suggesting that the High Pressure banks made only a partial adjustment to the proposed regulation during the initial period.

These results suggest that firms quickly respond when regulators propose new regulation. However, it is unclear why managers would make changes to regulations that have not yet been enacted. We hypothesize that this reaction is contingent on whether managers believe that their firms will ultimately be subjected to the regulation. In our setting, small banks had significantly more uncertainty about whether they would be subjected to the Basel III framework. This uncertainty was partially driven by the initial consultative documents that indicated that the first “*key element*” for the framework was to “*ensure that large, internationally active banks are in a better position to absorb losses*” (Basel Committee 2009). This uncertainty also stemmed from the Wall Street Reform and Consumer Protection Act (“Dodd-Frank”) that was introduced in December, 2009 and proposed that financial companies with total assets above \$10 billion be required to perform semi-annual stress tests and report the results of those tests to the Board of Governors of the Federal Reserve. This repeated focus on the regulatory capital levels of large, interconnected financial institutions led many to believe that smaller institutions would not be subjected to the same regulatory framework as larger institutions.

Accordingly, we utilize the \$10 billion total asset threshold to partition our sample and predict that the High Pressure banks above this threshold will respond differentially in the Proposed period whereas the smaller High Pressure banks will not respond until the Adoption period when the uncertainty about their adherence to the regulation was resolved. Our results are consistent with this prediction and provide evidence that managers' expectations about a regulation being implemented significantly impacts when they begin responding to the proposed regulation.

Our study makes several contributions to the literature. First, we provide evidence that firms anticipate and prepare for regulatory changes well in advance of the official implementation date. Given the long regulatory process typically observed in the United States, our findings highlight that the appropriate date for an event study may be the announcement of the regulation rather than its date of enactment or official implementation (Lang and Shackelford 2000). Accordingly, we encourage researchers to carefully consider how policymakers may have signaled, leaked, or otherwise released information related to the impending regulation in order to avoid false inferences about the significance of the event being studied (MacKinlay 1997; McWilliams and Siegel 1997).

Second, we contribute to the extensive literature on fair value accounting by providing empirical evidence that managerial incentives can significantly influence an asset's reported fair value. Our finding combines with Barth et al. (2012) to dispel the widespread belief that fair value accounting precludes managers from strategically manipulating earnings and/or regulatory capital (Healy and Wahlen 1999). However, unlike their study, which examines the use of transaction-based earnings management (Graham et al. 2005), our study focuses on a specific accrual to examine accrual-based earnings management. By examining a specific accrual, rather



than aggregate accruals, our study is better designed to identify the discretionary component of the accrual (McNichols 2000).

Finally, our study joins others in providing regulators with timely information about how banks are responding to the recent implementation of Basel III (Cosimano and Hakura 2011; Angelini et al. 2011; Repullo and Saurina Salas 2011). Specifically, we show that banks have responded to this regulation by making significant operational and financial reporting changes. Given the importance of this reform, and the limited research performed to date, we join with Beatty and Liao (2013) in calling for additional research in this area.

The remainder of the paper proceeds as follows. Section 2 motivates our study. Section 3 describes our research design and the data used therein. Section 4 discusses our empirical results. Section 5 provides additional analyses and we conclude in Section 6.

## **2. Background**

### *2.1 Basel III Timeline*

Initial consultative documents for Basel III were released in December 2009 with the purpose of establishing a global regulatory framework that would strengthen the stability of the financial system by increasing bank liquidity and decreasing leverage (Wellink 2011). However, the Basel Committee did not agree on the final framework for this regulation until June 2011. At that point, each member country still needed to translate the finalized framework into national laws and regulations. In December 2011, some clarity about this tailoring process in the United States was provided when the Federal Reserve announced that they would propose to have substantially all of the Basel III rules implemented. This formal proposal occurred in June 2012 when the Federal Reserve published their proposed set of reforms and invited the public to

provide comments. In July 2013, after receiving more than 2,500 public comment letters, the Federal Reserve announced the final regulatory terms and mandated that banks begin the phase-in process in January 2014. Smaller, less complex banks were given an additional year to begin the phase-in process.

The magnitude of the changes proposed for Basel III, combined with the lengthy regulatory process in the United States, was such that U.S. banks would not be required to implement Basel III until several years after it was initially proposed. However, industry experts noted that banks immediately responded to the new proposals even though they were aggressively lobbying to have them altered.<sup>4</sup> In fact, an industry report published in April 2013 noted that *“more than two-thirds of [the impact to ROE from Basel III] has already been reflected in current ROE levels, as many banks have anticipated regulatory demands and reached Basel III requirements before the deadline”* (Boston Consulting Group 2013). This suggests that banks were implementing the proposed changes even though they were uncertain about what the final regulation would require. Consistent with this behavior, Wells Fargo reported in their 2010 annual report that *“Although uncertainty exists regarding the final rules, we are evaluating the impact of Basel III on our capital ratios based on our interpretation of the proposed capital requirements.”*

There are several reasons that banks may have responded to Basel III prior to it being enacted. First, business model and/or capital structure changes are often time-intensive. By

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<sup>4</sup> The *Los Angeles Times* reports that the country’s largest banks increased their lobbying expenditures in 2009 by 12% in an attempt to influence any potential regulation following the crisis. JPMorgan Chase & Co., Wells Fargo & Company, and Morgan Stanley had the most significant year-over-year lobbying expenditure increases of 12%, 27%, and 16% respectively (Popper 2010). While this lobbying may have influenced some of the regulation that was being discussed, it did not alter the specific provisions motivating our tests.

responding early, firms have additional time to make the proposed adjustments in an orderly manner. Further, by responding sooner, managers are able to spread any costs that may be associated with making the changes over an extended period of time. This will better position them to avoid introducing additional volatility into their firms' financial performance.

Second, in 2009, the Basel Committee announced that they would begin to examine how banks would be impacted if the proposed Basel III framework were to be implemented. Additionally, the Committee established a semi-annual monitoring process in 2011 to examine the risk-based capital ratio, the leverage ratio and the liquidity metrics for a representative sample of institutions in each geographic jurisdiction (Basel Committee 2012). This process allowed banks to voluntarily and confidentially report their regulatory capital ratios under the Basel III framework.<sup>5</sup> This voluntary reporting structure provided banks with an incentive to report this information to avoid unnecessary regulatory scrutiny.

Third, some banks have incentives to voluntarily disclose their estimated Basel III ratios to distinguish themselves from poorly capitalized banks (Akerlof 1970). This reaction may then trigger non-disclosing banks to disclose their information. This unraveling theory of voluntary disclosure may ultimately lead each bank to truthfully disclose its information (Grossman and Hart 1980; Grossman 1981; Verrecchia 1983). Consistent with this idea, we observed that many banks, including all of the Comprehensive Capital and Analysis Review (CCAR) stress test participants (SNL Financial 2013), have voluntarily disclosed their estimated Basel III risk-based capital ratio as part of their 10-Q filings with the SEC prior to the enactment date.

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<sup>5</sup> These results were then aggregated and published on a semiannual basis to allow market participants to observe how banks were preparing for the new regulation. This monitoring assumed full implementation of the Basel III package as proposed. Thus, for all intensive purposes, banks were being monitored to assess their readiness for the *proposed* set of standards.

## 2.2 Basel III & Mortgage Servicing Rights

While Basel III significantly impacts all banks above the \$500 million consolidated asset threshold, an important part of our research design is that it also includes provisions designed to differentially affect banks. One of these provisions, as proposed in the initial consultative document, targeted the intangible assets arising from banks' use of the OTD lending model. Specifically, it proposed that "goodwill and other intangibles should be deducted from the Common Equity component of Tier 1" (Basel Committee 2009). The Basel Committee later quantified this statement by announcing that they planned to increase the risk-weighting of MSR to 250% from their previous 100% risk-weighting and cap a bank's MSR at 10% of its common equity component of Tier 1 capital (Basel Committee 2010).<sup>6</sup> These proposed changes increase the regulatory costs associated with holding MSR by an estimated 63% *before* taking into consideration the 10% limitation (Mortgage Bankers Association 2012). Assuming that the 10% limitation is breached, the new regulatory costs could be considerably higher than 63%.

We expect these provisions to elicit a differential response among banks because the banks that are near the 10% threshold have a much larger incentive to reduce their portfolio of MSR. One way that banks could lower their MSR holdings is by reducing their use of the OTD lending model in order to allow runoff of their MSR. This could be done relatively quickly because, as noted previously, the OTD model allows banks the flexibility to quickly ramp up or

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<sup>6</sup> In addition to this 10% cap, Basel III also imposes a similar bright-line penalty on banks that have MSR, deferred tax assets, and investments in the common shares of unconsolidated financial institutions that together exceed 15% of their Tier 1 capital. It's therefore possible that MSR will have to be deducted from regulatory capital even when they do not individually exceed the 10% threshold.

ramp down their mortgage lending without affecting the other parts of their operations. Alternatively, or even simultaneously, banks could quickly reduce the amount of their MSR holdings by selling them to another party. However, such transactions are complicated because the proposed regulation is such that there is likely to be a limited number of banks with the interest and capacity to purchase the MSRs. While banks could seemingly obtain a better price by selling their MSRs to a non-bank servicer, such servicers did not exist when the regulation was proposed and only now exist as a result of the proposed regulation.<sup>7</sup> Thus, managers may have been constrained in their ability to sell their MSRs when the regulation was initially proposed.

