INFORMATION DISCLOSURE, BANK PERFORMANCE, AND

BANK STABILITY

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Abstract

The purpose of this research is to identify the effects of information disclosure on commercial bank performance and stability. Specifically, the study examines the relationship between different levels of information disclosure and the subsequent impact on various measures of bank return and risk. The focus is on securitized assets and credit derivative activities, both of which were at the heart of the subprime mortgage crisis of 2008. Using a sample of 27 US bank holding companies (BHCs) for the period from June 2001 to December 2008, a significant relationship between the quantity and quality of information disclosure and bank performance and stability is observed. A "switching" behavior is identified, whereby performance and stability initially decrease and then improve when additional information on a bank's securitization and credit derivative activities are disclosed. This switching effect is possibly explained by economies-of-scale and a "learning curve" effect. The results provide guidance for managing both the volume and quality of information disclosed by both bank managers and the regulatory authorities.

Keywords: information disclosure; transparency; banking disclosure; bank performance; bank stability; securitization; credit derivatives; financial crisis.

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1. Introduction

Commercial banks are often viewed as being opaque (Morgan, 2002, Jeffrey et al., 2012). Information asymmetries are due mainly to complex financial instruments and the high degree of connectivity among institutions. Opacity affects a bank's ability to serve as an intermediary, particularly their access to the capital markets, and their cost of capital. From a market perspective, opacity impacts the efficient allocation of capital and the stability of the financial system (Jeffrey et al., 2012, 2013). Providing accurate and timely information regarding the risk and return profile of banks can help ensure proper discipline and channel capital to its most productive use. As the subprime mortgage crisis illustrates, lack of transparency may lead to the closure of funding markets for individual institutions, with the cumulative effect being a widespread break down of the financial markets (Acharya et al., 2009, Allen and Carletti, 2010, Kenny and Morgan, 2011).

Expanded financial disclosure is often proposed as a strategy to strengthen market efficiency and stability. The regulatory framework under Pillar 3 of both Basel II and Basel III specifically addresses the need for enhanced information regarding bank risk and risk-based capital levels as a means to achieve greater market discipline and complement supervisory regulation (BIS, 2006, BIS, 2014). Yet, the potential benefits of this strategy are not fully evident. Increasing the flow of financial information may exceed the markets' ability to effectively handle such information. If too much overly complex information or too little firm-specific information is provided, even a financially sound bank could fail due to myopic

depositor behavior that induces massive deposit withdrawals.[1] As Nier (2005) and

Sowerbutts et al. (2013) point out, the effects of information transparency may turn

from positive to negative in times of crisis when banks report increasing risk and

stress levels. Also, increased levels of financial information are presumed to be

associated with higher costs associated with producing such information (BIS

2011). Thus, the net effect of supplying additional information to the market is a

function of a number of competing and possibly offsetting factors. The overall effect

is positive when the marginal benefits from expanded information disclosure

exceed the marginal costs of supplying the information. Thus, it is useful to think of

an optimal level of information disclosure for banks.

The theoretical banking literature has developed several models to

investigate the optimal level of voluntary disclosure. Diamond (1985) concluded

that efforts to provide optimal disclosure are better than no disclosure policy for

financial firms. Admati and Pfleiderer (2000) developed a model to help identify the

optimal disclosure policy for a single firm. They argue that there are convexities in

the level of disclosure. Little disclosure does not have much value but as the level of

disclosure increases an optimal point is reached.

The purpose of this research is to further explore the effect on bank

performance and stability associated with an increase in both the quantity and

quality of information disclosure. Using a panel data of 27 US Bank Holding

Companies (BHC), the study attempts to answer three main questions:

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[1] For example, a bank's CAMELS rating or the amount that it borrows through the FED's discount window are purposely not made public in order to not destabilize financial markets. See as well Prescott (2008).

1) Is there an optimal level of information disclosure for banks?

2) How does both the quantity and quality of information disclosure impact bank performance and stability?

3) How does the interaction of the quantity and quality of information disclosure affects bank performance and stability?

As was demonstrated during the financial crisis, many banks discovered that mortgage loan securitization and credit derivative activities had a major negative impact on their financial performance and stability (Acharya et al., 2009, Allen and Carletti, 2010, BIS, 2008). In many cases, distressed banks had not been able to provide a comprehensive and current reporting on these activities (BIS, 2011). Thus, this study focuses on the effects of the disclosure of securitization and credit derivative information. More specifically, bank call reports (Y-9), annual financial statements, and The Wall Street Journal index are investigated to examine both the quantity and quality of information disclosed to the market. A series of cross-sectional regression models are then run to test the subsequent effect of disclosure on bank performance and stability.

The literature review in section 2 provides evidence that the results from previous research are mixed and inconclusive. In particular, there is little evidence regarding the effects from the disclosure of loan securitization and off-balance sheet activities. Section 3 provides the methodological basis for this research. The results of the study are presented at Section 4 and suggest that an optimal level of

disclosure exists. These findings may guide future disclosure policy both for bank

managers, investors, and bank regulatory authorities.

2. Literature review

Different approaches have been use to investigate the relationship between

information transparency and bank performance along with efforts to judge the

suitability of information disclosure as a means of exercising market discipline on

bank risk taking behavior. Two main themes in the literature are apparent: The first

theme asks to what extent detailed bank-specific market data leads to an accurate

assessment of a bank's financial performance and stability.[2] The second theme

addresses the relevance of accounting data for assessing banks´ return and risk.[3]

According to Nier and Bauman (2006, p. 333) "Market discipline refers to a

market-based incentive scheme in which investors in bank liabilities, such as

subordinated debt or uninsured deposits, "punish" banks for greater risk-taking by

demanding higher yields on these liabilities." Generally, large bank creditors and

investors are assumed to exercise market discipline (Uchida and Satake, 2009,

Hirtle, 2007). As outlined in Pillar 3 of the Basel II and III accords, regulators see

market discipline as a complementary tool for monitoring risk at individual banks

and for maintaining overall financial sector stability: "Market discipline can only

work if market participants have access to timely and reliable information which

enables them to assess a bank's activities and the risks inherent in their activities.

