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DETERMINANTS OF LOAN AND LEASE LOSSES EXPERIENCED BY NORTH AMERICAN BANK HOLDING COMPANIES IN 2008

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Abstract

This study analyzes the determinants of loan and lease losses experienced by North American Bank Holding Companies in 2008, as a result of the credit crisis initially triggered by residential lending to high-risk borrowers. The performed analysis is based on financial information on Bank Holding Companies obtained from the Federal Reserve System and on macroeconomic data for the United States of America at national, regional and state levels. For both larger and smaller Bank Holding Companies, higher credit losses were associated with higher loan portfolio average spreads and higher shares of construction and land-related loans. The fact that the Bank Holding Company was audited by one of the "Big Four" auditing firms also proved to be relevant. Larger Bank Holding Companies' credit losses were also found to be influenced by lower gross domestic product growth rates, higher proportions of restructured loans and higher shares of foreign loans. Larger housing price declines, lower shares of foreign loans and lower provisioning ratios of delinquent loans also resulted in higher credit losses for smaller Bank Holding Companies.

This study also demonstrates that larger and listed Bank Holding Companies incurred in higher credit losses comparatively to smaller and unlisted Bank Holding Companies, respectively. Finally, it was found that Bank Holding Companies developing their activities in the West registered comparatively higher credit losses, while Bank Holding Companies developing their activities in the Northeast incurred in comparatively lower credit losses.

Keywords: Bank Holding Companies, credit losses, subprime crisis, credit crisis, United States of America, 2008

JEL Classification: G20

DETERMINANTES DAS PERDAS DE CRÉDITO INCORRIDAS PELAS *HOLDINGS* BANCÁRIAS NORTE-AMERICANAS EM 2008

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Resumo

Este estudo analisa os factores determinantes das perdas de crédito incorridas pelas *holdings* bancárias Norte-Americanas em 2008, como resultado da crise do mercado de crédito inicialmente despoletada pela concessão de crédito hipotecário de alto risco. A análise efectuada baseia-se em informação financeira das *holdings* bancárias obtida junto da Federal Reserve System e em dados macroeconómicos para os Estados Unidos da América, aos níveis nacional, regional e estatal. Conjuntamente para as *holdings* bancárias de maior e de menor dimensões, perdas de crédito mais elevadas estão associadas a carteiras de crédito com *spreads* médios mais altos e a maiores proporções de empréstimos para construção e financiamento de terrenos. O facto de a *holding* bancária ter sido auditada por uma das "*Big Four*" também se revelou relevante. As perdas de crédito das *holdings* bancárias de maior dimensão foram ainda influenciadas por menores taxas de crescimento do produto interno bruto, maiores pesos de empréstimos reestruturados e maiores proporções de empréstimos ao estrangeiro. Maiores quedas dos preços dos imóveis para habitação, menores pesos de empréstimos ao estrangeiro e menores níveis de provisionamento do crédito vencido implicaram também maiores perdas de crédito para as *holdings* bancárias de menor dimensão.

Este estudo demonstra ainda que as *holdings* bancárias de maior dimensão e as que são cotadas em bolsa incorreram em perdas de crédito mais elevadas face às *holdings* bancárias de menor dimensão e às que não são cotadas em bolsa, respectivamente. Finalmente, verificou-se que as *holdings* bancárias que desenvolvem as suas actividades no Oeste registaram perdas de crédito comparativamente mais elevadas, enquanto as *holdings* bancárias que desenvolvem as suas actividades no Nordeste incorreram em perdas de crédito comparativamente menores.

Palavras-chave: *holdings* bancárias, perdas de crédito, crise do mercado de *subprime*, crise do mercado de crédito, Estados Unidos da América, 2008

Classificação JEL: G20

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Finally, I also thank Joana, my girlfriend and true friend, for all we've shared so far, including concerns related to completing our dissertations.

