

A Survey of the Ratio of Mortgage Assets to Total Assets and Its Relation to Regulation

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Abstract:

This paper aims to look at banks' portfolios, specifically their holdings of residential mortgage assets, to determine if regulation has any affect on the composition. We do this by looking for clear discontinuities at times where we have a change in regulation, whether it be a change in capital requirement or in auditing. These actions by banks', if they exist, could provide insight on how to improve the regulation that we have now as well as allow us to see which instruments affect mortgage holdings in particular. The reason for this focus would clearly be the mortgage crisis of 2008. Overall, this paper does not find any clear changes of mortgages held relative to total assets due to two specific legislative actions. This would imply that we might want to consider other ways to affect exposure of a banks' portfolio to any single asset.

Acknowledgements: I would like to thank foremost Ulrike Malmendier. With out her vast variety of research, I would have never been able to see all the possibilities that my thesis could take. I would also like to thank Prof. Roger Craine and Prof. Justin McCrary for inspiring this particular topic and spending the time to help me clear it up for myself.

Section 1: Introduction

The banking industry has recently come under scrutiny due to the financial crisis that has hit the world. What started as a downturn in the housing market in the US, quickly escalated into global economic slowdown. As a result, people are asking themselves why this happened and if there was something that could have been done to prevent it. One the idea that is consistently considered is whether or not “better” regulation could have prevented the crashing of the secondary market in mortgages in the first place.

One can see regulation of the banking industry as a meeting point between two fields: law and economics. It brings up the issue of whether or not the government should be stepping in to affect finance, and if so, to what degree. Ideally, as laissez fair economists, we would prefer for the industry to regulate itself, allowing entry and exit of banks, dependent on the success or failure of each bank. Due to the sensitive nature of money, however, there are positive externalities to ensuring stability in the industry. As a result, we end up with law entering the financial marketplace. The two main tools of regulation are auditing and setting capital requirement ratios. There have been models developed to try to examine which one is the best course of action in a given scenario. Each has their positive and negative qualities. Overall, this interplay of law and economics leads to unique tensions. And because this is on such a large scale, one can see the different motivations act in harmony as well as against each other. These two disciplines are a natural pair in this industry and seeing how one affects the other is one of the aims of this paper.

This paper specifically focuses on how regulation affects a given bank's holdings of mortgages according to their balance sheets, if at all. To do so, it looks at the balance sheets from thirty-three banks (or their holding companies, e.g., instead of Citibank, it looks at Citigroup) that span the past fifteen years as taken from MergentOnline.com. Some of these balance sheets had to be set aside, yielding a final sample of twenty-two major banks across the United States. A more detailed explanation of data selection can be found in Section 3. Using the information on the balance sheets, we are able to create a ratio to see what percentage of a bank's assets lie in mortgages and how that changes over time. Then we bring in regulation. Since the Basel Accord I has been in effect since 1988, while this sample starts in 1994, we cannot see if there is a link between the ratio of mortgage assets to total assets and changes in the capital requirement ratio. We can, however, look at other regulation changes due to legislation that has been passed during the past fifteen years that affects the industry (specifically: SOX and Gramm-Leach-Bliley Act). We also examine differences among banks to gain insight on their decision-making. That there are no dramatic changes of holdings in the vicinity of the time that these pieces of legislation came into law; as a result, one would have to consider that mortgage holdings do not contain all the information that is necessary to properly look at the effects of legislation, or regulation, on bank portfolios.

The paper is organized as follows. Section 2 is the literature review. Section 3 explains the data collection and the choices that were made in regards to the data. The second half of Section 3 includes the main analysis of the different effects of the pieces of legislature that came into being during the fifteen years. Section 4 concludes.

Section 2: Literature Review

The existing literature on regulation is both vast and variable. There is literature directly from the sources of regulation, like the FDIC (Federal Deposit Insurance Corporation), as well as pieces from professors around the world. Some are opinion pieces while others are models of regulation. This paper will use several key papers as representations of the different literature out there on bank regulation.

First, we should introduce how and what role regulation plays in the United States currently. Rose Marie Kushmeider's paper, "The U.S. Federal Financial Regulatory System: Restructuring Federal Bank Regulation" shall work as a tool to do so. Part of answering the question of whether or not the US's system of regulation is a desirable one is, if we could start a new one at the drop of a dime, would keep the current system; Kushmeider argues that, "most observers of the U.S. financial regulatory system would agree that if it did not already exist, no one would invent it" (Kushmeider, 1). Furthermore, she argues that too much overlap of jurisdictions exists. This not only has a cost due to decreasing overall efficiency of the system, it also impedes the possibility of improving said system. There is a historic precedent of distrust of centralization in the United States, which actually encourages the many agency set up of regulation.