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[2] For example, Perignon and Smith (2010) relate an index for Value-at-Risk disclosure to the quality of Value-at-Risk estimations.
[3] See for example Bourgain at al. (2012) who look at the relation between financial openness and risk-taking and the references given there.

Improved public disclosure strengthens market participants' ability to encourage safe and sound banking practices." (BIS 1998, p. 1). To the extent that bank management knows that its financial activities and risk exposures will be transparent to the market, they have a strong incentive to improve their risk management practices and strengthen their internal controls. In addition, enhanced information disclosure may improve bank management itself and help foster more appropriate competitive strategies[4].

The literature finds that markets generally value greater transparency. Tadesse (2005) concludes that crises are less likely in countries with regulatory regimes that require extensive bank disclosure. Bauman and Nier (2004) study the relationship between a banks' long-run average stock price volatility and the level of disclosure that banks provide over time in their annual reports. They find that expanded disclosure benefits investors. Based on the disclosure index employed by Baumann and Nier (2004), Bourgain et al. (2012) analyze risk-taking of banks in the context of financial openness. They state an ambiguous effect from increasing bank disclosure, as bank transparency attracts depositors and at the same time increases competition. As a response, banks may establish safer risk management policies what the authors confirm by their empirical investigation.

Nier and Baumann (2006) show that banks which disclose more information are subject to greater market discipline and thus have an incentive to limit their risk of default. In particular, greater information disclosure encourages

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[4] A strand of literature investigates market discipline by examining debt prices, particularly subordinated notes and debentures (SNDs) spreads. See Evanoff and Wall (2001), Krishnan, Ritchken and Thomson (2005, 2006), DeYoung et. al. (2001), Sironi (2003), and He and Reichert (2003).

banks to hold larger capital buffers. Hirtle (2007) finds that greater disclosure is associated with more efficient risk taking and improved risk-adjusted returns. Focusing on the relation between the term structure of credit spreads and the accounting transparency of firms, Yu (2005) concludes that high quality information disclosure generally supports smaller credit spreads (level effect) and, more specifically, short-term credit spreads are reduced (term structure effect).

Penas and Tumer-Alkan (2010) present weak evidence of market discipline using data from the Turkish banking system. They studied the market's ability to monitor Turkish bank activities and found that the market reacted negatively to measures of financial fragility. They also examined how the market reacts to the quality and timeliness of information disclosure and showed that additional disclosure requirements increase the usefulness of accounting statements while audited statements with greater lags are not as informative. Tanyeri (2010) questions if the financial statements of Turkish banks are sufficiently transparent. Transparency is measured based on "hidden capital" and is calculated as the difference between the market and book value of the bank. Results are mixed as the study found that hidden capital does exist and fluctuates during crisis and non-crisis periods. On the other hand, the hypotheses that their financial statements are transparent cannot be rejected. Jeffrey et al. (2012, 2013) highlight the effects of opacity in times of both market stability and instability. They find that the valuation discount on opaque investments decreased during the pre-crisis period and rose sharply at the onset of the financial crisis during 2007. Overall, they conclude that information opacity increases the likelihood of a financial crisis.

Although there is substantial evidence that market discipline can complement traditional supervisory methods (see Demirguc-Kunt et al., 2008, Fernandez and Gonzales, 2005), during the recent subprime crisis it became evident that the market failed to understand the risks inherent in many banking services, particularly in regard to their securitization and off-balance sheet activities (Acharya et al, 2009; BIS, 2008; BIS, 2011). It is generally recognized that the global financial crisis was primarily triggered by loose underwriting standards in the residential mortgage sector. The ultimate impact was then exacerbated by the large volume of mortgage-backed securities (e.g., CMOs) and the large volume of insurance contracts (e.g., credit default swaps) written against these securities.

The question is still not fully answered regarding to what extent information disclosure contributes to the proper assessment of a bank's risk and return profile. In the context of the financial crisis, it is particularly relevant to examine whether greater transparency regarding loan securitization and credit derivatives activities increased the market's ability to accurately and reliably assess a bank's financial condition.

3. Methodology and Hypotheses

3.1. Modeling Approach

To answer the three research questions discussed above, an OLS regression model is employed, where both bank and time specific effects are controlled for. When investigating the effects of information disclosure, an implicit assumption is that these effects can be isolated from the many other factors which contribute to

bank performance and stability. This problem is faced by all studies, which examine the effects of information disclosure. One approach to address this problem is to include appropriate control variables and to compare results among consistent groups of banks. For example, when testing the effects of high quality financial disclosure on credit spreads, Yu (2005) includes several control variables, such as firm leverage, equity volatility, and credit rating. Cheung et al. (2010) control for return on assets and firm size, while investigating the relation between company transparency and market valuation. Tanyeri (2010) controls for the impact during both crisis and non-crisis periods, bank size, and the specific mix of services provided by the bank.

In addition to using similar control variables, this study estimates a number of lagged regression models. Testing disclosure effects across several periods may help to disentangle persistent disclosure effects from exogenous business effects. Although even with the use of many control variables and lagged regressions it may not be possible to totally segregate disclosure effects from business activity effects. The following hypotheses are tested:

H1: There is an optimum quantity of disclosure that leads to maximum bank performance/stability.

Two specifications of the hypothesis are possible;

> **H1a:** There is an inverted U-shaped relationship between bank disclosure and performance/stability. That is, as the level of disclosure increases, bank performance/stability improves, reaches a maximum, and then possibly

declines as the bank releases increasingly complex information which is difficult for the market to accurately assess. Alternatively,

H1b: At low levels of disclosure bank performance/stability may decline, reach a minimum, and then increase. The decline may reflect the market's negative reaction surrounding the initial disclosure. As the level of production increases, the market becomes more comfortable with the information being disclosed. In addition, the bank may have likely reach a more efficient level of production of the financial activity in question.

H2: There is a positive relationship between the quality of disclosure and bank performance/stability.