Managers could also alter their financial reporting decisions in order to lower their MSR holdings. While this may seem unlikely given that MSRs are to be initially recorded at their fair value, the absence of a secondary market for MSRs is such that their fair values are determined by managerial inputs (Kothari and Lester 2012; Altamuro and Zhang 2013). Given that the primary determinants of an MSR's value are its credit risk, prepayment risk, collateral, and product type (subprime vs. prime, ARM vs. fixed, etc.), managers have the ability to alter the MSR valuations by using values within a reasonable range for each of these items. Such behavior is seemingly acknowledged in how the Federal Housing Finance Association (FHFA) describes

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<sup>7</sup> For example, Nationstar, currently one of the five largest mortgage servicers in the country, had their initial public offering on March 8, 2012. On page 2 of their registration statement filed with the SEC, they note *"In the aftermath of the U.S. financial crisis, the residential mortgage industry is undergoing major structural changes that affect the way mortgage loans are originated, owned and serviced. These changes have benefited and should continue to significantly benefit non-bank mortgage servicers. Banks currently dominate the residential mortgage servicing industry, servicing over 90% of all residential mortgage loans as of September 30, 2011...However, banks are currently under tremendous pressure to exit or reduce their exposure to the mortgage servicing business as a result of increased regulatory scrutiny and capital requirements."*

the valuation process that banks use to determine the Level 3 asset values for their MSRs.<sup>8</sup> Specifically, the FHFA states:

*In estimating the fair value of MSRs, market participants generally use a Level 3 model-based fair value approach. Level 3 financial assets and liabilities consist primarily of financial instruments for which there is limited market activity and therefore little or no price transparency. As a result, the valuation techniques used to estimate the fair value of Level 3 instruments involve significant unobservable inputs, which generally are more subjective and involve a high degree of management judgment and assumptions. The key model assumptions are not entity specific assumptions but instead are market-based consistent with the fair value notion. Market participants have a broad range of views of these assumptions resulting in fair values that have a wide range due to the lack of price transparency. (Servicing Compensation Initiative 2011)*

In support of this statement by the FHFA, Hendricks and Shakespeare (2013) observe significant variation in the prepayment assumption used by large banks and Cochran et al. (2004) finds that the MSR valuation multiple ranges from 0 bps to 380 bps (0%–3.8%) of a loan’s UPB. Given this range of acceptable inputs and valuations, managers have both the ability and incentive to reduce their MSR valuations.

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<sup>8</sup> Note that ASC 820-10-35-37A requires that an asset’s level classification in its entirety is determined based on the *lowest level input* that is significant to the fair value measurement. Thus, to obtain Level 2 status, mortgage-servicers must be able to observe each of the significant inputs included in its valuation model.

### 3. Research Design and Data

#### 3.1 Research design

The objective of this paper is to examine when and how firms respond to *proposed* regulation. To answer these questions in an idealized experimental setting, we would prefer to have two randomly selected groups of banks that are identical in every respect except that one group is subject to proposed regulation (treatment group) while the other group is not (control group). Because we are unable to construct such a randomized experiment, we utilize a difference-in-difference research design that is less susceptible to omitted correlated variable problems than many other research designs. Further, we use a balanced panel of firms to avoid any concerns that our results are driven by changes in the composition of the two groups (Shadish et al. 2002).<sup>9</sup> The theoretical strength of this research design is that alternative explanations for our empirical findings must be that changes occurred in one group but not the other at the same time as the treatment.

Our use of this research design requires us to identify a variable that captures the regulatory pressure that each bank faces from a proposed regulation. As noted in Section 2.2, new provisions included in the original Basel III proposal sought to increase the risk-weighting of MSRs from 100% to 250% *and* to limit the amount of a bank's MSRs to 10% of its common equity component of Tier 1 capital. Accordingly, we utilize this proposed 10% limitation to differentiate those banks that face significantly increased regulatory pressure from the new MSR provisions from other banks that are not impacted as much from the proposed regulation.

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<sup>9</sup> In untabulated results, we also perform our analyses using an unbalanced panel and find our results to be qualitatively similar.

Specifically, we divide each bank's MSR valuation by its common equity component of Tier 1 capital as of December 31, 2009 (shortly after the initial release of the Basel III consultative documents). We then create an indicator variable (*HIGH\_PRESSURE*) that is equal to one if this ratio is in the top quintile of banks as of December 31, 2009, and zero otherwise.<sup>10</sup>

### *3.2 Sample selection and descriptive statistics*

As documented in Panel A of Table 1, our primary sample consists of quarterly observations of U.S. commercial bank holding companies from 2006-2014 that meet the following criteria: (1) complete data for each quarter of our study (including 2005 for lagged values), (2) an MSR balance as of December 31, 2009, (3) mortgage-servicing portfolios of at least \$1 million, and (4) non-missing values for each of the variables used in our analyses. We obtain our data from bank holding companies' quarterly call reports (Form Y-9C) that can be accessed from the Compustat Bank Regulatory Database and the Federal Reserve Bank of Chicago website.

## **INSERT TABLE 1**

Two of our subsequent analyses require banks to have an observable market valuation and to disclose detailed information about their MSR portfolio. Accordingly, for these analyses, we

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<sup>10</sup> An alternative to using the top quintile of banks for this *HIGH\_PRESSURE* variable would be to use the banks that exceed the 10% limitation. However, several difficulties arise when attempting to implement this approach. First, the Mortgage Bankers Association indicates that banks will operate with a buffer to ensure that they do not exceed the 10% threshold (Mortgage Bankers Association 2012). While the Mortgage Bankers Association suggests that this buffer could be around 7%, any attempts to quantify the buffer's size would be entirely arbitrary. Second, we are unable to calculate each bank's precise Tier 1 capital ratio under Basel III given the data that is disclosed in historical call reports. Accordingly, we elect to use the reported MSR value divided by Tier 1 capital to identify those banks that are likely to face the most dramatic increases in regulatory capital costs. The Mortgage Bankers Association (2012) estimates that the number of banks facing pressure is between 54 (using the 10% threshold) and approximately 108 (using the 7% threshold). At the time of the MBA's analysis, we observe that 431 banks had an MSR balance and at least \$1 million of UPB. The top quintile of these 431 banks would be 86 banks, which falls near the midpoint (81 banks) of the MBA's estimated range of banks facing pressure from the proposed regulation.



restrict our sample to include only the publicly-traded banks whose market value of equity and book value of equity could be obtained from the intersection of the CRSP and Compustat databases. We further restrict this reduced sample to those banks that include MSR rollforwards in their Form 10-K filings. By hand-collecting this data, we are able to obtain detailed information that is not provided in banks' call reports about the changes to their servicing portfolios. Table 1, Panel B documents the impact of these two restrictions on our sample.

### **INSERT TABLE 2**

Table 2 contains the descriptive statistics for our primary sample. This table includes the mean, median, interquartile range, and standard deviation for each variable in our sample for the entire time-series of our study. We also provide the mean and standard deviation for all variables partitioned between the time periods before and after the announcement of Basel III. Because the Basel Committee signaled their intent to penalize banks' MSR holdings in mid-December 2009 (Basel Committee 2009), we establish the pre (post) period of our study to include all bank-quarter observations prior to (on or after) January 1, 2010. Since the years 2006-2009 contain the time period leading up to and including the financial crisis, it is not surprising that the macroeconomic variables included in our study differ between the two periods. Further, we note that banks had more assets, larger servicing portfolios, lower concentrations of residential loans, and more diverse revenue streams following the announcement of Basel III. The detailed descriptions for each of these, and other, variables in our study are provided as part of Appendix A. Table 3 provides the correlation coefficients between each of these variables.

### **INSERT TABLE 3**

## 4. Empirical results

### 4.1 Banks' response to the announcement of Basel III – Validation

We begin our empirical analysis by examining whether specific lending and financial reporting behavior changed to a greater extent for High Pressure banks relative to other banks following the release of the initial consultative documents for Basel III. The purpose of this analysis is to validate our identification strategy that is based on the underlying premise that new provisions included in the proposed regulation would elicit differential behavior before the regulation is enacted from these banks with the highest MSR/Tier 1 ratios. As noted in Section 2.2, there are several different channels through which the High Pressure bank managers could reduce their exposure to the proposed regulation. Specifically, they could reduce their use of the OTD lending model, sell some of their MSR holdings, or reduce the valuations that they apply to their MSRs. Accordingly, we predict that the High Pressure banks will display differential behavior for any or all of these specific behaviors between the time that the regulation is proposed (December 2009) and the final mandatory compliance date (December 2014). To examine our prediction, we estimate the following equation using an OLS regression and bank fixed effects:

$$\begin{aligned} BEHAVIOR_{it} = & \alpha_0 + \beta_1 POST + \beta_2 HIGH\_PRESSURE_i + \beta_3 POST * HIGH\_PRESSURE_i \\ & + \sum \beta_j CONTROLS_{it} + \varepsilon \end{aligned} \quad (1)$$

where *BEHAVIOR* is one of the three specific behaviors that bank managers could take to reduce their exposure to the new regulation, namely *OTD*, *UPB*, or *MSR/UPB*. *OTD* is the ratio of loans originated for resale during the quarter, scaled by the beginning of quarter mortgage loans on the balance sheet. Thus, *OTD* measures the extent of a bank's participation in the OTD market as a

fraction of its overall mortgage portfolio (Purnanandam 2011). *UPB* is the natural log of the total quarter-end unpaid principle balance of loans serviced for others. This variable reflects the balance of loans (not on the bank's balance sheet) that the bank services on behalf of other entities that hold the loans. *MSR\_UPB* is the reported value of a bank's MSR's divided by the UPB of the associated servicing portfolio.<sup>11</sup> *POST* is an indicator equal to one if the fiscal quarter falls after the Basel Committee released the initial Basel III consultative documents in mid-December 2009, and zero otherwise. *HIGH\_PRESSURE* is an indicator equal to one if the ratio of a bank's MSR's to tier 1 capital is in the top quintile of banks as of December 31, 2009, and zero otherwise.<sup>12</sup>

We also include several control variables in the model to reduce concerns that our results are driven by omitted correlated variables. Among these are two observable inputs that have a significant impact on the valuation of MSR assets (Hendricks and Shakespeare 2013), namely the 10-year Treasury bond rate (*10YR\_BOND*), and the state-level unemployment rate (*UNEMPLOY*). We also include each bank's size (*LN\_ASSETS*), profitability (*ROE*), revenue mix (*REVMIX*), and the proportion of total balance sheet assets devoted to mortgage holdings (*MLOANS\_ASSETS*) in the model. We also include a quarterly time trend variable (*TREND*) to control for time trends in bank behavior that are unrelated to the announcement of Basel III.