Acronyms and Abbreviations

BEA	Bureau of Economic Analysis
BHC / BHCs	Bank Holding Company / Bank Holding Companies
CAGR	Compound Annual Growth Rate
ECB	European Central Bank
EUR	Euro, the single official currency of the European Union's Member States that make up the "euro area"
FED	Federal Reserve System
FHFA	Federal Housing Finance Agency
GBP	Great British Pound, the currency of the United Kingdom
GDP	Gross Domestic Product
HPI	Housing Price Index
IMF	International Monetary Fund
MBA	Mortgage Bankers Association
NIC	National Information Center
NDS	National Delinquency Survey
OLS	Ordinary Least Squares
OTS	Office of Thrift Supervision
UK	United Kingdom
USA	United States of America
USD	United States Dollar

Glossary

Billion. References to "billion" used in this study should be understood as one thousand million (i.e., 10^9).

Credit losses. The definition "credit losses" refers to losses faced by financial institutions in their loan portfolios. Several proxies can be used to measure credit losses, including proxies based on provisions for loan losses, net charge-offs and flow of new nonperforming loans.

Credit score. A credit score is a number/grade representing a person's creditworthiness or the likelihood of that person repaying his or her debts, being primarily based on a person's debt-paying history/debt profile and on a statistical analysis of similar borrowers in terms of credit risk profile.

Nonperforming loans. Generally, a loan is considered to be "nonperforming" if payments of interest and principal are past due by 90 days or more or, if those payments are less than 90 days overdue, there are reasons to doubt that owed amounts will be fully recovered.

Owners' equity in household real estate. Difference between (i) residential real estate assets' valuation and (ii) related total debt outstanding.

Prime loans. There isn't a standard definition for what are prime loans and subprime loans. Conceptually, the former may be defined as mortgage loans carrying lower credit risk, based on borrowers' creditworthiness and terms of mortgage contracts.

Subprime loans. As opposed to prime loans, subprime loans are mortgage loans carrying higher credit risk. Generally, subprime loans are granted to borrowers with a previous record of delinquency, a low credit score and high debt service-to-income ratios and as a consequence subprime loans are subject to higher interest rates.

Trillion. References to "trillion" used in this study should be understood as one million million (i.e., 10^{12}).

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1. Introduction

Back in the first semester of 2007, few could foresee that the subprime crisis could actually lead to a worldwide financial and economic crisis with an extent not experienced since the Great Depression. In June 2007, Ben Bernanke, FED's Chairman, said that, up to then, "the troubles in the subprime sector seemed unlikely to seriously spill over to the broader economy or the financial system"[1]. A month later, Bernanke stated that subprime-related losses could cost up to USD 100 billion which, in case he was correct, would indeed confirm that subprime-related losses had a rather limited impact in the financial system. However, the problems in the subprime sector turned out to be the prelude of a crisis that would have a dramatic impact in the North American financial system and which ultimately dragged the world economy into a severe crisis.

The financial crisis, which deepened in 2008, took its toll in financial institutions, mainly in the USA and Europe. The financial industry suffered significant losses related to its credit exposure and several large capital injections, in order to restore lost equity and to comply with regulatory requirements, occurred.

But, what caused such a crisis? The answer to this question lies in several factors: failures of financial supervision authorities, credit rating agencies' inability to correctly perceive the risks involved in complex financial instruments, economic agents' overconfidence and, of course, banks' lending practices.

This study will focus on the factors that determined North American BHCs' loan and lease losses in 2008. It will thus discuss the reasons behind the fact that credit loss experience was so dissimilar between North American BHCs, taking into consideration external and bank-specific factors.

The performed analysis is based on a sample comprising 349 BHCs, for which it was obtained historical financial data from the FED, based on regulatory filings that BHCs have to submit periodically[2]. This data forms the backbone of the bank-specific determinants of credit losses considered in this study and, since it was obtained from a single information source, it mitigates data comparability issues across all BHCs. The data used for external determinants of credit losses was collected from recognized North American public entities (BEA and FHFA) at national, regional and state levels.

[1] Speech of Ben Bernanke to the 2007 International Monetary Conference in Cape Town, South Africa (June 5th 2007).

[2] BHC data obtained through the NIC, which is a central repository of financial data and institution characteristics collected by the FED.