H3: The impact of expanded disclosure (i.e. increased quantity) on both bank performance and stability is enhanced when the information being disclosed is of higher quality. Thus, there is a positive interaction effect between quantity and quality of information.

To examine the effect of both the quantity and quality of disclosure on bank performance and stability, two separate model specifications are estimated. The first set measures the effect of the *quantity* of disclosure while the second set measures the effect of the *quality* of the information disclosure. The general equation for both sets of models is as follows:

Performance/Stability=f (Disclosure Quantity/Quality Indices,Control Variables) (1)

More specifically, the optimal level of disclosure is tested using the following non-linear equation:

$$P(S)_i = \alpha_1 DISC_i + \alpha_2 (DISC_i)^2 + \sum_{j=3}^{m} \alpha_j (Control) + \varepsilon_i \qquad (2)$$

where

P = performance;

S = stability;

DISC = quantity of disclosure;

 i = individual bank;

j = specific control variable;

ε_i = normally distributed error term.

Note that the expected signs of the estimated coefficients implied by

Hypotheses 1-(a) and 1-(b) is as follows:

a) for bank performance: H1a: $\alpha_1 > 0$, and $\alpha_2 < 0$ and for H1b: $\alpha_1 < 0$, and $\alpha_2 > 0$

b) for bank stability: H1a: $\alpha_1 < 0$, and $\alpha_2 > 0$ and for H1b: $\alpha_1 > 0$, and $\alpha_2 < 0$.[5]

3.2. Dependent and Independent Variables

Various measures of bank performance and stability are used as the

dependent variable in separate regressions. These measures follow the general

practice discussed in the literature [see Hirtle (2007) as an example].[6] The detailed

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[5] The paper analyzes two measures of stability: the standard deviation of stock returns and the z-statistic, where an increase in the first represents a greater level of *instability* while an increase in the z-statistic represents an improvement in *stability*. In addition the bank's market beta was also used as a measure of stability but since the results were very similar to the other two measures, the beta model results are not presented in the study.

[6] Depending on the research objective more granular or aggregated measures are employed. For example, Barth et al. (2004) employ more disaggregate measures such as net interest margin and overhead costs,

definition of all the variables and indices used in the current study are given in Table I. Although it might seem that accounting–based measures of bank performance are not directly affected by changes in information disclosure, differences in disclosure can have an important indirect impact. For example, the market may perceive a more transparent bank to be less (more) risky which may lead to a lower (higher) cost of capital, which consequently impacts various accounting measures of performance and stability, such as ROA and ROE, and the bank's z-value. To see if such an effect exists, both accounting measures of performance and stability along with key market measures are used in this study.

To measure the quantity of information, several disclosure indices are constructed. The indices measure the level of detail supplied by banks when reporting on their securitization and credit derivative activities. Quantity (and quality) indexes for disclosure that are mostly based on counting key words have been frequently applied as a research tool (see for example Helbok and Wagner, 2006; Perignon and Smith, 2010; and Bourgain et al., 2012). However, Cooke and Wallace (1989, p. 51) argue that "financial disclosure is an abstract concept that cannot be measured directly". Thus, the results presented in this study have to be interpreted with care.[7]

On a quarterly basis, banks are required to disclose detailed financial information in their Y-9 regulatory call reports, which are subsequently made public with a three month lag. However, banks have a much greater degree of discretion

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while Bourgain et al., (2012) take a more general approach employing aggregate measures such as a bank's ROE or z-score.

[7] Marston and Shrives (1991, p. 208) admit that measuring…"information disclosure cannot be carried out in a precise scientific way".

regarding the level of disclosure to include in their annual reports to shareholders. The following indices, labeled SBI, DBI, TBI, SQI, DQI and TQI, are described in detail in Table I. These indices are based on call report data and measure the level of securitization and credit derivative activities the banks are involved in, while two other indices (SARI and DARI) are based on annual report data.

In regard to the call report indices, the level of involvement in both securitization and derivative activity is measured in two ways: a binary and a continuous manner. In binary format, if a bank is involved in a given financial activity it earns one point. If it is not involved zero points are earned. No attempt is made to quantify the degree of involvement. The binary index simply indicates the total number of unique activities the bank engages in. SBI represents the securitization binary index, DBI the derivative binary index, and TBI indicates the total binary index across all securitization and derivative activities. The maximum attainable values for the binary indices are 69 for SBI, 12 for DBI, and 81 for TBI. In the quantitative format, the dollar amount of each activity is added and scaled by the size of each bank as measured by total assets. Thus, SQI, DQI, and TQI respectively represent the level of quantitative involvement in securitization, derivatives and the total dollar amount of both activities.

To calculate the SBI and SQI indices, the following information is collected regarding the securitization activities for seven asset categories (1-4 family residential loans, home equity lines, credit card receivables, auto loans, other consumer loans, commercial and industrial loans, plus all other loans, leases, and other assets). For each of these seven asset categories detailed securitization

information is reported for eleven characteristics as follows: (1) Outstanding principal balance of assets sold and securitized with servicing retained or with recourse or other seller-provided credit enhancements; (2) Maximum amount of credit exposure arising from recourse or other seller provided credit enhancements provided to securitization activities in the form of credit enhancing interest-only strips; (3) Maximum amount of credit exposure arising from recourse or other seller provided credit enhancements provided to securitization activities in the form of subordinated securities and other residual interests; (4) Maximum amount of credit exposure arising from recourse or other seller provided credit enhancements provided to securitization activities in the form of standby letters of credit and other enhancements; (5) Dollar amount of unused commitments to provide liquidity to asset sold and securitized; (6) Dollar amount of all securitized loans and leases 30 to 89 days past due; (7) Dollar amount of all securitized loans and leases 90 plus days past due; (8) Charge-offs on assets sold and securitized with servicing retained or with recourse or other seller-provided credit enhancements; (9) Recoveries on assets sold and securitized with servicing retained or with recourse or other seller-provided credit enhancements; (10) Sellers interest in securities; (11) Sellers interest in loans.

