Loan Delinquencies and Bank Stock Returns

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Abstract

This paper examines the statistical relationship between bank stock returns and two fundamental banking variables: (1) changes in net interest margin (NIM), and (2) changes in the loan delinquency rate. Motivated by passage of the Gramm-Leach-Bliley Act (GLBA) in 1999, as well as the significant loan problems witnessed during 2007-09, we examine two separate time periods. For the period following passage of GLBA, bank stock returns are positively related to NIM changes, and negatively related to delinquency changes. But for the pre-2000 period, these statistically significant relationships disappear.

I. Introduction

The basic theme of this paper is how bank loan problems relate to bank stockholder returns. Truth be told, the research started with a statistical "fishing expedition" of sorts. In 2007 and 2008, bank loan problems were becoming increasingly apparent. The ensuing recession brought dramatic consequences for bank profitability, and naturally, for bank stock returns. Hence, the motivating question of the paper presented itself: could we explain, statistically, the returns to bank stockholders by using some basic bank performance measures? And, given the high-profile loan problems associated with the recession, how were *loan delinquencies* associated with bank stock returns?

To foreshadow key results from our "fishing expedition": we did *catch a big fish*—finding that loan delinquencies display a significantly *negative* relationship to bank stock returns since the year 2000. But *catching that big one* doesn't tell the whole story. When we extended our examination to the pre-2000 period—notably, prior to the Gramm-Leach-Bliley Act—we found very different results. When this paper concludes, you might say we're "taking our line out of the water," yet recognize ample motivation for more *fishing expeditions.*

II. Background: performance measures, stock returns, and the literature

We expect that a firm's "fundamentals" will have important implications for profitability, and ultimately, for returns to shareholders. Here, we'll focus on a small set of *bank* fundamentals, or performance measurements, and examine their relationship to bank stockholder returns.

The literature on bank performance measures is large. For those unfamiliar with such measures, a good starting point would be a paper from the Federal Reserve Bank of Atlanta (Hein, Koch, and McDonald, 2005). This piece distinguishes the performance characteristics of smaller, *community banks*, from those of their large-bank brethren. The authors rely on a number of measures. Some are "general purpose" performance measures, applicable to any business—like *return on assets* and the *equity multiplier*. But more important for our purposes are bank-specific measures, such as *net interest margin* and *nonperforming loans.*

Net interest margin (NIM) is a widely-used bank performance measure. It is geared to

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the traditional business of banking: borrowing funds (primarily from depositors) and deploying those funds (in loans or securities). Specifically, NIM is *net interest income* divided by the bank's *earning assets.* And net interest income—i.e., the *total interest income* minus the *total interest expense*—encompasses a large portion of the typical bank's income statement. NIM captures information roughly analogous to that provided by a retail firm's *markup.* So a *bigger* NIM is viewed as "good news" for the bank—suggesting a *bigger* reward for bank stockholders.

While a bigger NIM is generally a good thing, it does not tell us about loan *quality*. Timely payback can be an issue. Economic events in 2007 and 2008 drew special attention to nonperforming loans at lending institutions. Hence, we bring in another measure, one designed to capture such problems: loan delinquencies. A higher rate of *loan delinquency* is "bad news" for the bank—implying *lower* returns to bank stockholders.

Our analysis follows a considerable stream of research examining bank returns and bank fundamentals. One prominent piece by Cooper, *et al.* examined the stock returns and fundamentals for a sample of 213 bank holding companies over the period 1986-1999 (Cooper, Jackson, and Patterson, 2003). Specifically, they found that "variables related to non-interest income, loan-loss reserves, earnings, leverage, and standby letters of credit" are important in forecasting bank stock returns (page 817). A more recent paper by Ryan Stever examines bank equity risks and loan portfolio characteristics with data from1986 to 2003 (Stever, 2007). Stever draws some interesting contrasts between large and small banks. In particular, *betas* of large banks are two to five times higher than those of small banks. Further analysis suggests that the more restricted diversification opportunities of smaller banks induces them to seek out loans with lower credit risk.

We note that most of the data examined in these two papers came from the period prior to passage of the Gramm-Leach-Bliley Act (GLBA). GLBA was passed in November of 1999, and took effect in March, 2000. It permitted U.S. banks to move towards a "universal banking" model—allowing them to operate in the securities and insurance businesses, as well as in traditional banking. And as one might expect, researchers have been examining various dimensions of bank performance, relative to passage of GLBA.