After introducing the reader to the various agencies that exist in US's system, Kushmeider goes on to argue that the trend in the world right now is to reorganize one's regulatory system. She brings in two examples of how some countries have restructured their regulatory systems to increase efficiency and productivity. First, there is the United

Kingdom, which placed all of its regulatory powers under one organization: the Financial Services Authority (FSA) in 1997. This had dual effects: "...the U.K. government decided not only to consolidate all financial services supervision within one agency, but also move that function outside the central bank" (Kushmeider, 6). The significance of this is that the central bank is the entity that is responsible for effecting macroeconomic policy. By taking regulation outside of its jurisdiction, the government, to some degree, limits the amount of information the central bank has when making those decisions since information sharing across agencies is always a costly endeavor. The other example is Australia; it, too, consolidated the number of agencies that were responsible for regulation. A key difference was that Australia consolidated their system into two agencies: one is in charge of safety-and-soundness regulation while the other was focused on market integrity and consumer protection. The act of consolidating allows the two countries to fix some of the issues that we see otherwise, such as accountability problems due to overlap. On the other hand, putting regulation in the hands of one parent agency may not be the best way to go since a single regulator will have the ability to change policy quickly, and possibly, overly dramatically. This would add uncertainty to the market and, thus, make it less stable. Another possible issue with placing all the regulation in the hands of a single agency is the risk of "potential conflicts of interest between the conduct of monetary policy and supervision of banks" (Kushmeider, 12). Kushmeider continues with the example of an economic downturn, where "concerns about safety and soundness cause banks to be procyclical in their lending behavior while monetary policy is trying to be countercyclical" (13). She brings up other considerations,

such as the type of regulation one should employ, whether it be umbrella supervision or consolidated regulation, and the role that the central bank should play.

Lastly, from this paper, it is important to remind ourselves the goals of regulation i.e. why we even have a system for it in the first place. The first goal that Kushmeider lists is ensuring the safety and soundness of banking. She writes, “Operationally, this means that disruptions in the financial system should not have a significant effect on aggregate real economic activity” (Kushmeider, 14). The failure of one bank should not greatly affect the entire industry, and thus the overall stability of it is maintained. Second, regulation should play the role of increasing efficiency in the industry. Also, competition in the industry ensures that the consumer also enjoys the benefits of more efficient operations. Which brings us to the last goal of regulation – consumer protection. Since information between the suppliers of banking services and buyers of banking services is biased usually in favor of the banker, consumer protection plays the role of allowing the consumer to feel more secure in depositing his/her own money.

Kushmeider gives us a great overview of the uses of banking regulation, as well as different ways to implement it in the practical sense. She shows examples of where overhauling the old system brought improvement to the country as well as two different forms of doing it. Other authors on regulation take a more theoretical approach to their analysis. Instead of looking directly at what has already occurred, they look at what can occur when reality is modeled. Specifically, we would like to bring the reader’s attention to “Franchise Values, Regulatory Monitoring and Capital Requirements in Optimal Bank Regulation” by Thomas Barnebeck Andersen and Thomas Harr (*Journal of Emerging Market Finance*, 2008).

Let us take a closer look at their paper, using them as a representation of papers that prefer to look at regulation through a theoretical lens. Here the authors use a model that tries to capture both types of regulations' effects on franchise value. They assume a benevolent regulator that aims to maximize the profits of all banks plus the interest on deposits paid to depositors less the cost of regulation. The aim of their regulation policy is to have the individual bank to invest in the safer asset, where the bank does not run the risk of losing its franchise value, or shutting down. They found several interesting results. First, they “show that when competition in the banking industry increases...it is always optimal to decrease auditing” (Andersen and Harr, 83). They admit that this may be a counterintuitive result, but they support it by adding, “it derives from the fact that an increase in competition erodes franchise values” (Andersen and Harr, 84). Competition eats away at the franchise value since, with more banks, each bank becomes less unique to the industry as a whole. There a lot more choices and thus each individual brand would be less recognizable to the consumer. As a result, auditing would hold less of a threat to each bank because they have less to loose if it discovered that they are not acting prudentially. They also note that it one should see an increase in the capital requirement ratio after an increase in competition, to balance out the decrease in the effectiveness of auditing. Their second result is a bit more complex: “Our second result demonstrates that when the yield of the gambling [the riskier of the two that the bank can take] asset increases...the effectiveness of auditing increases...” (Andersen and Harr, 84). Let us take it one part at a time. The first part, where we consider the situation where the return of the riskier asset increases, we see that increasing auditing is the efficient response of the regulator. This makes sense because if there is an increase in the returns of the risky

asset, there is increased incentive for a bank to not follow the prudential strategy and instead invest in the risky one; the possible loss of its franchise is worth the higher gains. To alter these incentives, a regulator needs to make investing in the risky less profitable, accounting for the increased returns. We must not forget that if a bank is discovered to be invested in the risky asset, it loses its charter. By increasing auditing, the chance of a bank losing its charter increases and the prudent strategy, as a result, seems more attractive. Both of these results come from the authors' model. Using second derivatives, they analyze changes in either competition or returns on the riskier asset in relation to cheating.