The credit derivative indices, DBI and DQI, cover four categories of credit derivatives (credit default swaps, total return swaps, credit options, other credit derivatives): For each of these four asset categories detailed derivative information is reported for four characteristics as follows: (1) Notional amounts of credit derivatives when the bank is the guarantor; (2) Notional amounts of credit

derivatives when the bank is the beneficiary; (3) The amount or gross fair value at which an asset(liability) could be bought(incurred) or sold(settled) in a current transaction between willing parties when the bank is the guarantor; (4) The amount at which an asset (liability) could be bought(incurred)or sold(settled) in a current transaction between willing parties when the bank is the beneficiary.

In terms of the two annual report indices, securitization activities (SARI) and derivative activities (DARI) represent the number of times keywords relating to securitization and derivative activities are mentioned in the bank's annual report. Each bank's 10-K annual report is carefully analyzed. The focus here is on the extent of information provided regarding the objectives and strategies being followed by management and the potential risks facing the bank.

Over the sample period, there have been four major changes in the required level of detail reported in the call reports. At each breakpoint, even when a bank was providing roughly the same level of activity as in the past, they were required to disclose considerably more detailed financial information concerning their securitization and credit derivative activities. Hence, the indices based on call report data measure both the level of activity and degree of disclosure.

In addition to various quantity indices, the quality of disclosure is measured by three different indices: a quality index (QualIndex), the total number of transparency related problems mentioned in news articles (TRNS), and the total number of articles appearing in the Wall Street Journal (# of articles). To construct QualIndex, a sample of announcement articles relating to loan loss revisions, earnings announcements, and SEC probes are extracted from The Wall Street

Journal Index (WSJI)[8]. Each article is then read to see if it is related to quality

associated problems and to identify the bank's motives for changing its provisions of

loan losses, its projections of future earnings, or the nature of the formal

investigation by the SEC. In a similar approach, Barakat and Hussainey (2013)

construct a quality index for the disclosure of a banks´ operational risk. This index is

based on the number of words that are related to the most important operational

risk items used in the Capital Requirements Directive and two similar studies.

To understand if the endogeneity poses a problem in the model, a Hausman

test is performed. The results confirmed that endogeneity is not a problem in the

model and there is no need for more complex estimation techniques. Furthermore,

it seems likely that both the quantity and quality of information disclosure may

interact, since the market may be particularly concerned about banks with both a

low level of disclosure and a history of providing low quality financial information.

Alternatively, the market may be more concerned about a low level and low quality

of disclosure for financially weak banks, compared to healthy banks. Interaction

terms are included in the model to test for such effects.

The sample period is from June 2001 to December 2008. Considering that

smaller banks are not heavily engaged in securitization and off-balance sheet

activities, they were excluded from the sample. The sample consists of bank holding

companies (BHCs) which have total assets greater than $10 billion as of December

2008. By the end of the sample period, December 2008, there were 74 BHCs with

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[8] The following keywords are used in the search: disclosure, disclose, disclosing, disclosed, actual knowledge, actual, reveal, reveals, revealed, SEC, probe, probes, transparent, transparency, scrutiny, scandal, red flag, fails, failed, failure, violation, violations, revision, revisions, loan loss and loan losses.

assets greater than \$10 billion. Ten foreign BHCs were dropped from the sample

since the level of U.S. activities for these BHCs represent only a relative small

portion of their total consolidated worldwide activities. In addition, two BHCs

whose activities are primarily non-bank in nature and fourteen BHCs with

insufficient data for the whole sample period were removed from the sample. Out of

the remaining sample of 48 BHCs, fourteen banks with zero disclosures regarding

securitization and derivative activities were removed from the sample[9]. Finally,

seven BHCs with very low activity levels were also dropped. The final sample

includes a total of 27 BHCs.

Stock price data for the BHCs were downloaded from University of Chicago's

Center for Research in Security Prices (CRSP) database. Data concerning

securitization and credit derivative activities are extracted from bank's Y-9C reports

available from the Federal Reserve Bank of Chicago, and 10-K reports which are

available from the EDGAR database at the SEC. The data sets are merged using their

PERM numbers. Data concerning banks which have encountered transparency

problems are obtained from a search of the Wall Street Journal Index.

4. Empirical Results

4.1. Overview and Optimal Disclosure

Table II provides the correlations between the variables. The results confirm

that correlations are not significantly high between the variables. Table III gives the

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[9] Disclosure and activity are intertwined, where zero disclosure means no activity. To prevent biases in the
results, banks with no engagement in securitization and credit derivative activities are removed from the
sample.

descriptive statistics for each of the key variables and indices. The average total assets for BHCs in the final sample for the period, June 2001- December 2008, is approximately $227 billion (median value $57 billion). Banks in the sample have an average annualized ROA of 1.04% and an average annualized ROE of 11.84%. In general, banks in the sample have very high loan to deposit ratios, as well as high risk-weighted asset to total asset ratios.

The average values for SBI is 10.98, 2.31 for DBI, and 13.3 for TBI. When compared with the maximum attainable values for these indices (SBI: 69, DBI: 12 and TBI: 81), these numbers show that on average, banks have relatively low disclosure index values based on their call report data. The average values for the annual report indices show that banks generally communicate in their annual reports in more detail regarding their securitization activities in comparison to their credit derivative activities (55.97 vs. 5.78, respectively).

The QualIndex on average is 99.1%, which indicates that on the whole banks provide high quality public information (i.e., free from material errors and purposeful omissions of important facts). However, the number of total articles that appeared in the WSJ search during a typical quarter averaged 14 for the sample of banks. Although not all of these articles are related to clearly identified transparency concerns, such as revisions in loan losses, earnings revisions, or SEC probes, most of them conveyed negative information about the banks[10]. Therefore this number is used as an alternative measure of the quality of information being disclosed.

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[10] Gunther and Moore (2003) refer to accounting restatements as a measure of quality (e.g., correction of loss underreporting) arguing that underreporting of losses is very likely in times of financial difficulties.