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<sup>11</sup> There are at least two aspects of this frequently-used valuation ratio that make it attractive for detecting the presence of discretion in fair value reporting. First, the denominator cannot be manipulated by managers – it is simply the unpaid principle balance of loans serviced by the bank and is not subject to reporting discretion. Second, the fair value of MSR's in the numerator (which are often recorded as level 3 fair value assets) is largely driven by observable macroeconomic factors, which can be included as control variables in the regression models (Hendricks and Shakespeare 2013). This, along with the difference-in-difference research design, eliminates many alternative explanations for the presence of within-bank changes in the valuation of MSR's other than the strategic exercise of financial reporting discretion.

<sup>12</sup> Note that because *HIGH\_PRESSURE* remains constant across all quarters for a given bank, it is subsumed by the bank fixed effect and is therefore not reported as a main effect in the tables.

Additional information about each of the variables in Equation 1 is provided in Appendix A. Finally, we also include bank fixed effects to create a within-bank research design. For these, and all subsequent specifications, standard errors are clustered by bank.

#### INSERT TABLE 4

The results of estimating Equation 1 are provided in Table 4. Consistent with our expectation, we find that the High Pressure banks responded differentially after the Basel Committee released the initial consultative documents for Basel III.<sup>13</sup> Specifically, we observe that  $\beta_3 < 0$  for each of the three specific behaviors that these banks could take to evade some of the increased regulatory costs associated with the new MSR provisions. Focusing on Column 3 of Table 4, we find that  $\beta_3$  is estimated to be negative (-0.1498) and is statistically significant (t-stat=-3.61). This suggests that the High Pressure banks reduced their MSR valuations by 15.1% more than the other banks that felt relatively less pressure from the MSR provisions included in Basel III. Taken together, Table 4 provides support for our identification strategy and suggests that these provisions led banks to alter both their operating and financial reporting decisions.

#### *4.2 Banks' response to the announcement of Basel III – Timing*

Having shown that High Pressure banks made specific decisions that would reduce the increased regulatory costs associated with the proposed MSR provisions, we now refine our analysis to better understand the *timing* of this response. To do so, we divide our post-

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<sup>13</sup> There are two reasons for the lower in sample size in columns (1) and (2) relative to column (3). First, observations from 2006 are not included because commercial banks were not required to report origination and loan sale information (Schedule HC-P of the Y-9C) until 2007. Second, only banks with greater than \$1 billion in assets or \$10 million in loans held for sale (for two consecutive quarters) are required to report origination and loan sale information.

announcement period into two separate time periods, namely: 1) “Proposed”, and 2) “Adopted”. The Proposed time period begins after the Basel Committee released the initial consultative documents for Basel III in December 2009 and ends in December 2011 when the Federal Reserve issued a press release indicating that they planned to implement the Basel III reforms in the United States. The Adopted period begins immediately after the Proposed period concludes and extends through the final mandatory compliance date for FDIC-supervised banks (January 1, 2015). While it is known that investors respond quickly when new regulations are proposed (Lev 1979), prior research generally assumes that firms wait to respond to proposed regulation until the regulation is finalized, or even implemented. However, Section 2.2 highlights several reasons why firms may prefer to respond sooner. Accordingly, we expect that the differential behavior exhibited by the High Pressure banks after the release of the initial consultative documents will not be found exclusively in the Adopted time period. Rather, we expect that these firms will have begun to act differently during the Proposed time period and then continue into the Adopted period. To test this prediction, we estimate the following equation using an OLS regression and bank fixed effects:

$$\begin{aligned}
 OPERATIONS_{it} = & \alpha_0 + \beta_1 POST\_PROPOSED + \beta_2 POST\_ADOPTED + \beta_3 HIGH\_PRESSURE_i \\
 & + \beta_4 POST\_PROPOSED * HIGH\_PRESSURE_i \\
 & + \beta_5 POST\_ADOPTED * HIGH\_PRESSURE_i + \sum \beta_j CONTROLS_{it} + \varepsilon \quad (2)
 \end{aligned}$$

where all variables are as previously defined.

**INSERT TABLE 5**

Table 5 contains the results of estimating Equation 2. In all three columns, and consistent with our predictions, we find the estimated coefficients for  $\beta_4$  and  $\beta_5$  are increasingly negative between the Proposed and Adopted time periods. While the results support our primary hypothesis that firms quickly respond to proposed regulation, we observe that  $\beta_4$  is (is not) statistically different from zero in Columns 1 and 3 (2). One might interpret these results to suggest that the High Pressure bank managers preferred to engage in these two actions rather than dispose of their servicing portfolio. However, this interpretation is complicated as the lack of an active market for MSR's at the time the regulation was announced (as described in Section 2.2) may have limited managers' ability to pursue this course of action. In fact, we see that the percentage change in the estimated coefficients from the Proposed to the Adopted time period is greatest for the UPB regression, suggesting that High Pressure managers eagerly pursued this option as a more liquid market for MSR's developed. Taken together, our results are consistent with our prediction and suggest that managers do not wait for a proposed regulation to become finalized before making operational and financial reporting changes that reduce their firms' exposure to the proposed regulation. Rather, our results suggest that firms respond when new regulation is proposed and that their response intensifies as the regulation is formally adopted.

#### *4.3 Banks' response to the announcement of Basel III – Uncertainty*

Having shown that there is time-series variation in banks' responses to proposed regulation, we now examine the role that uncertainty plays in determining how quickly managers respond to proposed regulation. We expect uncertainty to influence managers' response time because becoming compliant with new regulation generally requires firms to incur new costs (both real costs and opportunity costs). Thus, we expect that managers will be unwilling to incur these costs if they do not believe that they will be subjected to the proposed regulation.

In our setting, the initial Basel III consultative documents indicated that the first “key element” of the new framework was to “*ensure that large, internationally active banks are in a better position to absorb losses*” (Basel Committee 2009, pp. 2). This focus on reforming the large banks was also a theme of the Dodd-Frank Act that was introduced in December 2009. This piece of legislation proposed that all financial companies with total assets greater than \$10 billion be subject to semi-annual stress tests, which would be reported to the Board of Governors of the Federal Reserve. If this focus on large, interconnected financial institutions caused smaller banks to be less certain that they would be subjected to the proposed Basel III reforms then we would expect that they would not act as quickly in responding to the proposed regulation. To test this prediction, we partition our sample based on the \$10 billion total asset threshold and re-estimate Equation 2 for each of the two partitions. Our prediction is that the rapid changes in operational and financial reporting behavior documented in Table 5 are concentrated among the large banks that had less uncertainty that they would ultimately be subjected to the proposed regulation.

#### **INSERT TABLE 6**

Table 6 contains the results of this analysis. Consistent with our prediction, the results of estimating Equation 2 within the partition of large banks (Columns 1a, 2a, and 3a) are similar to those results documented in Table 5. On the other hand, we observe that  $\beta_4$  is never significantly different from zero in any of the regressions within the small bank partition (Columns 1b, 2b, and 3b). However, important to our identification strategy, we do observe that  $\beta_5$  is negative and statistically significant in Column 2b. Thus, these banks did behave differentially than their peer firms after Basel III was proposed, albeit only after the Federal Reserve had removed much of the uncertainty associated with the implementation of the regulation. Taken together, and to the

extent that our partition on firm size captures managers' uncertainty about being subjected to the proposed regulation, these results suggest that managers are more likely to make anticipatory changes to proposed regulation when they are more certain that their firms will eventually be subjected to the proposed regulation.

## **5. Additional analyses – Valuation**

Our results indicate that banks altered both their operational and financial reporting decisions in response to the MSR provisions included in the proposed Basel III regulation. While regulators may have included these provisions to alter firms' operational decisions, the financial reporting changes identified in this paper are more surprising. Accordingly, we further examine the financial reporting changes to better understand the mechanisms by which these banks reduced the valuation of their MSR's. We also examine the value relevance of banks' MSRs to determine whether investors see through this strategic use of financial reporting discretion.