Their results can be applied to the practical world of regulation with ease. For example, if we bring in mortgages into the picture, we see the secondary market from mortgage-backed assets. As the returns in the market increased, the assets themselves got more risky and less prudent. If a regulator was able to recognize the fact that the underlying asset was not as prudent as before, s/he could have reacted, theoretically, by increasing auditing of banks. Following this line of thinking, we could see real world applications of the Andersen and Harr paper.

Many other papers discuss bank regulation. We could look at the conclusion of Benston's and Kaufman's paper, entitled "The Appropriate Role of Bank Regulation," in an effort to answer the question of why bank regulation has to exist in the first place. They argue for an overall reduction, if not complete elimination of bank regulation, though they do concede, "only one economic justification for regulating banks – the reduction of the negative externalities from moral hazard and agency costs that accompany poorly structured government-provided deposit insurance" (Benston and

Kaufman, 695). Otherwise, they believe that the market should regulate banks and the financial industry as a whole. Another paper we would like to point out is Bernauer's and Koubi's "Taking Firms and Markets Seriously: A Study of Bank Behavior, Market Discipline, and Regulation." this paper looks at the fact that many banks are holding more than the required capital requirement ratio. It finds that there are positive externalities assumed not to be considered by the regulator. They write, "better-capitalized banks experienced lower borrowing costs" (Bernaur and Koubi, 17). This market force could explain why many banks hold more than what is required by the government. A possible takeaway is that a regulator should consider this externality when setting capital requirement ratios, recognizing that in this case market forces will work naturally with the regulation. Thus, there may be reason to set the capital requirement ratio slightly lower than without taking this externality into account. Lastly, we would like to bring Furfine's, "Evidence on the Response of US Banks to Changes in Capital Requirements" into the discussion. His main conclusion is that capital requirement ratios do in fact play a key role in the lending decisions of banks, a role that cannot be explained by "...a fall in loan demand [or] shocks to bank capital simultaneously..." (Furfine, 14). Thus, the level of the capital requirement ratio is a key factor in a given bank's decision-making process.

As we can see, all these papers play a significant role in the literature surrounding bank regulation. What this paper tries to add is a specific example. By looking at mortgage holdings over time, this paper tries to see if there is a real change in asset distribution; specifically, whether mortgage holdings are affected by changes in the legislation. As stated above, because the capital requirement ratio has been constant

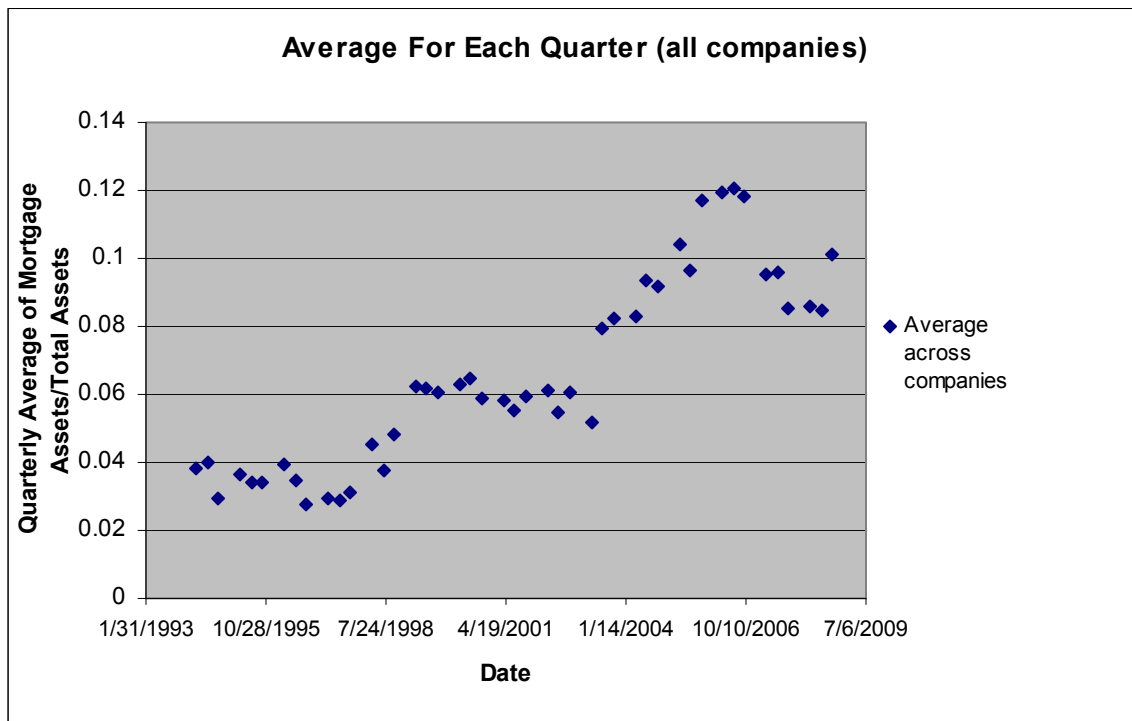
through out the test period, we can only consider the changes in legislation as points of interest.