Relationship between Disclosure and Bank Performance - An initial

regression tests the relationship between disclosure/financial activity and bank

performance. For reasons of simplicity, Table IV and subsequent tables show only

those results for dependent variables which are statistically significant at least for

one hypothesis variable.[11] When performance is measured by risk-adjusted ROA

there is a significant relationship between disclosure/financial activity and

performance (for risk-adjusted ROA the coefficient for SBI is -0.9311 and 0.0166 for

SBI^2; the coefficient for TBI is -0.8683 and 0.0137 for TBI^2). The signs of the

coefficients are consistent with those expected under Hypothesis 1b. Thus, the

empirical results indicate that as the level of information disclosure/financial

activity increases, bank accounting performance (ROA) decreases to a certain point

and afterwards starts to increase. This result might possibly be explained by

economies-of-scale and from considerations that combine disclosure and other

activity related factors. Basically, it assumes that little information concerning a

specific off-balance sheet activity for a bank likely signifies a low level of activity in

itself. There are considerable costs, such as personnel, computer and software,

monitoring cost, etc., attached to the securitization process and when dealing in

credit derivatives the stature and reputation of the bank is important . If the level of

these financial activities is low, their service costs and limited market recognition

may outweigh their potential benefits. This applies similarly to the cost of disclosure

itself. If the level of disclosed information is low, there is an unfavorable

relationship between quantity and the cost of information being produced. On the

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[11] Since the ROA and ROE results are quite similar only the ROA results have been included.

other hand, once a bank reaches a certain size, it can support a much larger level of these activities, possibly manage the associated costs more efficiently, and ultimately make a profit. Furthermore, investors in banks which are more heavily involved in securitization and credit derivatives may have a greater appreciation or sensitivity to the quantity and quality of information being disclosed. These results confirm the theoretical model developed by Admati and Pfleiderer (2000) who argue that a little information is often not very important but once the level of the disclosure has reached a certain point, it is beneficial to report it.

Figure 1 shows the plot of the SBI index and the risk-adjusted ROA performance measure. Bank size is shown as the size of the circle where larger banks are shown as bigger circles. The figure shows that as the level of disclosure/financial activity increases, bank performance declines. However, after a certain point, as the level of disclosure/financial activity increases, bank performance begins to improve. As depicted in Figure 1, banks which have the largest disclosure/financial activity level and the higher performance measures are the bigger banks (namely, Citigroup, Wachovia, and Bank of America). This suggests that large banks may benefit from economies-of-scale and are better able to manage securitization and credit derivative activities and their associated disclosure costs more profitably than smaller banks.[12]

The results also suggest that there is a level of disclosure/financial activity above which bank performance begins to increase. For example, the level of SBI

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[12] Evidence concerning the risk of large international banks and their use of derivatives is provided in Reichert and Shyu (2003).

where the risk-adjusted ROA starts to increase is 28.0[13]. Similarly the level of TBI where the risk-adjusted ROA starts to increase is 31.6.

Another way to depict this relationship is by plotting the index values against the various performance and stability measures. In Figure 2 all the graphs show that up to a certain point the performance/stability measures decline and then begin to rise after reaching a minimum point. For example, graph (a) of Figure 2 exhibits the relationship between the bank's z- value and TBI. Each dot represents the index level which corresponds to the z-value on the x-axis. The graph clearly shows the turning point for the TBI level, after which the z-value starts to increase. The turning point shown in the graph (22.1) is roughly consistent with the regression derived turning point of 30.9. The BHCs which lie to the right of the turning point are J.P. Morgan Case, Citigroup, Wachovia, and Bank of America, all of which are money center banks that are large enough to be able to handle securitization activities efficiently. The results show that as the level of disclosure/financial activity increases, the performance and stability of the banks decrease. However, the situation reverses for money center banks which operate at or near the level of maximum economies-of-scale.

Relationship between Disclosure and Bank Stability - Table V shows the regression results for disclosure/financial activity and bank stability. As mentioned before, only the statistically significant results are presented. Disclosure/financial activity for both securitization and credit derivative activities have a significant

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[13] To find this number, first derivative of the function is taken and set equal to zero. For example,

$f(Risk - adjustedROA) = -0.9311SSBI + 0.0166SSBI^2 + \text{control variables and random error}$

$f(Risk - adjustedROA)' = -0.9311 + 0.0332SSBI = 0$

$SSBI = 28.04$

impact on the bank's z-statistic. The coefficient for SBI is -20.7, and 0.3745 for SBI^2; while the coefficient for TBI is -20.3, and 0.327 for TBI^2. Again, the signs of the coefficients are consistent with those expected under Hypothesis 1b. This suggests that only after reaching a critical point, providing additional information to the market begins to stabilize the bank. The level of SBI above which the bank stabilizes is 27.6 and the level of TBI is 30.9. No statistically significant effects were observed when bank stability is measured by the standard deviation of stock returns. As the z-statistic is calculated using a combination of ROA and σ_{ROA}, potentially offsetting effects of both risk and return may come into play. Higher information disclosure, that is presumed to coincide with higher financial activity level, at first increases the level of risk. However, after a certain threshold is reached the increase in return begins to dominate. Once again this may be a result from economies-of-scale or from a "learning curve" effect as the bank aggressively expands into securitization and credit derivative activities.

As a robustness check, the regressions are re-estimated by including an interaction term between the crisis period dummy variable and the disclosure index. The results were essentially the same as before. Also, to see if the large banks are biasing the results, the three largest banks are dropped from the sample and the regression models are re-estimated once again. The results changed very little as they still show the same U-shaped relationship between bank performance and disclosure and an inverted U-shaped relationship between bank stability and disclosure.

Annual Report Indices- Table VI presents the regression results between the annual report indices (SARI and DARI) and the various performance measures. When performance is measured by ROA, the securitization annual report index (SARI) has no significant effect on performance but the credit derivatives annual report index (DARI) has a significant impact. When ROA is the dependent variable, the coefficient on DARI is -0.00059 and 0.000004 for DARI^2. On the other hand, when risk-adjusted ROA is used as performance measures, the significant impact of the credit derivatives index disappears and the securitization annual report index shows a significant impact on performance. When risk-adjusted ROA is the dependent variable, the coefficient on SARI is -0.1015 and 0.00026 for SARI^2.