This study proceeds as follows. Section 2 provides some background information on the recent evolution of the North American credit and housing markets, as well as a brief synopsis of the most relevant events concerning the credit crisis of 2007-2009. Section 2 aims to promote a brief review of the housing market crisis, discussing its importance on the beginning of the financial and economic crisis. In Section 3, a literature review is presented. This section will perform a revision of the determinants of banks' credit loss experience presented in several relevant studies, separating between external determinants and bank-specific determinants of credit losses.

Section 4 presents the methodology and characterizes the data, describing the external and bank-specific factors considered as determinants of BHCs' credit losses. The sample of BHCs considered in this study is based on financial institutions classified, as of December 31st 2006, in peers 1, 2 or 3, in accordance with thresholds defined by the FED[3].

Section 5 presents and discusses the empirical results for the used BHCs' sample. A set of hypotheses tests with the purpose of assessing whether credit loss experience in 2008 was similar across predefined BHCs' groups is also performed.

Finally, in Section 6 the study's conclusions are presented. In addition, some suggestions for further investigation are also discussed. They are a consequence of some weakness of this study and/or some questions raised during the study's preparation.

[3] These thresholds are defined according to BHCs' total assets – Peer 1: total assets of USD 10 billion and over; Peer 2: total assets between USD 3 and 10 billion; Peer 3: total assets between USD 1 and 3 billion.

2. Evolution of the North American Credit and Housing Markets and the 2007-2009 Credit Crisis

2.1. Evolution of the North American Credit and Housing Markets

It is common to associate the 2007-2009 credit crisis with the preceding housing market boom, which became more pronounced after 1999. The low level of interest rates observed mainly after 2001, as a response to the economic slowdown induced by the burst of the technology stocks' bubble and the terrorist attacks of September 11th 2001, were a catalyst for housing prices appreciation, as North American families accessed to more affordable credit conditions[4]. According to the FHFA's HPI Purchase-Only Index[5], the North American housing market peaked in the second quarter of 2007, having registered a CAGR of 7.3% between 2001 and 2006, which was substantially above the inflation rate for that same period[6]. After having reached a peak in the second quarter of 2007, the North American housing market registered a substantial contraction, with prices decreasing 8.2% in 2008 (once again, according to the FHFA's HPI Purchase-Only Index). Based on data up to September 2009, the housing prices decline pace is decelerating in 2009[7]. However, the correction in the housing market may still not be over.

The Government of the USA implemented several measures to mitigate the effects of the financial and economic crisis on families and companies, as well as to promote the country's economic recovery. According to the BEA, in the third quarter of 2009 real GDP in the USA increased at an annual rate of 2.8%. This increase was preceded by periods of substantial economic contraction, namely the fourth quarter of 2008 and the first quarter of 2009, when real GDP registered an annual decrease of 5.5% and 6.6%, respectively.

[4] The homeownership rate for the USA increased steadily from 66.9% at the end of 1999 to 69.2% in the second quarter of 2004, when homeownership peaked in the USA. As of September 2009, the homeownership rate for the USA was at 67.6% (source: U.S. Census Bureau).

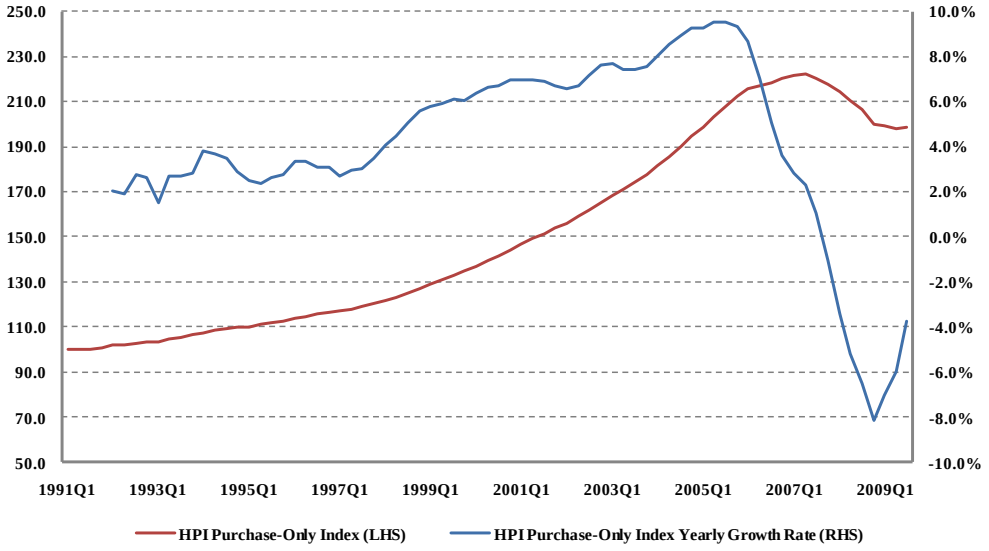
[5] The S&P/Case-Shiller Home Price Indices are also well-known among the housing market observers. In this study, it was decided to use the FHFA's HPI Purchase-Only Index mainly because apparently the latter has a broader geographic coverage than the S&P/Case-Shiller Home Price Indices. More detail on this matter can be found at http://www.fhfa.gov.