Section 3: Data and Analysis

To start this section off, we need to explain where the data came from and how it was chosen and edited. First, this paper will be using data that was extracted from the balance sheets of different financial holding companies on MergentOnline.com, an electronic resource available to students in UC Berkeley. The bank and financial companies were selected by finding lists of major holding companies based on total assets. This list yielded a total of thirty-three original holding companies. Of these thirty-three, one, Regions Financial Corporation, experienced a merger in the middle of the fifteen-year period we have data for. A few others, specifically Etrade and Harris Bank Corp, either started later than the rest of the data set or ended earlier than the rest of the data set. Zion Bancoorporation, M and T Bancorp, and State Street Corporation, did not have any sort of mortgage assets, according to their balance sheets. HSBC Group Holdings only had annual data available; since all the rest were in terms of quarters, it appeared more beneficial to drop this one bank then to lessen the precision of the data set by restricting it to annual data. The one bank that we have concern with for omitting is Wells Fargo. The issue with their balance sheet is that there was no clear distinction on between commercial mortgages and residential mortgages. Because we want comparable measures, we were forced to let go of this bank. We ran into the same problem with Morgan Stanley's balance sheet – there was no clear way to separate out our measure of

interest. After removing the problem balance sheets from our data set, we resulted with twenty-two bank holding companies. And with these holding companies we will do our analysis.

Before we dive into the trends, however, we should consider some summary statistics. The key measure of interest is the ratio of mortgage assets to total assets held by each company.



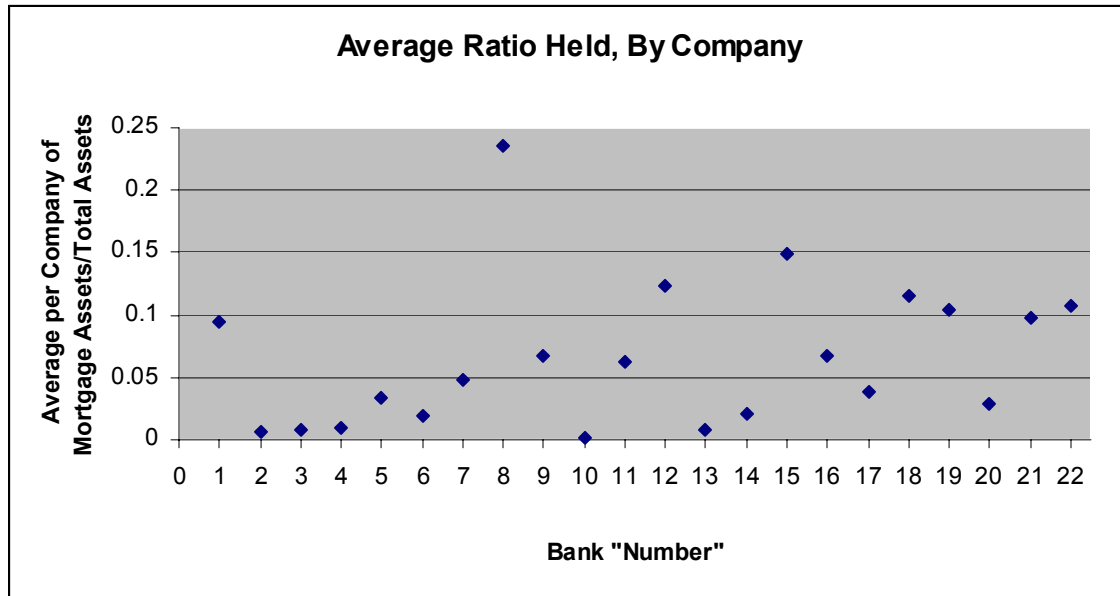
Summary Statistics For the Average For Each Quarter