Yeager, *et. al.* examined financial statement data on *bank holding companies* (BHCs) and *financial holding companies* (FHCs) between 1996 and 2004 (Yeager, Yeager, and Harshman, 2007). *Financial* holding companies are basically the banking institutions that moved into non-traditional banking activities, like insurance or securities underwriting, under GLBA. According Yeager, *et. al.*, GLBA aimed to provide financial firms with added "revenue efficiencies and economies of scale and scope by becoming universal banks." The authors looked for evidence of performance differences—particularly, differences attributable to a change from *bank* holding company status to *financial* holding company status. In their own words, the authors found that "banking organizations that ultimately became FHCs in the post GLBA era showed little change in condition, profitability, and revenue productivity relative to their performance as BHCs" (Yeager, Yeager, and Harshman, 2007, page 327).

A more recent paper by Geyman and Yeager was also motivated by passage of GLBA (Geyfman and Yeager, 2009). Whereas the Yeager, *et. al.* study limited itself to financial

statement data, Geyfman and Yeager examined market return data. In particular, using data from 1990 to 2007, they compared return and risk characteristics of traditional bank holding companies with those companies involved in broader, universal banking activities. They find that "universal banks had similar systematic risk but sharply higher total and unsystematic risk than more traditional banks. Universal banks did achieve modest risk diversification benefits in the post GLBA era…." (page 1667). Geyman and Yeager's time period ended in 2007—on the doorstep of what turned out to be a deep recession. However, the authors were careful to acknowledge the potential significance of what was starting to appear, no doubt just as their paper entered the publication review pipeline. As they conjecture: "We suspect that even this risk reduction [from above-mentioned diversification benefits] may disappear as researchers update the sample period to include more of the subprime financial crisis that began in 2007 because the crisis hit universal banks much harder than other banks" (Geyfman and Yeager, 2009, page 1667).

The preceding two papers are indicative of the importance of the GLBA in the banking environment—and especially, the scrutiny devoted by researchers to its impact. And the motivation for our analysis here is very much the same. But at this juncture, we have the added benefit of being able to look at more of the *post-GLBA* period—which, as we know now, includes a period of dramatic loan problems.

III. Data

Our goal is to explain movements to bank stock returns—or, more precisely, to determine if two fundamental bank performance measures will contribute to a *statistical explanation*. To capture bank stock returns, we used publicly-available bank stock index data. Professor Kenneth French's online data library provides monthly, industry-based stock returns, based on CRSP data (French, 2010). The returns employed here are *value-weighted* index returns for the banking industry. In addition, we compounded the French monthly returns to construct our own series of *quarterly* returns; this was done to achieve consistency with loan data, which are compiled *quarterly* by Federal bank regulators.

The Federal Reserve's quarterly *loan delinquency rate* data were used to capture loan quality problems (Board of Governors, 2010). These data, for *all loans*, have been published since 1985. Formally, the series tracks delinquent loans and leases, defined as those past-due thirty days or more. These include both loans accruing interest and those in nonaccrual status. The Fed publishes delinquency rates for *three* categories of *banks*: (a) the *100 largest*, measured by asset size, (b) those *smaller than the 100 largest*, and (c) *all banks*. **Figure I** shows delinquency rates for *all loans*—from 1985 through the first quarter of 2009—contrasting rates for the largest 100 banks with rates for other banks. We note the obvious negative impact of *recessionary* episodes: in the early 1990s, in the early 2000s, and during 2007-09. While the two series plotted in Figure I are positively correlated, there clearly have been more dramatic changes in the "100 largest bank" series.

Quarterly net interest margin (NIM) data, for different size categories of banks, is published by the FDIC in its *FDIC Quarterly*. The FDIC defines its NIM series as "the difference between interest and dividends earned on interest-bearing assets and interest paid to depositors and other creditors, expressed as a percentage of average earning assets." A

computer-readable version of the NIM series is available at the website of the Federal Reserve Bank of St. Louis. **Figure II** contrasts two separate NIM series, from 1985 through the first quarter of 2009, for: (a) banks of *at least $15 billion* in asset size, and (b) *all banks*. Clearly, the *largest* banks have shown lower NIMs than banks as whole. One other result discernable from Figure II: for all banks, NIM has been on a fairly consistent "downward march" since the mid-1990s.

The nature of the NIM and delinquency data—especially in view of the plots in Figures I and II—raises the statistical issue of *stationarity*. Applying regression analysis to *nonstationary* data can give misleading results. As indicated by C.W.J. Grainger, "few series met with in business or economics appear to be stationary, but rather most contain either trends or long swings…" (Grainger, 1980, page 65). And concerning the use of *levels* of economic variables, Grainger notes that "such variables often need to be differenced to achieve stationarity. Using them in an indifferenced form can easily lead to spurious regressions…." (Granger, 1980, page 113). Consequently, for the analysis that follows, we transformed the NIM and loan delinquency data. We used one-quarter *changes* in each of these variables.

Finally, our analysis was subject to the constraints of available data. While *NIM* is available from the first quarter of 1984, the *delinquency rate* series started with the first quarter of 1985. And because we "differenced" the data, our first possible observation was for the *second quarter* of 1985.