[6] Inflation rates for the USA between 2001 and 2006 ranged from a minimum of 1.6% to a maximum of 3.4% (source: Bureau of Labor Statistics, Consumer Price Index for all urban consumers).

[7] In the third quarter of 2009, the FHFA's HPI Purchase-Only Index registered a slight increase compared to the previous quarter (approximately 0.2%), but still down approximately 4% compared to price levels observed in the third quarter of 2008.

Figure 1 illustrates the evolution of the North American housing market prices, as measured by the FHFA's HPI Purchase-Only Index, for the period between 1991 and September 2009. Associated with the financial and economic crisis, housing market prices in the USA decreased to levels registered in the first quarter of 2005. As of September 2009, the accumulated depreciation of housing prices since the market peak is approximately 10.7% (based on FHFA's HPI Purchase-Only Index).

Figure 1. Evolution of the FHFA's HPI Purchase-Only Index (seasonally-adjusted). The left vertical axis illustrates the evolution of the HPI Purchase-Only Index, while the right vertical axis measures the trailing 12 month growth rate of the HPI Purchase-Only Index. Source: FHFA.



The housing market performance was significantly different across the USA. The states that registered a better performance during the housing market's boom, registered (in general) the most relevant downward movements afterwards. Table 1 resumes housing market performance by state. The states of Arizona, California, Florida and Nevada were particularly hit in the housing market downturn, as it can be seen in Table 1. For instance, in Nevada housing prices went down to levels not seen since the first quarter of 2002, while in California the financial and economic crisis has led prices to levels near those registered in the first quarter of 2003[8]. The housing market crisis was not so intense in the states of Iowa, Kansas, North Dakota, Oklahoma, South Dakota and Texas. In those states, housing prices were actually able to increase since June 2007

[8] Source: FHFA.

(period in which housing market prices peaked in the USA, as measured by the FHFA's HPI Purchase-Only Index).

Table 1. Housing market performance by state.
Source: Own elaboration based on FHFA's data.