Minimum of average	0.02764
1 st Quartile of average	0.03943
Median of average	0.06068
3 rd Quartile of average	0.08602
Maximum of average	0.12050
Average of the average	0.065804
Standard Deviation of average	0.02817

As we can see, there is a clear pattern in the average per quarter of the ratio of mortgage assets to total assets. We know, from the historic perspective, that there was a recession in the years 1995 to 1998. The scatter plot above reflects just this, with a beginning of a mortgage holdings being the lowest, on average, during these years. We also see a low during and after 9/11. Again, this follows our intuition that when the world was perceived as at a higher risk, banks were less willing to hold residential mortgages on their balance sheets. Also, there is a clear peak in 2006, specifically, in June 2006. At this time the average percentage of mortgage holdings was 12.0%. We can compare this to the lowest point on the scatter plot of 2.8%, reached in September of 1994; this is reflective of the down turn that the economy took right after. Overall, the average ratio of the entire sample is 6.6%. Since we can see that the median is about half a standard deviation larger than the mean, we can see that our distribution is skewed negatively. Our standard deviation is not very small (roughly 3%) and thus we can say there is variation in time of the amount of total assets held in mortgages. This supports the idea that mortgage holdings are responsive to the conditions of the bank, whether it is regulation or otherwise.

Now we can look at a scatter plot of the average of mortgage assets to total assets within the fifteen years, by company. First, the reader will find a key to navigate between company name and company number.

Company	Number				
		Fifth Third Bancorp	8	PNC	16
Bank of America	1	Huntington	9	Sovereign	17
BBT Corp	2	JpmorganChase	10	SunTrust	18
Capital one	3	KeyCorp	11	Union BanCal	19
Citigroup	4	Marshall and Tisley Corp	12	US Bancorp	20
Comerica	5	Merrill Lynch	13	Wachovia	21
Commerce Bancorp	6	National City Corp	14	WaMu	22
Countrywide	7	Northern Trust	15		



Summary Statistics For the Company Averages

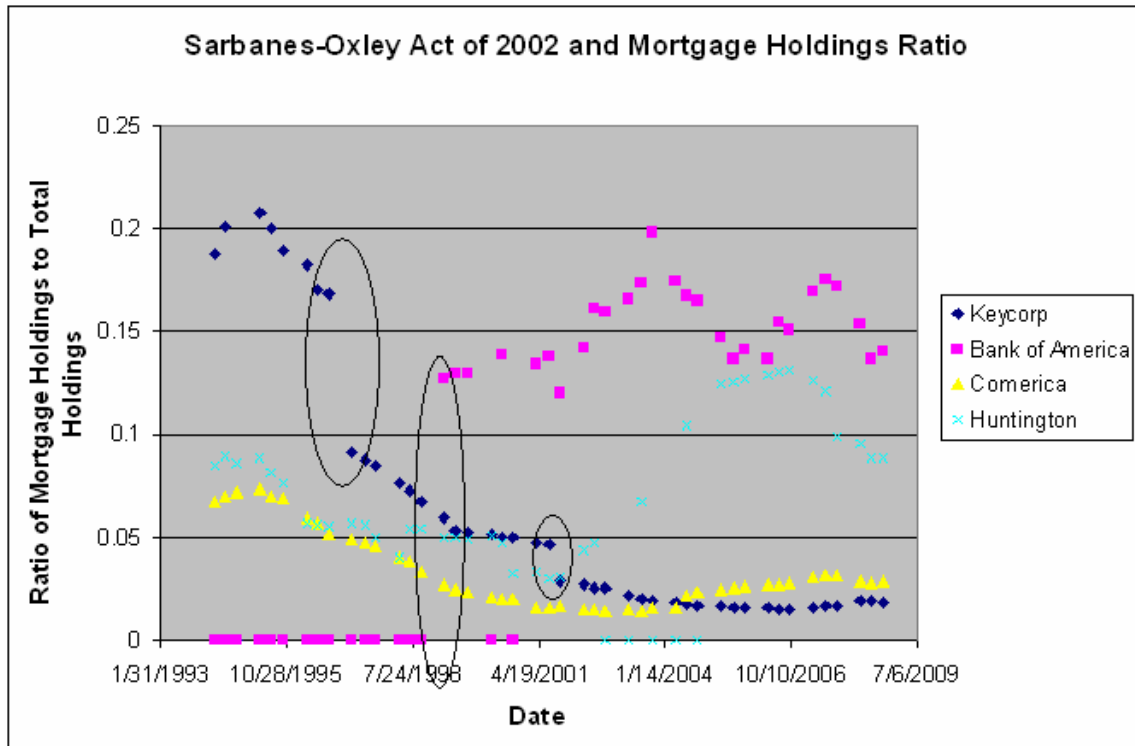
Minimum of Company	0.000874
1st Quartile of Company	0.019423
Median of Company	0.055003
3rd Quartile of Company	0.102986
Maximum of Company	0.236219
Average of the Company	0.065725
Standard Deviation of Company	0.058731