### *5.1 Banks' differential response to the announcement of Basel III—Valuation mechanisms*

To reduce a bank's aggregate MSR valuation, managers must either: (1) increase the amortization rate for their existing MSRs, and/or (2) lower the capitalization rates for new MSRs. Comparing these two mechanisms, amortization rate increases will reduce MSR holdings quicker than lowering capitalization rates because the amortization rates are applied to the bank's entire portfolio of MSRs whereas the capitalization rate is only applicable to the newly created MSRs. If High Pressure banks reduced the valuation of their MSRs (as suggested by the results in Tables 4, 5, and 6), then we should be able to see that they used either one or both of these mechanisms. However, as discussed in Section 3.2, this information is not included in banks' Y-9C filings. Thus, we restrict our sample of banks that: (1) are publicly traded, and (2) contain a



rollforward of their annual MSR activity in their 10-K filing.<sup>14</sup> We then hand-collect the information about these banks' servicing portfolios and tabulate descriptive statistics for this smaller set of banks and the hand-collected information in Table 7, Panel A. Using this hand-collected information, we then estimate the following OLS model:

$$MECHANISM_{it} = \alpha_0 + \beta_1 POST + \beta_2 HIGH\_PRESSURE_i + \beta_3 POST * HIGH\_PRESSURE_i + \sum \beta_j CONTROLS_{it} + \varepsilon \quad (3)$$

where  $MECHANISM_{it}$  is either: 1)  $AMORT\_RATE$ , which measures the percentage change in the reported value of bank  $i$ 's MSRs from changes in a bank's amortization rates or fair value assumptions, or 2)  $LN\_ADDITION\_VALUE$ , the capitalization rate used to create MSRs from bank  $i$ 's new loan originations. Aside from the use of  $MECHANISM_i$  as the dependent variable, Equation 3 is otherwise identical to Equation 1.

### INSERT TABLE 7

Columns 2 and 3 of Table 7, Panel B provide the results of estimating Equation 3. However, before we discuss those results, it is important to establish that the financial reporting discretion identified in Tables 4-6 is also found in our reduced sample of firms. Accordingly, Column 1 of Table 7 re-estimates Equation 1 (using MSR/UPB as the dependent variable) with our restricted sample of firms. Consistent with this group of firms utilizing their financial

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<sup>14</sup> Because the 10-k filings were not available for all of our banks through 2014 our hand collected sample only goes through 2013.

reporting discretion following the announcement of Basel III, we see that the estimated coefficient on the *POST\*HIGH\_PRESSURE* variable is negative and statistically significant.<sup>15</sup> The similarity of these results with those using the full sample (Table 4, Column 3) suggests that the analyses using the restricted sample are likely to be generalizable to the full sample.

Model 2 of Table 7 examines whether High Pressure banks increased their amortization rate to a greater extent relative to other banks after the initial consultative documents for Basel III were released. Consistent with High Pressure banks increasing their amortization rates to a greater extent than other banks, we find that  $\beta_3$  is estimated to be positive (3.3401) and statistically significant (t-stat=1.84). In terms of magnitude, High Pressure banks increased *AMORT\_RATE* by 22.2% (on average) more than banks that felt relatively less pressure from the Basel III proposals. Given that the majority of firms value these assets at the lower of cost or market, this result suggests that firms either (1) shortened the expected life of their existing MSRs, or (2) assumed a lower fair value, prompting a write-down if the fair value was lower than historical cost. While the disclosures are not sufficiently granular in the 10-K forms to disentangle these two possibilities, they are both consistent with managers using their financial reporting discretion to reduce the MSR valuation to avoid a portion of the regulatory capital increase.<sup>16</sup>

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<sup>15</sup> In this sample, High Pressure banks reduced their MSR valuations by 17.2% more than Non-High Pressure banks, which is similar to the increase of 15.1% observed for the sample used in Table 4. The slightly larger write-downs observed in this restricted sample are likely driven by the fact that the average servicing intensity of the High Pressure banks is nearly 10% higher, indicating that these banks would have had greater incentives to reduce their MSR balances, while still maintaining their business models.

<sup>16</sup> It may seem counter-intuitive that a bank would prefer to writedown an asset when faced with increased regulatory capital pressure. However, in this setting, a bank's MSRs can only represent 10% of its tier 1 capital. Thus, the bank will be forced to reduce its common equity by the amount of MSR holdings that exceed 10%. The effect of this capital adjustment is equivalent to the bank writing down its MSR holdings to the 10% threshold. Further, a bank that takes the writedown will generally have a higher capital ratio in the future than it would if it

Model 3 examines whether High Pressure banks reduced their capitalization rates to a greater extent than other banks that felt relatively less pressure from the Basel III proposals. Consistent with High Pressure banks behaving in this manner, we find that  $\beta_3$  is estimated to be positive (0.3114) and statistically significant (t-stat=2.32). On average, High Pressure banks lowered their capitalization rates (*LN\_ADDITON\_VALUE*) by 7.0% more than other banks. Taken together, Models 2 and 3 detail the mechanisms that the managers of High Pressure banks used to lower their valuation multiples. They also provide further evidence that the banks most affected by the MSR provisions in Basel III used their financial discretion over their MSR valuations to avoid a portion of the new regulatory costs.

## *5.2 Investors' differential response to banks' MSR valuations*

The evidence in Sections 4 and 5 suggest that High Pressure banks used their discretion over financial reporting to strategically lower the value of their MSR valuations to a greater extent than banks that felt relatively less pressure from the Basel III proposals. If this is true, then the difference between the economic value of High Pressure banks' MSR portfolios and their reported values will have increased as a result of this behavior. On the other hand, if this decline is driven by some other factor (e.g., poor expected performance in the High Pressure banks' underlying servicing portfolios), then the relationship between the economic value and the reported value will not have been altered. Therefore, we estimate the following OLS regression

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simply adjusted its regulatory capital. This is because a bank that writes down its MSRs will have lower amortization expense in future periods. This will then increase the profitability of servicing which will cause retained earnings to increase at a faster pace than it would otherwise. Thus, the numerator effect from the writedown will generally dominate the denominator effect, resulting in a higher Tier 1 capital ratio.

to examine whether the value-relevance of High Pressure banks' MSR relative to non-High-Pressure banks was altered following the announcement of Basel III:

$$PPS_{it} = \alpha_0 + \beta_1 BV\_LESSMSR\_SHR + \beta_2 MSR\_SHR + \beta_3 POST + \beta_4 HIGH\_PRESSURE_i + \beta_5 POST * HIGH\_PRESSURE_i * MSR\_SHR + \sum \beta_j CONTROLS_{it} + \varepsilon \quad (4)$$

where  $PPS_{it}$  is the price per share of common stock for bank  $i$  in quarter  $t$ ,  $BV\_LESSMSR\_SHR$  is the book value of equity minus the MSR balance divided by the number of common shares outstanding, and  $MSR\_SHR$  is the MSR balance divided by common shares outstanding. The coefficient of interest is  $\beta_5$  and measures the change in equity investors' relative valuation of High Pressure banks' MSR valuations after the announcement of Basel III. We also include each of the lower order interactions between  $POST$ ,  $HIGH\_PRESSURE$ , and  $MSR\_SHR$ . Finally, we include the same control variables from Equation 1 as well as bank fixed effects in our model. Additional details about each variable included in Equation 4 can be obtained from Appendix A.

### INSERT TABLE 8

Our prediction that  $\beta_5$  will be positive requires the market to disentangle managers' strategic financial reporting. One reason we expect the market to figure out this relationship is that banks disclose many of the key inputs that they use to form their MSR valuations. Investors can thus compare these inputs to across banks to determine the relative conservatism of the inputs used within each firm's valuation model. Further, banks are required to report the amount of loans they service in their call reports. Thus, any significant deviations in the reported MSR value relative to the reported UPB of their servicing portfolio could inform investors that managers may be strategically altering their valuations. Consistent with our prediction, Model 1

of Table 8 reveals that  $\beta_5$  is estimated to be 6.1055, with a t-statistic of 2.46. We then partition the sample in Columns (2a) and (2b) using the same \$10 billion threshold that was previously used in Table 6. We find that the results in Column 1 are primarily driven by the stress testing larger banks. This result is consistent with Table 6 that indicates that the large, High Pressure banks were the ones utilizing their financial reporting discretion to lower the valuations of their MSRs. Taken together, these findings provide further evidence that the decreased MSR valuations reported by High Pressure banks following the announcement of Basel III were not driven by deteriorating economics in their mortgage-servicing portfolios, but were in fact driven by managers' strategic financial reporting.

### *5.3 Performance analysis*

Our findings, collectively, suggest that High Pressure banks trade off increased profitability in the current period to improve their future capital ratios. This behavior is contrary to the extensive literature suggesting that managers generally exhibit myopic behavior (Stein 1989; Bushee 1998; Graham et al. 2005). One reason that managers may be willing to incur these current period writedowns is because they are able to offset them with other discretionary accruals.<sup>17</sup> One accrual that banks could use for this purpose is the loan loss provision (LLP).

The LLP is the single largest accrual on a bank's balance sheet (Beatty and Liao 2013). The LLP's magnitude, combined with its opacity, may provide High Pressure banks with an effective mechanism to offset their MSR writedowns. By reducing their LLP to offset MSR

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<sup>17</sup> We use the term 'writedowns' in this section to refer to both of the mechanisms outlined in Section 5.1; namely, increased amortization rates for existing MSRs and reduced capitalization rates for new MSRs. Both of these mechanisms reduce a bank's current profitability in exchange for lower risk-weighted assets and increased future profitability.

writedowns, banks are able to avoid the temporary reduction in their operating performance that they would otherwise incur. Further, the lower risk-weighting associated with a bank's outstanding loans relative to its MSRs will result in the bank having a higher tier 1 capital ratio in the current period if it engages in this strategic behavior.<sup>18</sup> Accordingly, we examine this possibility that High Pressure banks reduced their LLP to a greater extent than non-High Pressure banks following the announcement of Basel III by estimating the following equation:

$$LLP_{it} = \alpha_0 + \beta_1 POST + \beta_2 HIGH\_PRESSURE_i + \beta_3 POST * HIGH\_PRESSURE_i + \sum \beta_j CONTROLS_{it} + \varepsilon \quad (5)$$

where  $LLP_{it}$  is the loan loss provision for bank  $i$  in quarter  $t$ . Similar to our prior equations, this specification also employs a difference-in-difference research design with  $\beta_3$  capturing the differential effect. We also include each bank's LLP from the prior quarter in addition to each of the variables suggested by Model (a) of Beatty and Liao (2013).<sup>19</sup>

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<sup>18</sup> Note that the future impact of this behavior would suggest that High Pressure banks would then have higher LLP in the future. However, this increased LLP will not negatively affect a bank's earnings as it will be able to offset those losses with the increased income from servicing undervalued MSRs (as discussed in footnote 19). Further, the lower regulatory capital requirements associated with a bank's loans relative to its MSRs will result in the bank having lower risk-weighted assets in the future which will result in higher capital ratios. Thus, the net result of offsetting discretionary MSR writedowns with lower LLP has no affect on current or future earnings but increases both current and future capital ratios relative to recording MSRs and LLP without discretion.