	Peak			
State	Period	2001 to Peak Appreciation[1]	Depreciation After Peak[2]	Evolution After 2007Q2[3]
Alaska	2009Q1	68.2%	-5.4%	-3.1%
Alabama	2007Q3	40.5%	-3.7%	-3.6%
Arkansas	2007Q2	38.5%	-5.6%	-5.6%
Arizona	2006Q4	105.6%	-36.0%	-34.5%
California	2006Q1	126.6%	-40.0%	-35.8%
Colorado	2007Q1	29.0%	-3.0%	-2.8%
Connecticut	2007Q1	68.4%	-9.7%	-9.4%
District of Columbia	2007Q2	159.5%	-9.0%	-9.0%
Delaware	2007Q2	81.7%	-10.5%	-10.5%
Florida	2006Q4	119.1%	-36.5%	-35.2%
Georgia	2007Q2	32.3%	-10.0%	-10.0%
Hawaii	2007Q2	131.1%	-11.3%	-11.3%
Iowa	2007Q3	27.5%	-0.2%	0.3%
Idaho	2007Q3	70.7%	-12.2%	-11.7%
Illinois	2007Q1	47.2%	-9.6%	-8.9%
Indiana	2007Q2	18.8%	-4.8%	-4.8%
Kansas	2009Q3	31.3%	0.0%	0.7%
Kentucky	2007Q4	28.6%	-1.4%	-1.1%
Louisiana	2007Q3	51.0%	-2.5%	-1.5%
Massachusetts	2005Q4	62.1%	-12.3%	-7.9%
Maryland	2007Q1	119.7%	-15.9%	-15.8%
Maine	2007Q4	68.4%	-4.6%	-4.0%
Michigan	2005Q4	17.1%	-23.3%	-16.9%
Minnesota	2006Q2	47.4%	-12.7%	-12.1%
Missouri	2007Q1	37.2%	-5.7%	-5.5%
Mississippi	2007Q1	37.2%	-3.8%	-3.2%
Montana	2008Q1	79.7%	-4.5%	-2.5%
North Carolina	2008Q2	39.4%	-3.4%	-1.5%
North Dakota	2009Q2	58.1%	-2.0%	3.9%
Nebraska	2007Q2	23.6%	-2.3%	-2.3%
New Hampshire	2005Q4	63.3%	-13.5%	-11.2%
New Jersey	2006Q2	95.0%	-11.8%	-11.4%
New Mexico	2008Q1	67.9%	-7.3%	-6.9%
Nevada	2006Q1	114.0%	-49.2%	-46.6%
New York	2007Q2	73.3%	-4.6%	-4.6%
Ohio	2006Q1	18.3%	-8.0%	-7.0%
Oklahoma	2009Q3	37.3%	0.0%	4.2%
Oregon	2007Q2	84.3%	-14.6%	-14.6%
Pennsylvania	2007Q2	67.2%	-4.6%	-4.6%
Rhode Island	2006Q2	101.3%	-17.7%	-12.9%
South Carolina	2008Q1	38.5%	-2.2%	-2.0%
South Dakota	2009Q2	41.0%	-0.9%	3.0%
Tennessee	2007Q3	38.2%	-4.8%	-4.8%
Texas	2008Q3	33.9%	0.0%	1.8%
Utah	2007Q3	65.5%	-15.9%	-15.2%
Virginia	2007Q2	88.7%	-12.5%	-12.5%
Vermont	2007Q3	74.2%	-1.5%	-0.3%
Washington	2007Q3	80.6%	-12.7%	-12.4%
Wisconsin	2007Q2	37.4%	-4.7%	-4.7%
West Virginia	2008Q4	42.1%	-4.3%	-0.8%
Wyoming	2008Q1	82.3%	-4.9%	-3.4%

[1] Accumulated appreciation between the last quarter of 2000 and the period in which the peak was reached.

[2] Accumulated depreciation between the period in which the peak was reached and September 2009.

[3] Evolution between June 2007 (when the housing market peak for the USA was reached) and September 2009.

Similarly to the housing market, the USA also experienced a significant credit expansion in the years that preceded the financial and economic crisis, especially after 2001. Once again, this was mainly driven by lower interest rates. Between 1997 and 2006, total debt outstanding to nonfinancial sectors expanded at a CAGR of 7.7% (CAGR of 9.0% for the period 2001-2006)[9]. Credit to residential real estate enjoyed even more significant growth rates during that period, having total debt outstanding related to home mortgages registered a CAGR of 11.5% between 1997 and 2006 (CAGR of 13.0% for the period 2001-2006) [10].

From 2007 onwards, banks clearly changed their lending practices as a response to the developments of the financial and economic crisis, being particularly felt in the residential real estate sector. In fact, overall credit growth in the nonfinancial sectors experienced a relevant slowdown, while total debt outstanding related to home mortgages actually declined in 2008 and up to the third quarter of 2009.

Figures 2 and 3 illustrate the evolution of both total debt outstanding to nonfinancial sectors and total debt outstanding related to home mortgages, respectively, for the period between 1997 and the third quarter of 2009. Those figures show that credit lending has clearly decreased after 2007. It is interesting to note that credit growth in 2008 and 2009 (up to the third quarter) went significantly below the observed levels during the last recession (2001-2002), notwithstanding the efforts of the United States Government in trying to make more lending available to economic agents. The effects were particularly severe in the residential real estate sector, as it can be seen in Figure 3.