IV. Empirical method and results

The value-weighted bank index returns (R) were regressed on two independent variables: (1) the one-quarter *change* in the loan delinquency rate (ΔDelinq) and (2) the one-quarter *change* in net interest margin (ΔNIM). In essence, we solved for *slope* coefficients (the betas) in the following equation:

$$R_t = \beta_0 + \beta_1 \Delta Delinq_t + \beta_2 \Delta NIM_t + \varepsilon_t .$$

Table I reports results for regressions where: (1) ΔDelinq was the delinquency rate change for *all loans and all banks*, and (2) ΔNIM was change in net interest margin for *all banks*. The *first row* of results in Table I presents output for 2000/Q1 through 2009/Q1. Recall that the year 2000 was the first full year following passage of Gramm-Leach-Bliley. The coefficients display anticipated signs: increasing loan delinquency *hurts* bank stock returns, while increased NIM *enhances* such returns. And the p-values (in parentheses) indicate a high degree of significance.

But what happens when we look back, prior to the year 2000? It turns out that the same kind of regression, applied to the period from 1985/Q2 through 1999/Q4 provides very different results. Consider the *bottom* row of output in **Table I**. The signs of the coefficients are reversed. In addition, p-values on *both* coefficients suggest *no* significant relationship between the independent variables and bank stock returns.

Table II presents the same kind of results— but now, with *large bank* measures employed for each of the independent variables. The dependent variable remains as before:

value-weighted bank stock index returns. Conceptually, this may represent a more suitable "matching" of independent and dependent variables, since the bank index returns are value-weighted, and hence, more reflective of *large bank* results. In these regressions: (1) ΔDelinq is the delinquency rate for *all loans, but only at the largest 100 banks* (by asset size), and (2) ΔNIM is net interest margin at banks with *at least $15 billion in assets*.

These *large bank* results tell a story similar to what we observed before. Looking at the top row of Table II—for the post GLBA period—the coefficients for ΔDelinq and ΔNIM display the same signs as in Table I. The coefficient on ΔDelinq is highly significant, while the coefficient on ΔNIM is less so (at the 10% significance level). And again, turning to the bottom row of Table II—results for the 1985-1999 period—signs on the coefficients are reversed and statistically *insignificant*.

V. Concluding comments

As suggested in the introduction, we've "taken our line out of the water"—at least temporarily—but no doubt, there is more to our "fish story." Results for 2000-09 are striking. The statistical associations—of loan delinquency changes and NIM changes, relative to bank stock returns—seems to sit well with our financial intuition. But extending our examination to the pre-2000 period raises questions about consistency of these results, and prompts us to ponder the true *driving* forces. We're left with a puzzle. It is unfortunate that data limitations do not permit an examination of years prior to 1985.

We have treated the year 2000 as a crucial and potentially interesting *break point*—primarily because of the Gramm-Leach-Bliley Act (GLBA), which was passed near the end of 1999. Yet, one could argue that a number of the changes codified in GLBA were already a reality for bank holding companies prior to the Act's passage. Starting in the 1980s, the Federal Reserve began interpreting the Glass-Steagall Act in an increasingly "liberal" manner. Bank holding companies were gradually permitted to engage in underwriting activities, through so-called "Section 20" subsidiaries. In addition, the banking industry has exhibited tremendous consolidation over recent decades. The Riegle-Neal Act of 1994 brought about interstate banking, no doubt motivating some of the recent consolidation activities.

On the surface, one could argue that larger, more diversified banking organizations would be *less* vulnerable to movements in fundamentals like loan delinquencies or NIM. Obviously, our analysis does not confirm this. And in this regard, we can view our results as being consistent with the conjecture, noted earlier, in the 2009 Geyfman and Yeager paper.

We end with one last observation. The period from 2000 to 2009 is a notable one, but *not just because* it is in the *post-GLBA* era. It was also a decade characterized by *two significant recessions*. By contrast, the earlier 1985-1999 period displayed just one economic slowdown—and a rather mild one (in the early 1990s). It *could* be that bank fundamentals have an asymmetric impact, as we move from booming to recessionary time periods. It is possible that the high-profile change in U.S. banking law near the end of 1999 may have been an "accompanying event," rather than the primary "causal event," in the explanation of bank stock returns.