<sup>19</sup> Table 4 of Beatty and Liao (2013) examines whether the residuals from four LLP models used in prior research to examine discretionary accruals are able to predict whether a bank will either restate its financial statements or receive a comment letter from the SEC regarding its LLP. They find that their Model (a), which is based on the models of Bushman and Williams (2012) and Liu and Ryan (2006), provides the most explanatory power of the four models examined. Refer to Section 5.2 of Beatty and Liao (2013) for additional information.

Models 1a and 1b of Table 8 provide the results of estimating Equation 5. Consistent with High Pressure banks reducing their LLP following the announcement of Basel III, we observe that  $\beta_3$  is estimated to be negative and is statistically significant. While this result is consistent with High Pressure banks engaging in this offsetting behavior, our research design is unable to identify that the lower LLP is the direct result of increased MSR writedowns. However, we believe that this relationship is potentially causal since the LLP is frequently suggested to be used by banks as a “plug” to achieve a certain amount of current operating income (Collins et al. 1995). Given that MSR writedowns are included in operating income, a bank’s use of its LLP in this manner implies that the MSR writedowns would directly impact its LLP in a causal manner.

Our results in Model 1 suggest that High Pressure banks decrease their LLP to offset their discretionary MSR writedowns following the announcement of Basel III. As noted previously, banks that engage in this offsetting behavior would avoid temporary declines in their operating performance associated with the writedowns of their MSRs. To examine whether the High Pressure banks avoid unusually low operating performance following the announcement of Basel III, we estimate the following equation:

$$\begin{aligned}
 PERFORMANCE_{it} = & \alpha_0 + \beta_1 POST + \beta_2 HIGH\_PRESSURE_i + \beta_3 POST * HIGH\_PRESSURE_i \\
 & + \sum \beta_j CONTROLS_{it} + \varepsilon
 \end{aligned}
 \tag{6}$$

where  $PERFORMANCE_{it}$  is either: 1) bank  $i$ ’s return on average assets ( $ROAA_{it}$ ), or 2) bank  $i$ ’s return on average equity ( $ROEE_{it}$ ). Similar to prior equations, this specification employs a difference-in-difference methodology with  $\beta_3$  capturing the differential effect. We also include

several control variables as well as bank fixed effects in our model. Additional details about each variable included in the model can be obtained from Appendix A.

Models 2 and 3 of Table 8 provide the results of estimating Equation 6. Consistent with High Pressure banks not reporting unusually low operating performance as a result of the increased MSR writedowns, our results fail to identify any evidence that High Pressure banks have lower ROEA or ROEE following the announcement of Basel III. Specifically, Models 2 and 3 estimate  $\beta_3$  to be 0.0001 (t-statistic = 0.25) and  $-0.6838$  (t-statistic =  $-0.89$ ), respectively. Despite the increased MSR writedowns documented in our study, these results suggest that High Pressure banks were able to maintain their profitability while reducing their risk-weighted assets. Holding all else equal, these two effects would combine to increase a bank's current regulatory capital ratio.

## 6. Conclusion

Prior research shows that investors immediately react to *proposed* regulatory changes (Lev, 1979). However, little is known about *when* and *how* managers respond to the uncertainty that the proposed regulation introduces into their operating environment. In this paper, we utilize the time period that the Federal Reserve used to adopt Basel III to examine how quickly firms adjusted their financial reporting and/or business model decisions in response to the proposed regulatory framework. Our results suggest that firms alter their business models and make strategic financial reporting changes before regulators even agree on the final regulatory terms. We also provide evidence that firms are more likely to make these anticipatory changes when they are more certain that they will eventually be subjected to the proposed regulation.



Our study makes several contributions to the literature. First, we provide evidence that firms anticipate and prepare for regulatory changes well in advance of the official implementation date. Given the long regulatory process typically observed in the United States, our findings highlight that the appropriate date for an event study may be the announcement of the regulation rather than its date of enactment or official implementation. Second, we provide empirical evidence that managerial incentives can significantly influence an asset's reported fair value. Our finding combines with Barth et al. (2012) to dispel the widespread belief that fair value accounting precludes managers from strategically manipulating earnings and/or regulatory capital (Healy and Wahlen 1999). Finally, our study provides regulators with timely information about how banks are responding to the recent implementation of Basel III (Cosimano and Hakura 2011; Angelini et al. 2011; Repullo and Saurina Salas 2011). Given the significant importance of this reform, and the limited research performed to date, we join with Beatty and Liao (2013) in calling for additional research in this area.

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## Appendix A – Variable names and descriptions

Variable	Description
<b><i>Dependent Variables</i></b>	
<i>AMORT_RATE</i>	Amortization (or fair value adjustment) of MSR for the quarter divided by beginning MSR balance plus newly originated MSRs and MSR purchases for the year, winsorized at 98% / 2%
<i>LLP</i>	Loan loss provision for the quarter scaled by lagged total loans, winsorized by year at 98% / 2%
<i>LN_ADDITION_VALUE</i>	Estimate of the number of dollars of unpaid principal balance (UPB) per dollar of MSR for additions to the MSR balance for the quarter. Calculated as the natural log of the following: $Addition\_Value = \frac{\Delta UPB_t - \frac{UPB_{t-1}}{MSR_{t-1}} (MSR\ Purchased_t + MSR\ Sold_t + MSR\ Amortization_t)}{MSR\ Additions_t}$ winsorized at 98% / 2%
<i>UPB</i>	Natural log of total quarter-end unpaid principle balance (UPB) on loans serviced for others, winsorized by year at 98% / 2%
<i>MSR_UPB</i>	MSR balance divided by unpaid principal balance (UPB), winsorized by year at 98% / 2%
<i>OTD</i>	Measure of the extent of participation in the originate-to-distribute mortgage lending market, calculated as the ratio of loans originated for resale during the quarter scaled by the beginning of the quarter mortgage loans on the balance sheet, winsorized by year at 98% / 2%
<i>PPS</i>	Price per share as of the report date, winsorized by year at 98% / 2%
<i>ROA</i>	Net income scaled by total assets as of the report date
<i>ROE</i>	Net income scaled by average total equity as of the report date
<b><i>Independent Variables</i></b>	
<i>10YR_BOND</i>	10-year Treasury Bond rate as of the report sheet date
<i>BV_LESSMSR_SHR</i>	Book value of equity minus MSR balance, scaled by total shares outstanding, winsorized by year at 98% / 2%
<i>CSRET</i>	Return on the Case Shiller Real Estate Index for the quarter
<i>EPS</i>	Net income divided by shares outstanding as of the report date, winsorized by year at 98% / 2%
<i>Δ GDP</i>	Change in GDP for the quarter
<i>LEADINGI</i>	State-level aggregate leading economic indicator from the Federal Reserve website
<i>LN_ASSETS</i>	Natural log of total assets, winsorized by year at 98% / 2%
<i>Δ LOANS</i>	Percentage change in total loans, winsorized by year at 98% / 2%
<i>MLOANS_ASSETS</i>	Total mortgage loans divided by total assets, winsorized by year at 98% / 2%

## Appendix A – Variable names and descriptions (Continued)

Variable	Description
<i>Independent Variables</i>	
<i>(cont.)</i>	
<i>MSR_SHR</i>	MSR balance divided by total shares outstanding, winsorized by year at 98% / 2%
<i>MSR_TIER1</i>	MSR balance divided by Tier 1 Capital balance, winsorized by year at 98% / 2%
<i>NPL</i>	Total non-performing loans scaled by lagged total loans, winsorized by year at 98% / 2%
<i>POST</i>	Indicator variable equal to 1 for all report dates after December 31, 2009, and zero otherwise
<i>POST_PROPOSED</i>	Indicator variable equal to 1 for report dates from January 1, 2010 through December 31, 2011, and zero otherwise
<i>POST_ADOPTED</i>	Indicator variable equal to 1 for report dates from January 1, 2012 through December 31, 2014, and zero otherwise
<i>REVMIX</i>	Noninterest income divided by total income, winsorized by year at 98% / 2%
<i>HIGH_PRESSURE</i>	Equal to 1 if the bank's ratio of MSR's to Tier 1 capital is in the top quintile of banks as of December 31, 2009, and zero otherwise. This is a measure of the degree to which the bank would expect to be affected under proposed Basel III capital rules that penalize MSRs. The Basel Committee first indicated that it was seeking to penalize intangible assets, such as MSRs, in a consultative document that was released in mid-December 2009.
<i>TREND</i>	Trend variable that increases by one in each calendar quarter
<i>UNEMPLOY</i>	State-level unemployment rate from the Federal Reserve website
<i>Δ UNEMPLOY</i>	Change in <i>UNEMPLOY</i> for the quarter

## Appendix B – Impact of MSR provisions included in Basel III on regulatory capital

The following example was taken from pages 28–29 of the MBA’s 2012 comment letter to the Federal Reserve, FDIC, and OCC regarding the rules proposed for Basel III (MBA, 2012). The purpose of including this example as an appendix to our study is to illustrate how the new provisions regarding MSRs affect a bank’s regulatory capital requirement.