[9] Source: The FED, "Flow of Funds Accounts of the United States" (3rd quarter of 2009).
[10] Source: The FED, "Flow of Funds Accounts of the United States" (3rd quarter of 2009).

Figure 2. Evolution of total debt outstanding to nonfinancial sectors.
Source: The FED, "Flow of Funds Accounts of the United States" (3rd quarter of 2009).

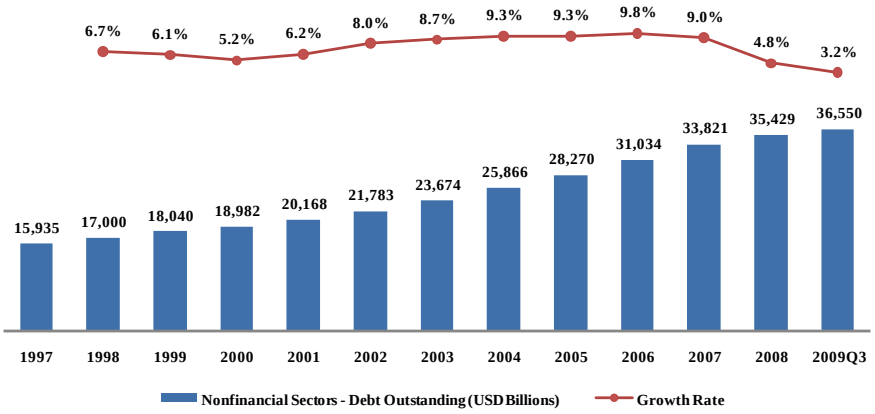
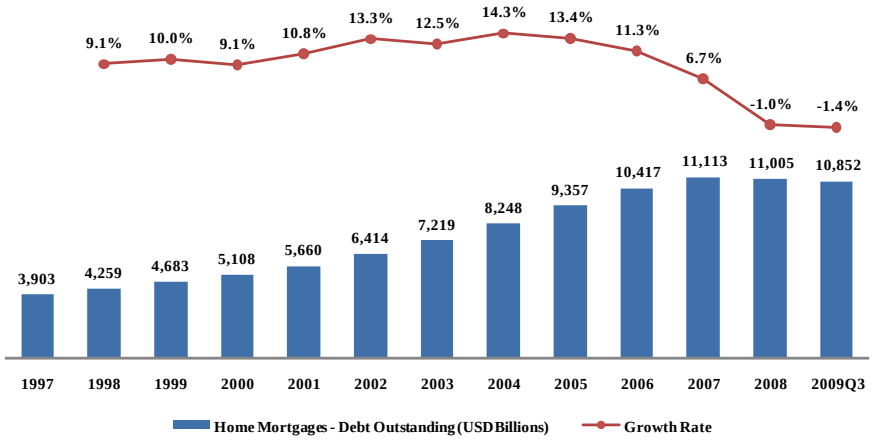
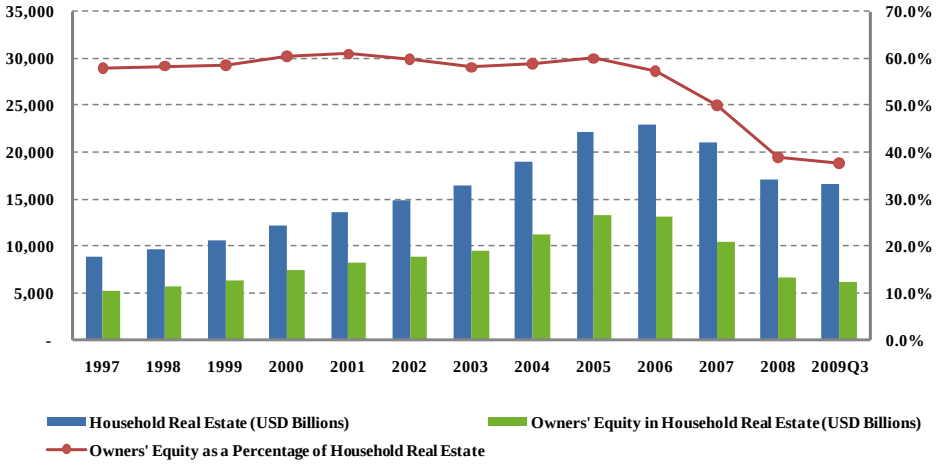


Figure 3. Evolution of total debt outstanding related to home mortgages.
Source: The FED, "Flow of Funds Accounts of the United States" (3rd quarter of 2009).