We can clearly see an outlier, at Bank Number 8, a.k.a. Countrywide, who has, on average, 23.6% of its total assets in mortgages. This is explained by the fact that Countrywide’s business model was that of mortgages. It is also highly likely to be related to the fact that Countrywide was destroyed by the mortgage crises. Another bank that did not survive the mortgage crisis of this past summer was WaMu. It also had relatively high averaged overtime percentage of its holding in mortgages; to be exact, in the period of fifteen years, on average, WaMu had 10.8% of its assets held as such. Other than these two interesting points, we see that, more or less, the distribution looks evenly spread out; if we ignore Countrywide, we do not see any significant outliers. The standard deviation

measure in this case does not reflect that visual observation due to the outlier that Countrywide is. While all the other points are clustered around the 6% mark, and Countrywide lying at 23%, this could easily increase the spread measure quite a bit.

Lastly, let us look at all the ratios at the individual level. Since this graph is so large, it is attached at the end and is titled “Ratio of Mortgage Holding to Total Assets for each Quarter.” Each bank has its own symbol on the graph, as one can see by the key to the right of the scatter plot itself. Because everyone reported their assets on the same day, all the points are vertically lined up exactly over a date. As we can see, some banks entered the mortgage market later than others, such as US Bancorp, while others exited the market in time, like KeyCorp. The clear outliers are Washington Mutual, holding over 40% of its assets in the form of mortgages, Wachovia, but only toward the recent years and Countrywide, for whom, as we mentioned above mortgages, whether commercial or residential were the main form of business. Interestingly, none of the above are still in existence today. As we know, this is associated with the subprime mortgage crisis of 2008. Please be aware, that when looking at the graph, due to the vertical overlap, some points may not be seen. Overall, we can see fluctuations among the holdings of mortgage assets relative to total assets. In some cases, we explain why such large discontinuities occur and at other times we can associate it with idiosyncratic variation.

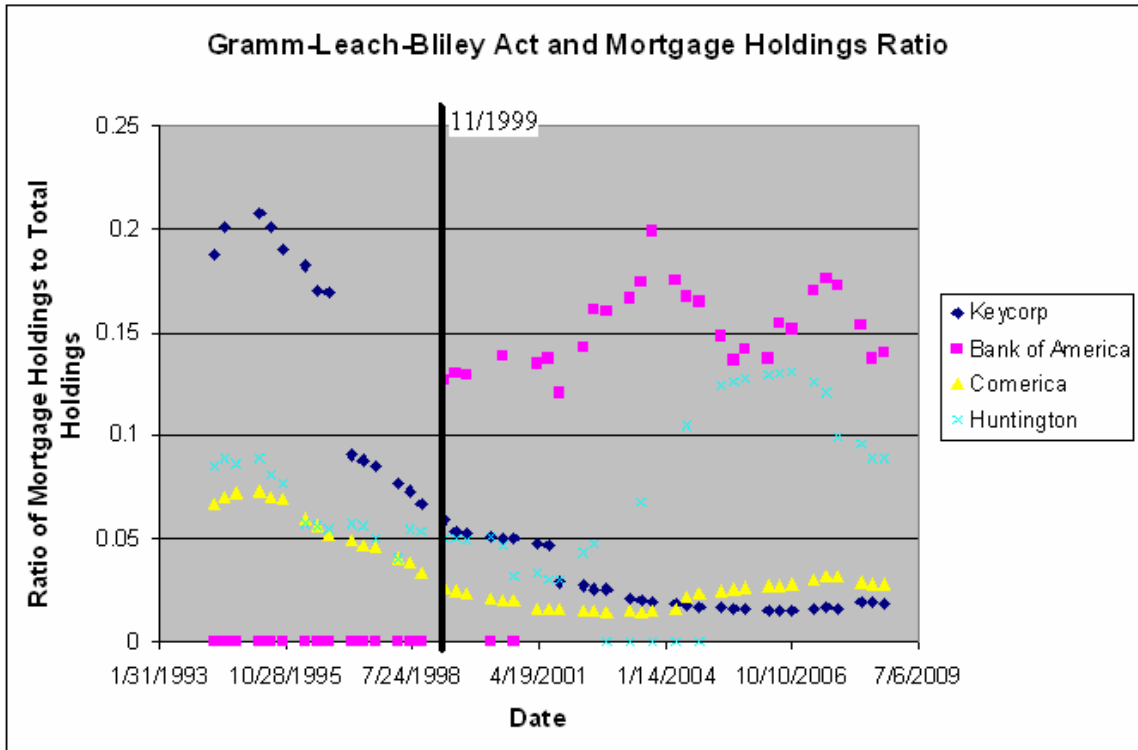
We have reached the point where we can consider specific banks and specific regulation measures. First, we would like to look at the four banks that we are using as representatives. The reason we chose them was because they had data that ran from start to finish of the sample time, or in the case of Bank of America, they were large. We turn our gaze now to the graph itself:



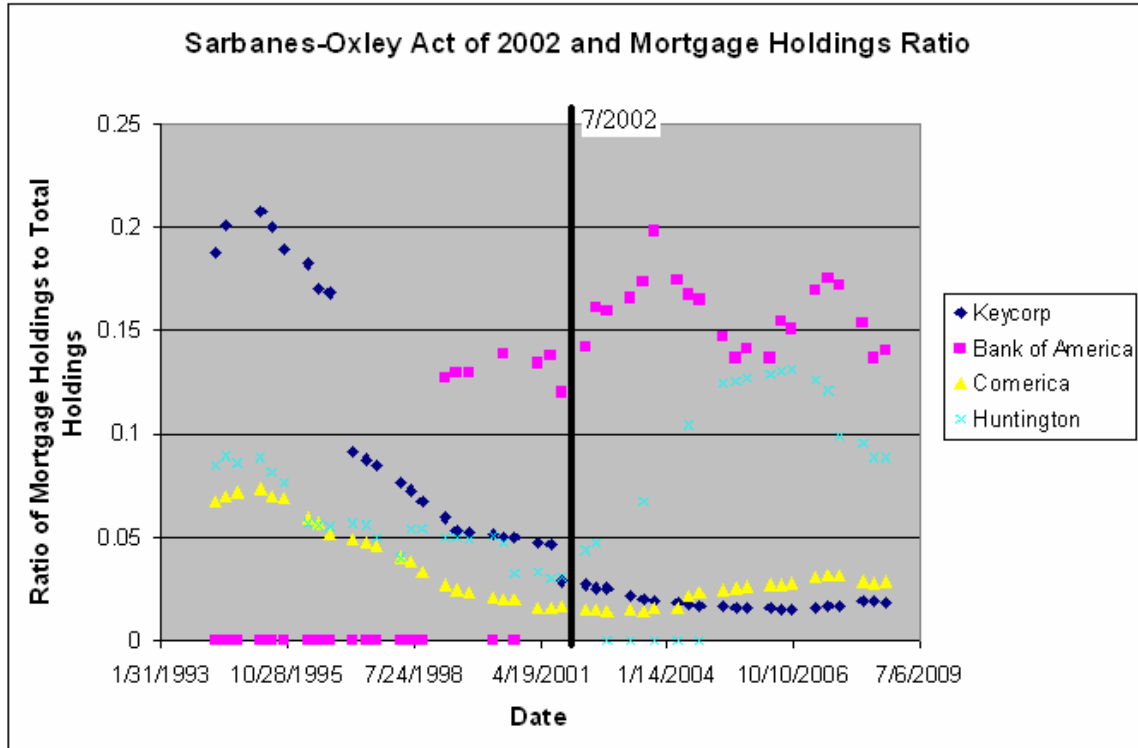
As the reader can see, we have highlighted three key areas. Starting at the very left, we can see a discontinuity for Keycorp regarding the percentage of their total assets held in mortgages. This can be explained by the fact that in September of 1997, Keycorp was approved to underwrite its assets. As a result, we see a decrease in some of its long term assets, more specifically the amount of mortgages they have on their balance sheets falls dramatically. A merger explains the second highlighted region. This will be explained below. Lastly, again with Keycorp, we have a highlighted region. We believe that this decrease in holding long-term assets on the balance sheet, such as mortgages, is due to 9/11, which occurred precisely in this time frame.