### Existing Automatic 10 Percent Haircut

The 10 percent and 15 percent limits are in addition to the current 10 percent haircut that arose from the FDIC Improvement Act of 1991.

Under present rules the effective capital that must be retained for MSRs is 17.2 percent as follows:

- Assume 8 percent minimum capital requirement to be adequately capitalized.
- 10 percent of the value is deducted and the remaining 90 percent is risk-weighted at 100 percent.
- This equates to a minimum capital requirement for MSRs of 17.2 percent (10 percent plus (90 percent times 8 percent)).

Under the proposed rules, the required capital that would have to be maintained, not considering the 10 percent and 15 percent proposed limits, would be a whopping 28 percent as follows:

- Assume 8 percent minimum capital requirement to be adequately capitalized.
- 10 percent of the value is deducted and the remaining 90 percent is risk-weighted at 250 percent.
- This equates to a minimum capital requirement of MSRs of 28 percent (10 percent plus (90 percent times 20 percent)).

This would increase the required capital for MSRs by 63 percent, without taking into consideration the 10 percent and 15 percent limitations in the proposed rule. If the Basel III 10 percent or 15 percent thresholds are breached, the minimum capital requirements skyrocket. Since foreign banks are not subject to the 10 percent haircut, it puts U.S. banks on an unlevel playing field. This is contrary to the purpose of the Basel rules which is to put banks worldwide on a level playing field with respect to regulatory capital requirements. (MRA, 2012, pp. 28–29)



## Table 1 – Sample Selection

Selection of samples used for regression analyses in Tables 4–9

<i>Panel A - Public and non-public U.S. commercial bank holding companies</i>	
Details	No. of Observations
Quarterly observations (Q1 2006 - Q4 2013) of banks that had an MSR balance as of December 31, 2009 and have data for all quarters (including 2005 lagged values)	7,788
Less: Observations with Unpaid Principal Balance < \$1 million	(405)
Less: Observations with missing data in the variables used	(866)
<b>Sample used for analyses in Model (3) of Tables 4, 5, and 6</b>	<b>6,517</b>
Less: Observations for which there was no mandatory reporting of originations	(2,053)
<b>Sample used for analyses in Models (1) and (2) of Tables 4, 5, and 6</b>	<b>4,464</b>
<i>Panel B - Public U.S. commercial bank holding companies</i>	
Details	No. of Observations
<b>Sample used for analyses in Model (3) of Tables 4, 5, and 6</b>	<b>6,517</b>
Less: Observations with no Permco in CRSP. Permco's were used to identify banks that would be required to file Form 10-K with the SEC	(3,713)
Less: Observations with missing values in the variables required for regressions in Table 8	(246)
<b>Sample used for analyses in Table 8</b>	<b>2,558</b>
Less: Observations that are missing information necessary to roll forward the MSR balance	(607)
Less: Observations from 2014 (10-K not available yet) and Quarters 1 - 3 for all years, since the 10-Q often does not contain a rollforward of the MSR balance	(1,464)
<b>Sample used for models (1) and (2) in Table 7</b>	<b>487</b>

**Table 2 – Descriptive Statistics**

Descriptive statistics for samples used in Tables 4 (years 2006-2013), 5, 6, 8, and 9. Definitions of all variables are found in Appendix A.

Variables	Full Sample - 2006-2013						Pre Sample (2006-2009)			Post Sample (2010-2014)			=Diff in Mean (Post – Pre)	
	N	mean	p25	p50	p75	sd	N	mean	sd	N	mean	sd	Diff	t-stat
<i>Dependent Variables</i>														
<i>OTD</i>	4,464	13.398	3.044	8.141	17.626	15.551	1,515	13.627	17.019	2,949	13.280	14.742	-0.347	-0.71
<i>UPB</i>	4,464	13.438	12.146	12.853	14.283	2.053	1,515	13.421	2.092	2,949	13.447	2.033	0.027	0.41
<i>MSR_UPB (%)</i>	6,517	0.696	0.500	0.674	0.853	0.314	2,888	0.725	0.365	3,629	0.673	0.263	-0.053	-6.76
<i>PPS</i>	2,950	23.762	12.930	20.385	31.000	15.440	1,305	25.916	15.794	1,645	22.054	14.939	-3.863	-6.80
<i>Independent Variables</i>														
<i>LN_ASSETS</i>	6,517	14.886	13.624	14.305	15.591	1.736	2,888	14.784	1.709	3,629	14.967	1.753	0.182	4.22
<i>MLOANS_ASSETS (%)</i>	6,517	20.524	14.590	19.830	25.208	8.277	2,888	21.767	8.903	3,629	19.535	7.600	-2.231	-10.91
<i>ROE (%)</i>	6,517	1.507	1.062	1.958	2.836	6.356	2,888	1.500	0.030	3,629	1.513	1.513	0.014	0.09
<i>10YR_BOND (%)</i>	6,517	3.193	2.520	3.040	3.850	1.034	2,888	4.034	0.813	3,629	2.524	0.618	-1.511	-85.22
<i>UNEMPLOY (%)</i>	6,517	7.004	5.200	6.900	8.600	2.266	2,888	6.134	2.326	3,629	7.697	1.958	1.564	29.45
<i>LEADINGI (%)</i>	6,517	0.655	0.090	1.025	1.629	1.639	2,888	-0.439	1.769	3,629	1.525	0.792	1.963	59.75
<i>REVMIX (%)</i>	6,517	20.803	14.078	19.556	25.948	9.423	2,888	17.854	8.257	3,629	23.150	9.633	5.296	23.47
<i>BV_LESSMSR_SHR</i>	2,950	19.232	12.367	16.535	22.235	10.555	1,305	17.987	8.822	1,645	20.219	11.658	2.232	5.73
<i>MSR_SHR</i>	2,950	0.411	0.065	0.161	0.451	0.688	1,305	0.434	0.838	1,645	0.392	0.540	-0.043	-1.68
<i>EPS</i>	2,950	0.372	0.196	0.366	0.570	0.498	1,305	0.328	0.612	1,645	0.408	0.381	0.080	4.32
<i>HIGH_PRESSURE</i>	6,517	0.198	0	0	0	0.399	2,888	0.198	0.399	3,629	0.198	0.399	0.000	0.03

**Table 3 – Correlations**

Correlation coefficients for variables used in regression analyses in Tables 4, 5, 6, 8, and 9. Definitions of all variables are in Appendix A.

<b>Variable</b>	<b>(1)</b>	<b>(2)</b>	<b>(3)</b>	<b>(4)</b>	<b>(5)</b>	<b>(6)</b>	<b>(7)</b>	<b>(8)</b>	<b>(9)</b>	<b>(10)</b>	<b>(11)</b>	<b>(12)</b>	<b>(13)</b>	<b>(14)</b>	<b>(15)</b>
<b>1 OTD</b>	1	0.36	0.29	-0.13	0.09	-0.28	-0.22	-0.10	0.04	0.00	0.26	0.09	0.52	-0.04	0.35
<b>2 UPB</b>	0.16	1	0.45	0.06	0.72	-0.01	-0.11	-0.04	0.04	0.05	0.41	0.13	0.76	0.05	0.57
<b>3 MSR_UPB (%)</b>	0.08	0.41	1	0.01	0.35	-0.14	0.00	0.22	-0.04	-0.07	0.14	-0.07	0.58	0.00	0.41
<b>4 PPS</b>	-0.05	0.15	0.03	1	0.28	-0.03	0.49	0.13	-0.28	-0.06	0.18	0.64	0.10	0.78	-0.01
<b>5 LN_ASSETS</b>	-0.12	0.81	0.32	0.29	1	-0.07	-0.03	0.02	0.03	-0.06	0.35	0.28	0.31	0.17	0.38
<b>6 MLOANS_ASSETS (%)</b>	-0.25	-0.05	-0.17	-0.07	-0.08	1	0.06	0.05	0.05	-0.04	0.06	-0.13	-0.03	-0.05	0.09
<b>7 ROE (%)</b>	-0.03	-0.04	-0.03	0.21	-0.03	-0.02	1	0.02	-0.29	0.04	0.12	0.03	-0.07	0.74	-0.06
<b>8 10YR_BOND (%)</b>	-0.08	0.00	0.21	0.14	0.03	0.06	-0.02	1	-0.20	-0.41	-0.22	-0.06	0.00	-0.03	0.00
<b>9 UNEMPLOY (%)</b>	0.02	-0.02	-0.08	-0.26	-0.03	0.14	-0.06	-0.18	1	0.17	0.12	-0.01	-0.01	-0.24	0.00
<b>10 LEADINGI (%)</b>	-0.05	0.00	-0.04	0.00	-0.03	-0.07	0.08	-0.25	0.07	1	0.17	-0.03	0.04	0.06	0.02
<b>11 REVMIX (%)</b>	0.26	0.47	0.13	0.20	0.36	-0.04	0.12	-0.20	0.06	0.14	1	0.18	0.39	0.27	0.45
<b>12 BV_LESSMSR_SHR</b>	0.14	0.27	-0.02	0.70	0.37	-0.15	0.08	-0.08	-0.02	-0.01	0.22	1	0.22	0.58	0.01
<b>13 MSR_SHR</b>	0.32	0.71	0.45	0.28	0.58	0.03	-0.02	0.07	-0.01	-0.02	0.44	0.33	1	0.15	0.62
<b>14 EPS</b>	0.00	0.09	0.01	0.59	0.16	-0.05	0.64	-0.03	-0.15	0.21	0.27	0.43	0.16	1	0.03
<b>15 HIGH_PRESSURE</b>	0.38	0.53	0.32	0.02	0.22	-0.03	-0.05	0.03	-0.02	-0.03	0.36	0.11	0.63	0.01	1