Similar to the previous set of findings, in each case the signs of the regression coefficients are as expected under Hypothesis 1b. That is, contrary to anticipating a consistently positive effect from increased disclosure, the information disclosure contained in annual reports at first decreases performance but ultimately ends up associated with improved bank performance. As mentioned before, this may possibly be explained by economies-of-scale and learning curve effects as smaller banks are less engaged in securitization and credit derivatives activities. Once a bank gets large enough it should be in a position to handle securitization and derivative activities more efficiently and the market responds more positively to enhanced disclosure. When smaller banks, which bear roughly the same level of fixed production costs for producing these financial activities, communicate more extensively those activities in their annual reports, the market appears to be skeptical and consequently bank performance declines.

Table VII shows the regression results for the annual report disclosure index and bank stability. As with the call report disclosure indices, the z-statistic is the only stability measure which shows a statistically significant quadratic relationship. The coefficient on SARI is -2.704 and 0.0066 for SARI^2. Once again, the signs of the regression coefficients support Hypothesis 1b. As before, this implies that disclosing information about securitization activities in annual reports decreases bank stability as the market receives new information up to a certain point. Beyond this point, the market better understands the bank's level of engagement and proficiency in the activity, which helps to stabilize the bank. Surprisingly, when stability is measured by the volatility of stock returns, the squared term is not significant. Finally, there is a positive and significant relationship between the credit derivative annual report index (DARI) and bank stability as measured by stock return volatility. When stock return volatility is the dependent variable, the coefficient on DARI is small (0.0099).

4.2. Quantity/Quality of Disclosure and Performance/Stability (Single Effects)

To explore the relationship between the disclosure/financial activity index and bank performance and stability more closely, the time periods (quarters) and specific banks that significantly increased or decreased their level securitization and derivative activities are identified. First, the various indices are plotted against time for each BHC to see how the level of disclosure/financial activity changes over time. Once this is done, the number of times where major changes in the indices occur are

recorded and correlated with our measures of bank performance and stability[14].

The results, not reported here, are asymmetric in the sense that increases in disclosure/financial activity have a more significant impact on bank performance and stability compared to decreases in disclosure. In addition, the performance measures are more sensitive to major changes in disclosure than are the stability measures. Furthermore, the results suggest that quantitative measures of disclosure are more sensitive to changes in the disclosure/financial activities level than qualitative measures of disclosure.

Starting in March 2003 and again in March 2006, banks were required to disclose more details concerning their securitization activities[15]. The results indicate that even though the bank maintained the same level of securitization or derivatives activities, an increase in information disclosure is followed by a significant market response[16]. On the whole, increases in disclosure that occurred during 2003 and 2006 appear to have a noticeable impact on performance and stability.

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[14] For the sake of brevity, the results are not tabulated here but they are available upon request.

[15] Starting March 2003, banks had to report the maximum amount of credit exposure arising from recourse or other seller provided credit enhancements provided in the form of subordinated securities and other residual interests in 1-4 family residential loans, home equity lines, credit card receivables, auto loans, other consumer loans, commercial and industrial loans and all other loans and leases. Starting March 2006, banks had to report the notional amounts of credit default swaps, total return swaps, credit options and other credit derivatives when the bank is either the guarantor or beneficiary.

[16] The quantitative level of activity was plotted against time for each bank and we generally observed no significant change in the level of activity for the two regulatory reporting changes mentioned above, March 2003 and March 2006. As a robustness check, regressions are estimated to see if there was a significant change in the quantitative measure of financial activity at the point in time when there was a regulatory change requiring more detailed disclosure. The results show that the quantitative measures of financial activity were not affected by the regulatory changes. This supports the findings that the market reacted to changes in disclosure rather than to changes in the level of securitization/derivative activity reported during March, 2003 and March, 2006.

In general, increases in both the call report and annual report indices result in an increase in bank performance, with the exception of the credit derivatives annual report index. Apparently, when banks provide more detail regarding their credit derivative activities in their annual reports, bank performance is negatively affected. Furthermore, almost all of the significant negative impacts surrounding credit derivatives happened with the publication of the 2008 annual report. One might think that the financial crisis is driving these results but this cannot be the entire explanation since a crisis period dummy variable was included in all the regression models. However, the results may be somewhat driven by the crisis since prior to 2008 the financial markets were not fully aware of the true riskiness of many types of credit derivatives; hence, additional information disclosure did not affect performance and stability very much. But when the market became more aware of the risks inherent in these credit derivatives, additional disclosure became a red flag which resulted in decreased bank performance and stability.

Quality of Information Disclosure - To test if the market recognizes and welcomes high quality information, the relationship between the quality of information disclosed and bank performance and stability is examined. As mentioned previously, three different measures are used as a proxy for the quality of information disclosure. Given that almost all the articles appearing in the Wall Street Journal contained negative news concerning a bank, the total number of articles is used as an inverse quality measure in addition to the number of transparency-problem related articles, and the previously discussed quality index (QualIndex). Given the dramatic increase in the total number of articles for our

sample of banks during the financial crisis an interaction term between the crisis years (2007 and 2008) and the total number of articles is included in the regression to correct for any potential bias in the results.

The regressions indicate that the quality of information disclosure has no significant effect on performance when performance is measured by ROA and risk-adjusted ROA. When performance is measured by stock returns, the total number of published articles negatively impacts a bank's stock return as one might expect. The regression coefficient on the # of articles variable is -0.00452. Thus, for example when a total of ten articles are published discussing a specific bank in Wall Street Journal the bank's stock price is reduced by 4.5% during the sample period.