Figure I

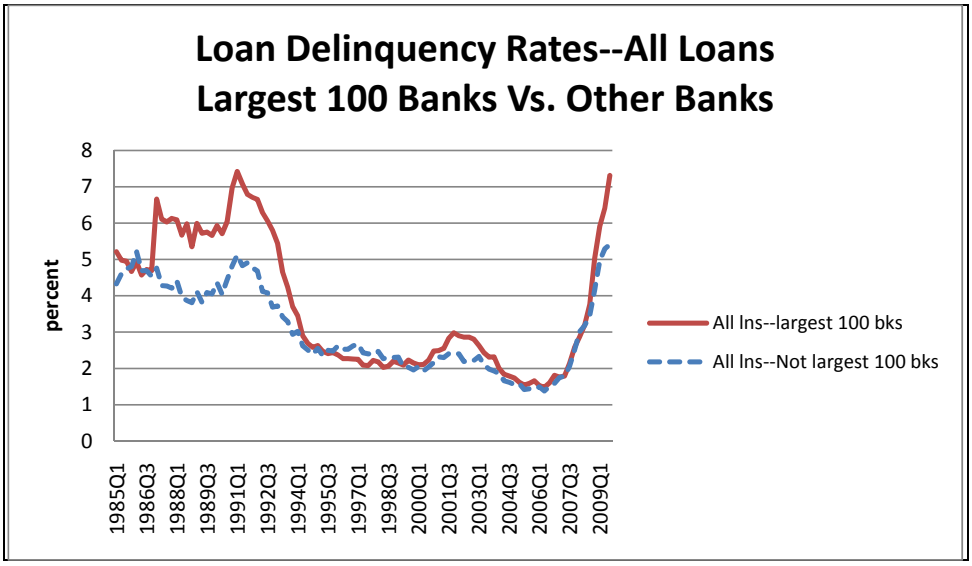

Figure II

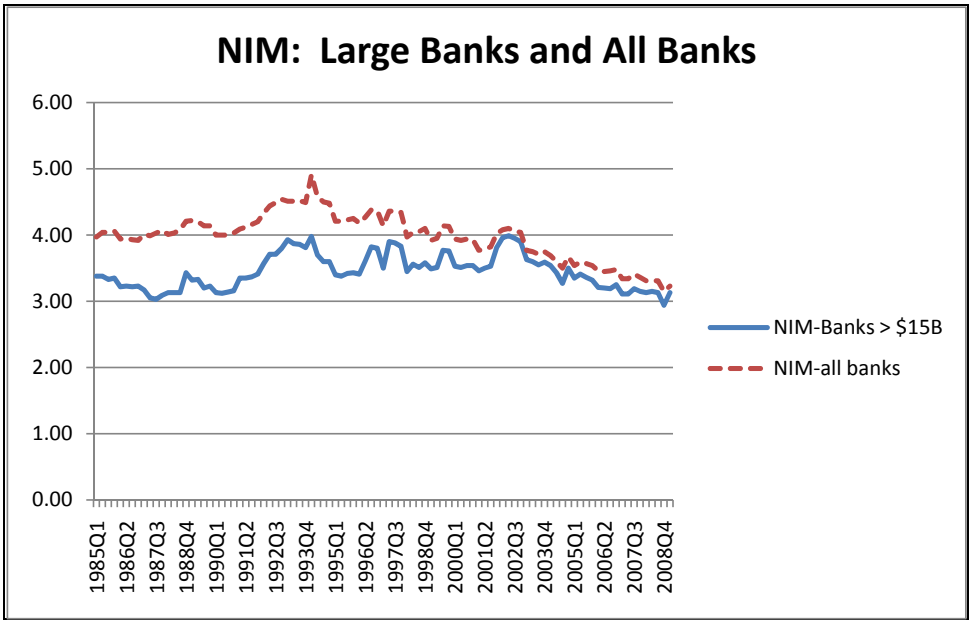

Table I
"All Bank" Results

$$R_t = \beta_0 + \beta_1 \Delta Delinq_t + \beta_2 \Delta NIM_t + \varepsilon_t$$

R_t: Value-weighted stock index returns, CRSP banks
(p-values in parentheses)

Time period	β_1 ΔDelinq *all loans, all banks*	β_2 ΔNIM *all banks*	n
2000/Q1-2009/Q1	-27.1197*** (0.0000257)	14.1278** (0.02897)	37
1985/Q2-1999/Q4	3.4699 (0.5089)	-7.0049 (0.5828)	59

*** Significant at the 1% level.
** Significant at the 5% level.

Table II
"Large Bank" Results

$$R_t = \beta_0 + \beta_1 \Delta Delinq_t + \beta_2 \Delta NIM_t + \varepsilon_t$$

R_t: Value-weighted stock index returns, CRSP banks
(p-values in parentheses)

Time period	β_1 ΔDelinq *all loans, largest 100 banks*	β_2 ΔNIM *banks > $15B*	n
2000/Q1-2009/Q1	-24.7395*** (0.0000577)	26.5544* (0.0720)	37
1985/Q2-1999/Q4	2.3919 (0.5367)	-1.2488 (0.9138)	59

***Significant at the 1% level.
**Significant at the 5% level.
*Significant at the 10% level.

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