Before we blend the two ideas, however, we would like to introduce the pieces of legislation of interest. First, we would like to look at the Gramm-Leach-Bliley Act, which was enacted in November of 1999. Its main effect was allowing for competition between securities companies, insurance companies and banks. It repealed the part of the Glass-

Steagall Act of 1933 that restricted a bank from functioning both as a commercial and investment bank and as a bank and an insurer. One key example from the sample in this paper is Citigroup, which was created from the merger between Travelers Group, an insurance firm, and Citibank. Many critics of this act link it to the mortgage crisis of 2007. They believe that this deregulation legislation has led to commercial banks taking on too many risky assets in the recent years since the passing of the Act and thus we have resulted in this situation. Taking a closer look at a couple of the banks, we can determine if there was any visible change in mortgage holdings due to the enactment of Gramm-Leach-Bliley in 1999. In particular, let us examine if the holdings of Key Corp, Bank of America, Comerica and Huntington. As we can see, we do not see a change in bank holding by three of the banks. The fourth, however, had a large change in the vicinity of the November of 1999 date – Bank of America went from holding no mortgages to quite a bit. Further research reveals that Bank of America merged with NationsBank in 1998, both commercial banks. As a result, we see a jump in mortgage holdings with respect to total assets. This could be because what was called “Bank of America” before the merger was a subset of what became “Bank of America Corporation” and within this new corporation, there were mortgage holdings. Thus, we can conclude that the Gramm-Leach-Bliley Act did not have an effect on the mortgage holdings of these four representative banks.



Next, we would like to look at the same four banks, but instead focus on the Sarbanes-Oxley Act of 2002 (SOX). First, again, we shall sum it up: it was enacted in reaction to the plethora of accounting scandals (the major one being Enron) that created large losses for investors. It created new and/or stronger requirements for the public company boards to follow, as well as for the public accounting firms and management firms to conform to. We could relate this to our previous models of regulation via the idea of auditing. Instead of making sure that the financial company invests only in the safe asset, we are making sure that what the books say is identical to what is actually happening. And if it is not, there are repercussions. Of course, unlike bank auditing, this regulation affects all publicly traded firms, not just the financial industry. Still, via the auditing link, we can still look to see if there is a jump in mortgage assets being held when SOX was enacted. The graph looks like:



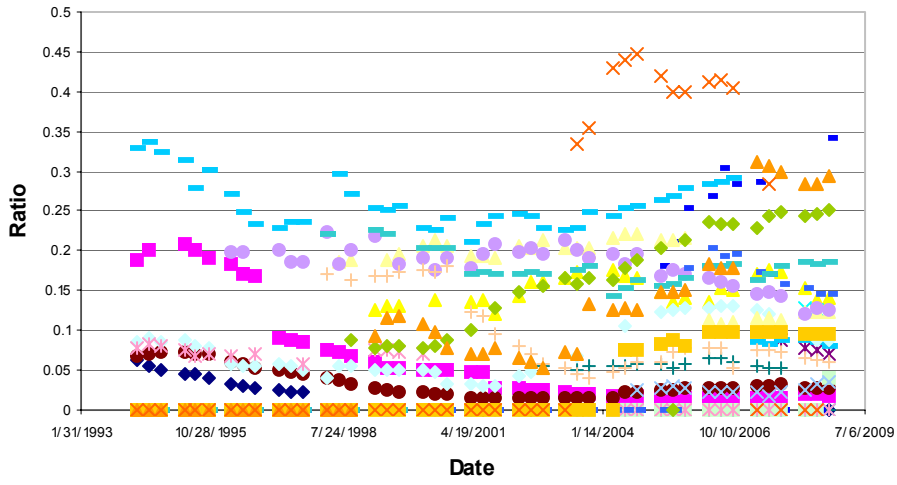
As we can see, most of the ratios look constant, and comparable to each other, on both sides of the line. In other words, we do not see a large discontinuity in quarter-to-quarter ratios of the mortgages near the activation date. As a result, we again conclude that the legislation did not directly affect the portfolio holdings, as viewed through mortgage holdings, of these four financial institutions.

Even though for both analyses we used only four banks, if we take them as representative of the industry, we could say that these types of legislative changes do not directly affect bank behavior. One could postulate that unless the legislation is directly aimed at banks and their portfolio composition, specifically mortgages, we would continually see just as a noisy and imprecise comparison as we see here near the boundary of when the legislation took effect.

Section 4: Conclusion

In conclusion, we find that the legislation that we looked at did not have a clear effect on the mortgage holdings of a given bank. There were no discontinuities at the time of enacting the legislation and any anomalies we did find were explained by other events in the bank's history. All this work, however, was not all for naught. We can see trends in how mortgage holdings changed over time with this data set. We can also see Washington Mutual, toward the end of its existence, holding almost half of its assets in the form of mortgages. We see this also with Wachovia, which also was bought out by another, and Union Bank of CA. Overall, we can see trends in holding but there does not seem to be any conclusive evidence to support the idea that regulation, via legislative changes, affects the percentage of total assets held as mortgages.

Ratio of Mortgage Holding to Total Assets for each Quarter



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