*Pearson pairwise correlations are in the lower left and Spearman correlations are in the upper right*

**Table 4 – Changes in operational behavior and valuation**

Below are presented the results from OLS regression of *OTD*, *UPB*, and *MSR\_UPB* on *HIGH\_PRESSURE* and controls. *OTD* is the ratio of loans originated for resale during the quarter scaled by the beginning of the quarter mortgage loans on the balance sheet. *UPB* is the natural log of total quarter-end unpaid principle balance (UPB) on loans serviced for others. *MSR\_UPB* is the MSR balance divided by unpaid principal balance (UPB). *HIGH\_PRESSURE* Equal to 1 if the bank's ratio of MSR's to Tier 1 capital is in the top quintile of banks as of December 31, 2009, and zero otherwise. The models omit the *HIGH\_PRESSURE* main effect as an independent variable since it remains constant across all quarters for a given bank. All other variables are defined in Appendix A. Standard errors are clustered by firm.

Variable	Pred	Dependent Variable		
		<i>OTD</i> (1)	<i>UPB</i> (2)	<i>MSR_UPB</i> (3)
<i>POST*HIGH_PRESSURE</i>	-	-4.8884*** (-3.19)	-0.1824** (-2.00)	-0.1307*** (-3.05)
<i>POST</i>		0.0256 (0.03)	0.1130*** (3.18)	0.0259* (1.79)
<i>L.MLOANS_ASSETS</i>		0.1115 (0.72)	0.0040 (0.35)	-0.0055 (-1.56)
<i>ROE</i>		-0.0866*** (-4.27)	-0.0010 (-1.63)	0.0002 (0.42)
<i>10YR_BOND</i>		-3.0664*** (-10.03)	0.0203*** (2.81)	0.0638*** (10.63)
<i>TREND</i>		-0.3350*** (-6.35)	0.0124*** (4.34)	0.0018* (1.74)
<i>UNEMPLOY</i>		0.8131*** (4.24)	0.0123* (1.94)	-0.0056** (-2.10)
<i>REVMIX</i>		0.4469*** (6.16)	0.0057** (2.39)	0.0006 (0.57)
<i>L.LN_ASSETS</i>		1.1261 (0.53)		
<i>LN_ASSETS</i>			0.3548** (2.28)	0.0308 (0.59)
Bank Fixed Effects		Included	Included	Included
Observations		4,464	4,464	6,517
R-squared		0.720	0.973	0.751

Standard errors clustered by firm; t-statistics in parentheses

\*\*\*, \*\*, and \* indicate significance at the 0.01, 0.05, and 0.10 level respectively.

**Table 5 – Timing of changes in operational behavior and valuation**

Below are presented the results from OLS regression of *OTD*, *UPB*, and *MSR\_UPB* on *HIGH\_PRESSURE* and controls (with the POST period split into a Proposed period and an Adopted period). *OTD* is the ratio of loans originated for resale during the quarter scaled by the beginning of the quarter mortgage loans on the balance sheet. *UPB* is the natural log of total quarter-end unpaid principle balance (UPB) on loans serviced for others. *MSR\_UPB* is the MSR balance divided by unpaid principal balance (UPB). *HIGH\_PRESSURE* is an indicator equal to 1 if the bank's ratio of MSR's to Tier 1 capital is in the top quintile of banks as of December 31, 2009, and zero otherwise. The models omit the *HIGH\_PRESSURE* main effect as an independent variable since it remains constant across all quarters for a given bank. All other variables are defined in Appendix A. Standard errors are clustered by firm.

Variable	Pred	Dependent Variable		
		<i>OTD</i> (1)	<i>UPB</i> (2)	<i>MSR_UPB</i> (3)
<i>POST_PROPOSED*HIGH_PRESSURE</i>		-3.4004** (-2.37)	-0.0822 (-1.18)	-0.0892** (-2.34)
<i>POST_ADOPTED*HIGH_PRESSURE</i>	-	-5.5263*** (-3.18)	-0.2301** (-2.21)	-0.1489*** (-3.23)
<i>POST_ANNOUNCE</i>		-0.2130 (-0.28)	0.0881*** (2.67)	0.0177 (1.32)
<i>POST_IMPLEMENT</i>		2.7275** (2.36)	0.1067** (1.98)	0.0285 (1.29)
<i>L.MLOANS_ASSETS</i>		0.1264 (0.82)	0.0044 (0.38)	-0.0054 (-1.54)
<i>ROE</i>		-0.0888*** (-4.83)	-0.0008 (-1.32)	0.0002 (0.67)
<i>10YR_BOND</i>		-2.5622*** (-7.43)	0.0166* (1.66)	0.0636*** (9.34)
<i>TREND</i>		-0.4228*** (-7.35)	0.0130*** (4.57)	0.0018 (1.61)
<i>UNEMPLOY</i>		0.9941*** (5.25)	0.0108 (1.59)	-0.0057** (-2.05)
<i>REVMIX</i>		0.4462*** (6.11)	0.0059** (2.45)	0.0007 (0.62)
<i>L.LN_ASSETS</i>		1.2272 (0.58)		
<i>LN_ASSETS</i>			0.3526** (2.25)	0.0301 (0.57)
Bank Fixed Effects		Included	Included	Included
Observations		4,464	4,464	6,517
R-squared		0.722	0.973	0.751

Standard errors clustered by firm; t-statistics in parentheses

\*\*\*, \*\*, and \* indicate significance at the 0.01, 0.05, and 0.10 level respectively.

**Table 6 – Perceived probability of adoption and the timing of changes in operational behavior and valuation**

Below are presented the results from OLS regression of *OTD*, *UPB*, and *MSR\_UPB* on *HIGH\_PRESSURE* and controls (with the POST period split into a Proposed period and an Adopted period). *OTD* is the ratio of loans originated for resale during the quarter scaled by the beginning of the quarter mortgage loans on the balance sheet. *UPB* is the natural log of total quarter-end unpaid principle balance (UPB) on loans serviced for others. *MSR\_UPB* is the MSR balance divided by unpaid principal balance (UPB). *HIGH\_PRESSURE* is an indicator equal to 1 if the bank's ratio of MSR's to Tier 1 capital is in the top quintile of banks as of December 31, 2009, and zero otherwise. The models omit the *HIGH\_PRESSURE* main effect as an independent variable since it remains constant across all quarters for a given bank. All other variables are defined in Appendix A.

Variable	Pred	Dependent Variable					
		<i>OTD</i> <i>Str test</i> (1a)	<i>OTD</i> <i>non-Str test</i> (1b)	<i>UPB</i> <i>Str test</i> (2a)	<i>UPB</i> <i>non-Str test</i> (2b)	<i>MSR_UPB</i> <i>Str test</i> (3a)	<i>MSR_UPB</i> <i>non-Str test</i> (3b)
<i>POST_PROPOSED*HIGH_PRESSURE</i>		-4.8865* (-1.87)	-1.7781 (-1.18)	-0.0626 (-0.44)	-0.0398 (-0.58)	-0.2350*** (-3.93)	-0.0058 (-0.14)
<i>POST_ADOPTED*HIGH_PRESSURE</i>	-	-4.7057* (-1.75)	-5.2046** (-2.36)	-0.3938** (-2.15)	-0.0696 (-0.62)	-0.3240*** (-4.27)	-0.0421 (-0.88)
<i>POST_ANNOUNCE</i>		1.1066 (0.69)	-1.4204* (-1.86)	0.0316 (0.44)	0.0740*** (2.73)	0.0646* (1.77)	0.0076 (0.57)
<i>POST_IMPLEMENT</i>		4.8956** (2.03)	0.4447 (0.39)	0.0853 (0.75)	0.0597 (1.28)	0.0893 (1.59)	0.0170 (0.76)
<i>L.MLOANS_ASSETS</i>		0.6331* (1.69)	-0.0669 (-0.43)	0.0683** (2.61)	-0.0164* (-1.66)	-0.0073 (-0.58)	-0.0057* (-1.78)
<i>ROE</i>		0.0090 (0.21)	-0.1089*** (-6.57)	-0.0007 (-0.17)	-0.0010* (-1.69)	0.0004 (0.20)	0.0001 (0.33)
<i>10YR_BOND</i>		-1.2230** (-2.58)	-3.1290*** (-7.31)	0.0008 (0.04)	0.0186* (1.76)	0.1428*** (7.75)	0.0431*** (7.62)
<i>TREND</i>		-0.3411*** (-3.27)	-0.4144*** (-6.33)	0.0233*** (3.07)	0.0112*** (3.55)	0.0066* (1.92)	-0.0005 (-0.45)
<i>UNEMPLOY</i>		0.5951 (1.68)	1.1619*** (5.58)	-0.0021 (-0.11)	0.0153*** (2.63)	-0.0117 (-1.57)	-0.0046 (-1.62)
<i>REVMIX</i>		0.1925** (2.62)	0.6241*** (6.07)	0.0025 (0.87)	0.0087** (2.58)	0.0008 (0.49)	0.0012 (0.81)
<i>L.LN_ASSETS</i>		3.5333 (0.98)	-0.8964 (-0.42)				
<i>LN_ASSETS</i>				0.3725 (1.37)	0.2978** (2.25)	-0.0257 (-0.35)	0.1307** (2.41)
Bank Fixed Effects		Included	Included	Included	Included	Included	Included
Observations		1,211	3,253	1,211	3,253	1,401	5,116
R-squared		0.685	0.742	0.971	0.925	0.747	0.740

Standard errors clustered by firm; t-statistics in parentheses

\*\*\*, \*\*, and \* indicate significance at the 0.01, 0.05, and 0.10 level respectively.