4.3. Interaction Effects of Quantity and Quality of Disclosure

To address the third research question which asks if the increase in disclosure has a greater impact on bank performance and stability when the information disclosed is of higher quality, an interaction term between the quantity and quality of information is included in the regressions.[17] Using various quality and quantity indices, a total of thirty-six models are run for each performance and stability measure. Once again, for the sake of brevity only the statistically significant results are reported[18].

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[17] The nature of interaction effects and their inclusion in linear regression is explained in Ozer-Balli and Sorensen (2012). Barth et al. (2004) use an interaction term to test the combined effect from "restrictions on bank activities" and "moral hazard".

[18] A total of 324 different regression models are run with the results for only 35 significant models reported. The entire set of results is available upon request.

Table VIII shows the regression results for the various performance measures. When performance is measured by ROA or risk-adjusted ROA, the interaction term between the disclosure indices and the number of total articles is positive[19]. For example, when ROA is the dependent variable, the regression coefficient on the interaction term, # of articles*TBI, is 0.000005; the coefficient on # of articles*TQI is 0.00005, and the coefficient on # of articles*DARI is 0.0000003. These results seem to indicate that when the bank discloses more about its securitization or credit derivative activities at a time when there is substantial news concerning the bank, the bank's performance improves. This result might seem contradictory at first since the number of articles is used as a measure of quality in the study. However, the results from the interaction is exactly as expected since more publicity about the bank would raise questions concerning the banks' operations and profitability. Hence, in times of increased publicity and disclosure, enhanced information is welcomed and followed by a positive reaction.

Table IX shows the regression results for the various stability measures. When the number of articles appearing in the newspapers along with increased information disclosure is modeled, increased disclosure decreases the bank's stock volatility and increases its z-statistic. For example, when stock volatility is the dependent variable, the regression coefficient on the interaction term, # of articles*TQI, is -0.0009 and when z-statistic is the dependent variable, the coefficient on # of articles*SARI is 0.0118. These results are in line with the results

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[19] When ROE is used as the performance measure, the results are very similar to the results when ROA is used as the performance measure. For the sake of brevity, only the results for ROA are shown in Table VIII. As always the results for ROE are available upon request.

from the regressions using the profitability measures. It can be inferred that even if there is a considerable amount of negative publicity regarding the bank, if the quantity of information disclosed is high, the market perceives it as a positive signal and consequently the bank stability improves.

On the other hand, if the information disclosed is of low quality, increased disclosure in annual reports regarding the bank's securitization and credit derivative activities only serves to destabilize the bank by increasing its stock volatility. The regression coefficient on TRNS*SARI is 0.0005, and the coefficient on TRNS*DARI is 0.0022.

5. Conclusions

This study examines the relationship between information disclosure and bank performance and stability during the eight years leading up to one of the worst financial crisis on record. Securitized assets and credit derivatives were seen as being primarily responsible for the sub-prime mortgage crisis, hence this research specifically focuses on the impact of information disclosure regarding a bank's involvement in the loan securitization process and its use of credit derivatives. The study examines the monitoring ability of the financial markets by evaluating the linkage between the information disclosure and bank performance and stability.

The results show a significant relationship between the quality and quantity of disclosure and various measures of bank performance and stability. Two competing hypotheses were initially discussed: one suggesting an inverted U-shaped relationship between disclosure and performance/stability, while the other

hypothesis suggested a U-shaped relationship. The results of the study provide evidence of a U-shaped relationship between information disclosure and bank performance and stability. This indicates that when banks initially disclose information about these activities, the market reacts negatively but as banks engage in substantially greater levels of securitization and credit derivative activity, they are able to capture potential economies-of-scale and move down the learning curve. As a result, after a certain point, the provision of more information serves to increase bank performance and stability.

When changes in disclosure indices are analyzed, an asymmetric result is obtained in that *increases* in disclosure/financial activity have a more significant impact on performance and stability compared to *decreases* in disclosure/financial activity. Furthermore, *performance* measures are more sensitive to changes in the disclosure/financial activity level than are the *stability* measures. In addition, *quantitative* measures of disclosure/activity are more influenced by changes in the level of disclosure than are *qualitative* measures of disclosure/activity. Finally, there is a greater market reaction to disclosure/activity changes by money center banks compared to regional banks.

During the sample period, there have been two major regulatory changes requiring banks to disclose more details in their 2003 and 2006 call reports. This increase in required disclosure levels was welcomed by the market in that most of the significant effects of increased disclosure on bank performance and stability happened during those years. Thus, even though the level of financial activity

remained roughly the same, the market noticeably reacted to an increase in the level of disclosure.

When changes in annual report disclosure indices are investigated, the market apparently perceives securitization activities as desirable since changes in the disclosure of securitization activities positively affects bank performance in a significant way. In general, an increase in disclosure/activity as reflected in the banks´ call report and annual report leads to an improvement in bank performance. However, enhanced discussion of credit derivative activities in the bank's annual report correlates to a decrease in performance, especially during 2008. This may possibly be explained by the market's growing perception of the riskiness of the credit derivatives. Prior to the crisis, the market was not fully aware of the real risks associated with these securities. As the market became increasingly aware of the inherent risks it began to react negatively to enhanced disclosure.

Analysis of the effects of the quality of information disclosure reveals that if the information is of lower quality, bank performance decreases while no similar effect on bank stability is evident. Here it should be noted that causality might be an issue. That is, if the bank management knows that they are not doing well they might be inclined to conceal certain information, or possibly disclose misleading information to the market. If this is the case it would lower the quality of the information disclosed and reduce transparency. Thus, it might be the case where poor bank performance leads to low quality information disclosure, and not vice versa. When there are multiple events in the news concerning a given bank, the data

indicates that the bank's performance is negatively impacted. In essence, the market perceives "no news as a being good news".

When the quality of enhanced annual report disclosure is high the bank's stock price increases significantly. Although there are cases when low quality information disclosure negatively affects performance and stability, the coefficients on those variables are very small.

One of the major challenges of this study was attempting to unravel the intertwined nature of the level of the financial activity itself and information disclosure regarding the activity. That is, does increasing the amount of financial activity per se (e.g., loan securitization) impact bank performance or is it the level and quality of information surrounding the activity that impacts performance, or may possibly both take place. A possible future study might attempt to isolate in more detail the volume of financial activity and disclosure effects by using a small, homogenous sample of banks which are similar in regard to their financial activity levels. Another direction for future research would be to use different measures of the both the quantity and quality of information disclosure. Furthermore, looking at the overall level of disclosure levels and studying the impact of corporate governance structure on the disclosure policies might produce interesting results. It might also be interesting to control for differences in ownership structure between individual and institutional investors to see if these groups react in a similar or asymmetric fashion to expanded financial disclosure.

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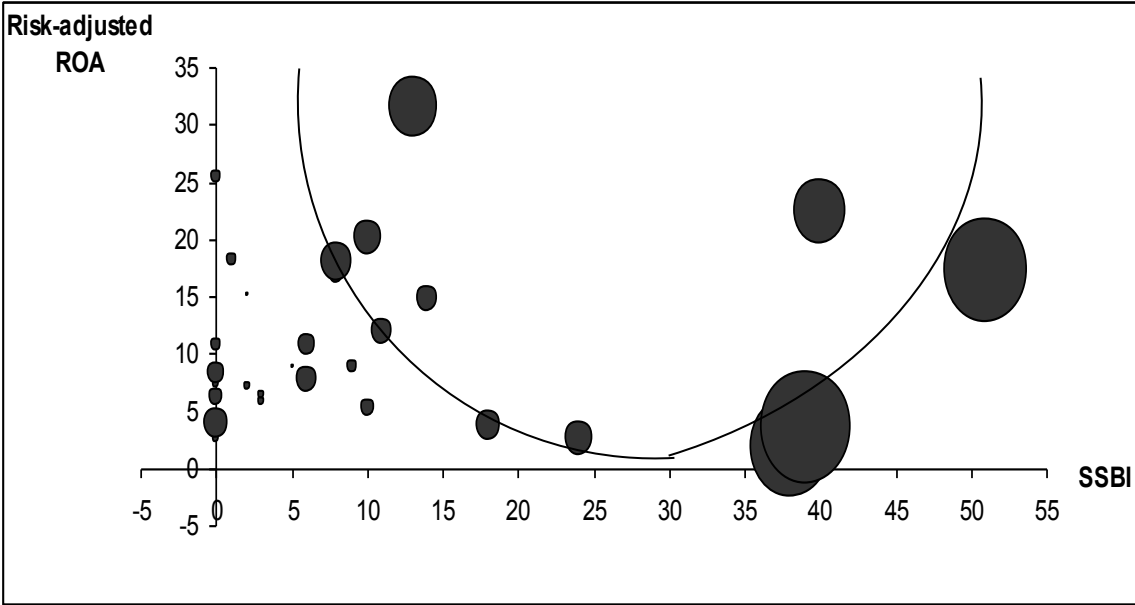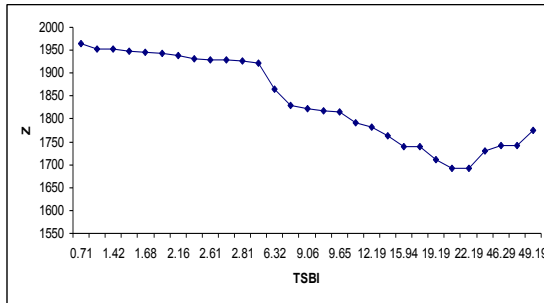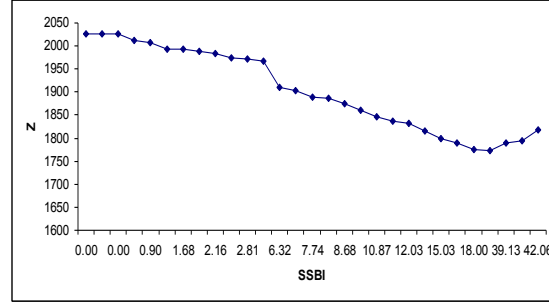
Figure 1. SBI and Risk-adjusted ROA

Figure 2. Turning Points

a) TBI and Z-value

b) SBI and Z-value

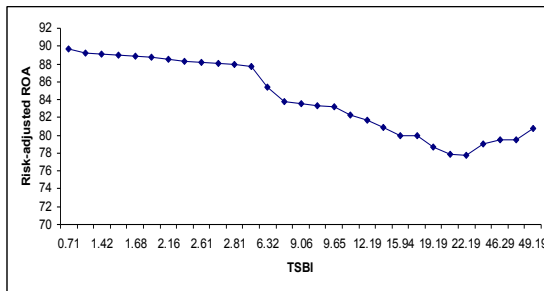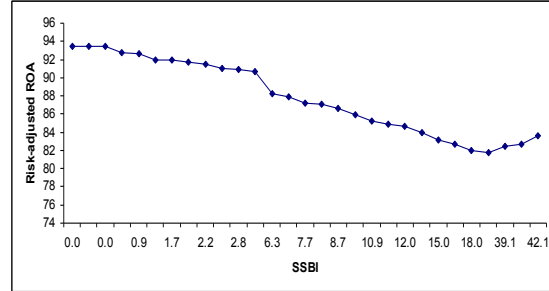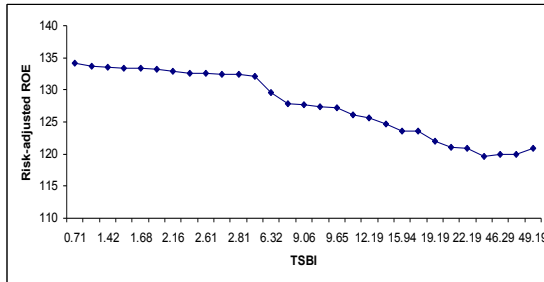**c) TBI and Risk-adjusted ROA**

d) SBI and Risk-adjusted ROA

e) TBI and Risk-adjusted ROE

f) SBI and Risk-adjusted ROE