**Table 7 – Changes in valuation of MSRs through amortization and FV adjustments**

Below are the descriptive statistics (Panel A) and the results from OLS regression of *MSR\_UPB*, *AMORT\_RATE*, and *LN\_ADDITION\_VALUE* on *SERVICER/SERVICER\_IND* and controls (Panel B). *MSR\_UPB* is MSR balance divided by unpaid principal balance (UPB). *AMORT\_RATE* is the amortization (or fair value adjustment) of MSR for the quarter divided by beginning MSR balance plus newly originated MSRs and MSR purchases for the year. *LN\_ADDITION\_VALUE* is the number of dollars of unpaid principal balance (UPB) per dollar of MSR for additions to the MSR balance for the quarter. *HIGH\_PRESSURE* is an indicator equal to 1 if the bank's ratio of MSR's to Tier 1 capital is in the top quintile of banks as of December 31, 2009, and zero otherwise. The models omit the *HIGH\_PRESSURE* main effect as an independent variable since it remains constant across all quarters for a given bank. All other variables are defined in Appendix A.

*Panel A: Descriptive Statistics*

Variable	N	mean	p25	p50	p75	sd
<i>MSR_UPB</i>	487	0.785	0.607	0.743	0.940	0.297
<i>AMORT_RATE</i>	487	21.688	15.297	21.603	29.274	12.173
<i>LN_ADDITION_VALUE</i>	434	4.923	4.596	4.922	5.284	0.813
<i>LN_ASSETS</i>	487	15.841	14.495	15.181	16.643	2.082
<i>ROE</i>	487	0.605	1.062	1.851	2.625	6.757
<i>10YR_BOND</i>	487	3.109	1.890	3.300	4.040	1.002
<i>UNEMPLOY</i>	487	7.360	5.700	7.400	8.700	2.052
<i>REVMIX</i>	487	23.092	15.748	22.478	28.748	9.259
<i>UPB</i>	487	14.127	12.399	13.206	15.317	2.540
<i>HIGH_PRESSURE</i>	487	0.246	0.000	0.000	0.000	0.431

*Panel B: Fair Value Regression Analysis*

Variable	Dependent Variable		
	<i>MSR_UPB</i> (1)	<i>AMORT_RATE</i> (2)	<i>LN_ADDITION_VALUE</i> (3)
<i>POST*HIGH_PRESSURE</i>	-0.1989*** (-4.20)	3.3174* (1.82)	0.2800** (2.08)
<i>POST</i>	0.0748*** (3.00)	5.6527*** (3.81)	0.0840 (0.74)
<i>L.MLOANS_ASSETS</i>	-0.6224 (-1.61)	3.6140 (0.20)	2.1843* (1.72)
<i>ROE</i>	0.0006 (0.92)	0.0519 (0.80)	0.0007 (0.21)
<i>10YR_BOND</i>	0.1037*** (8.59)	-8.5441*** (-8.08)	-0.3896*** (-9.00)
<i>TREND</i>	0.0014 (0.16)	-4.0822*** (-5.82)	-0.1873*** (-3.96)
<i>UNEMPLOY</i>	-0.0039 (-0.84)	1.2038*** (4.15)	-0.0168 (-0.85)
<i>REVMIX</i>	0.0022 (0.81)	-0.1271 (-0.67)	-0.0055 (-0.68)
<i>LN_ASSETS</i>	0.0050 (0.06)		0.4798* (1.88)
<i>L.LN_ASSETS</i>		-0.6955 (-0.20)	
<i>UPB</i>			0.1598 (1.39)
Bank Fixed Effects	Included	Included	Included
Observations	487	487	434
R-squared	0.818	0.439	0.681

Standard errors clustered by firm; t-statistics in parentheses

\*\*\*, \*\*, and \* indicate significance at the 0.01, 0.05, and 0.10 level respectively.

**Table 8 – Value relevance of MSR's and perceived probability of adoption**

Below are presented the results from OLS regression of *PPS* on *HIGH\_PRESSURE* and controls. *PPS* is defined as price per share as of the report date. *HIGH\_PRESSURE* is an indicator equal to 1 if the bank's ratio of MSR's to Tier 1 capital is in the top quintile of banks as of December 31, 2009, and zero otherwise. The models omit the *HIGH\_PRESSURE* main effect as an independent variable since it remains constant across all quarters for a given bank. All other variables are defined in Appendix A.

Variable	Dependent Variable		
	<i>PPS</i> All (1)	<i>PPS</i> <i>Str test</i> (2a)	<i>PPS</i> <i>non-Str test</i> (2b)
<i>POST*MSR_SHR*HIGH_PRESSURE</i>	6.1055** (2.46)	7.5924*** (2.90)	-0.8775 (-0.09)
<i>MSR_SHR*HIGH_PRESSURE</i>	-5.2915** (-2.41)	-5.1257 (-0.96)	-7.6236 (-0.70)
<i>POST*MSR_SHR</i>	-6.3657*** (-3.59)	-6.6430*** (-3.15)	-5.1034 (-1.08)
<i>POST*HIGH_PRESSURE</i>	-3.4632 (-1.58)	-5.4502* (-1.88)	2.6125 (0.65)
<i>10YR_BOND</i>	2.3361*** (9.56)	3.1978*** (5.96)	1.8081*** (8.49)
<i>TREND</i>	-0.0097 (-0.26)	-0.1014 (-1.46)	0.0285 (0.67)
<i>UNEMPLOY</i>	-1.9881*** (-10.36)	-2.4223*** (-7.54)	-1.7563*** (-8.18)
<i>LEADINGI</i>	0.3452** (2.28)	0.9054*** (4.12)	0.0605 (0.32)
<i>REVMIX</i>	-0.0363 (-0.74)	-0.0454 (-0.58)	0.0042 (0.08)
<i>POST</i>	3.1734*** (3.25)	6.0640*** (2.93)	1.4162 (1.08)
<i>BV_LESSMSR_SHR</i>	0.5415*** (7.79)	0.5728*** (6.70)	0.5804*** (4.37)
<i>MSR_SHR</i>	6.3202*** (3.13)	6.0251 (1.09)	4.4260 (1.09)
<i>EPS</i>	2.1814*** (4.32)	2.9892** (2.28)	1.4709*** (3.52)
Bank Fixed Effects	Included	Included	Included
Observations	2,558	939	1,619
R-squared	0.875	0.895	0.859

Standard errors clustered by firm; t-statistics in parentheses

\*\*\*, \*\*, and \* indicate significance at the 0.01, 0.05, and 0.10 level respectively.



**Table 9 – Performance analysis**

Below are presented the results from OLS regression of *LLP*, *ROA*, and *ROE* on *HIGH\_PRESSURE* and controls. *LLP* is defined as the loan loss provision for the quarter, scaled by lagged total loans. *ROA* is net income divided by total assets. *ROE* is net income divided by total equity. *HIGH\_PRESSURE* is an indicator equal to 1 if the bank's ratio of MSR's to Tier 1 capital is in the top quintile of banks as of December 31, 2009, and zero otherwise. The models omit the *HIGH\_PRESSURE* main effect as an independent variable since it remains constant across all quarters for a given bank. All other variables are defined in Appendix A.

Variable	Dependent Variable		
	<i>LLP</i> (1)	<i>ROA</i> (2a)	<i>ROE</i> (2b)
<i>POST*HIGH_PRESSURE</i>	-0.0363*** (-2.61)	0.0001 (0.24)	-0.6842 (-0.89)
<i>POST</i>	-0.0223*** (-2.97)	0.0015*** (6.58)	1.3723*** (3.53)
<i>LN_ASSETS<sub>t-1</sub></i>	0.0928*** (5.43)	-0.0008** (-2.09)	-1.0816** (-2.08)
<i>LLP<sub>t-1</sub></i>	0.5572*** (18.66)		
<i>NPL<sub>t+1</sub></i>	0.0170*** (3.23)		
<i>NPL</i>	0.0329*** (4.38)		
<i>NPL<sub>t-1</sub></i>	0.0241*** (3.91)		
<i>NPL<sub>t-2</sub></i>	0.0241*** (4.72)		
$\Delta$ <i>LOANS</i>	-0.0072*** (-5.91)		
$\Delta$ <i>GDP</i>	-0.1484* (-1.72)		
<i>CSRET</i>	-0.5402*** (-4.87)		
$\Delta$ <i>UNEMPLOY</i>	-0.0058 (-1.32)		
<i>10YR BOND</i>		0.0003*** (3.81)	0.1810* (1.74)
<i>TREND</i>		-0.0000*** (-4.10)	-0.0652*** (-3.48)
<i>UNEMPLOY</i>		-0.0004*** (-9.07)	-0.5090*** (-7.05)
<i>REVMIX</i>		0.0002*** (7.21)	0.2339*** (2.77)
Bank Fixed Effects	Included	Included	Included
Observations	6,330	6,517	6,517
R-squared	0.561	0.232	0.124

Standard errors clustered by firm; t-statistics in parentheses

\*\*\*, \*\*, and \* indicate significance at the 0.01, 0.05, and 0.10 level respectively.