Housing prices' depreciation led to a considerable decrease of owners' equity in household real estate. Owners' equity, expressed as a percentage of household real estate, stood at relatively stable levels for the period 1997-2006 (average of 59.0%), registering, since then, a significant decrease to 37.6% as of September 2009. During the period between December 2006 and September 2009, total owners' equity in the USA has decreased by USD 6,904 billion (approximately 52.6%). Figure 4 depicts the evolution of owners' equity in household real estate for the period between 1997 and the third quarter of 2009.

Figure 4. Evolution of owners' equity in household real estate.
Source: The FED, "Flow of Funds Accounts of the United States" (3rd quarter of 2009).

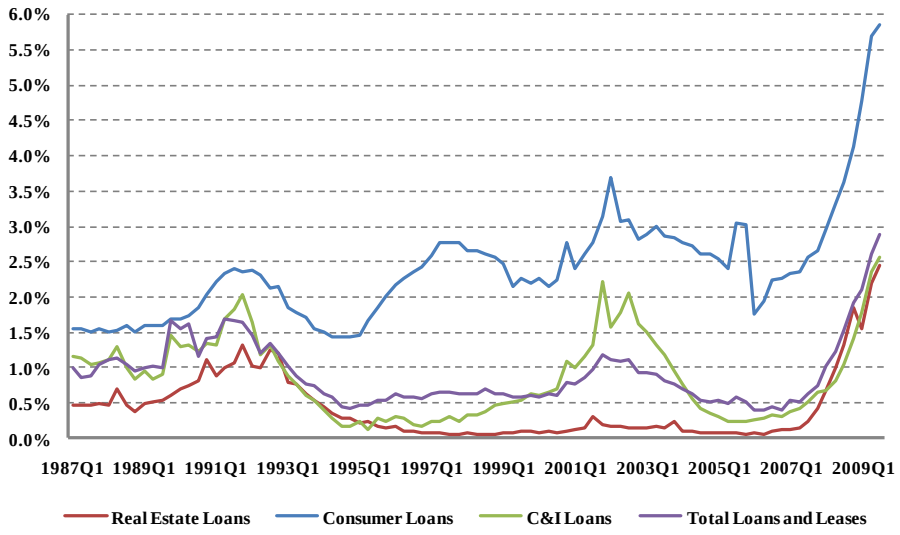


As in any other economic recession, banks' assets quality fell considerably. Charge-offs (loans removed from banks' balance sheets and charged against loan loss reserves) and delinquency rates (figure which accounts for loans facing repayment difficulties still registered in banks' balance sheets) increased dramatically, especially since the beginning of 2008. This fact illustrates that difficulties initially felt in the real estate sector rapidly spread to the remainder of the economy and to less riskier borrowers. Although the economy of the USA presented signs of recovery in the third quarter of 2009, banks still faced an increase in charge-offs and delinquency rates in that same period, in general to record levels for more than 20 years, according to data from the FED. Figures 5 and 6 depict the evolution of charge-off rates and delinquency rates, respectively, for the period between 1987 and September 2009.

Consumer loans were the most charged-off business segment by North American banks in the context of the 2007-2009 credit crisis. In the third quarter of 2009, it was registered an annualized net of recoveries charge-off rate of approximately 5.9% for consumer loans, well above remaining presented business segments in Figure 5. It is also interesting to note that for real estate loans the annualized charge-off rate in the third quarter of 2009 achieved a level (circa 2.4%) corresponding to almost the double of the worst charge-off level verified in past crises for the last 23 years. This is clearly symptomatic of this crisis' seriousness, since real estate loans, given their collaterals, typically are assets with relatively low charge-off rates.

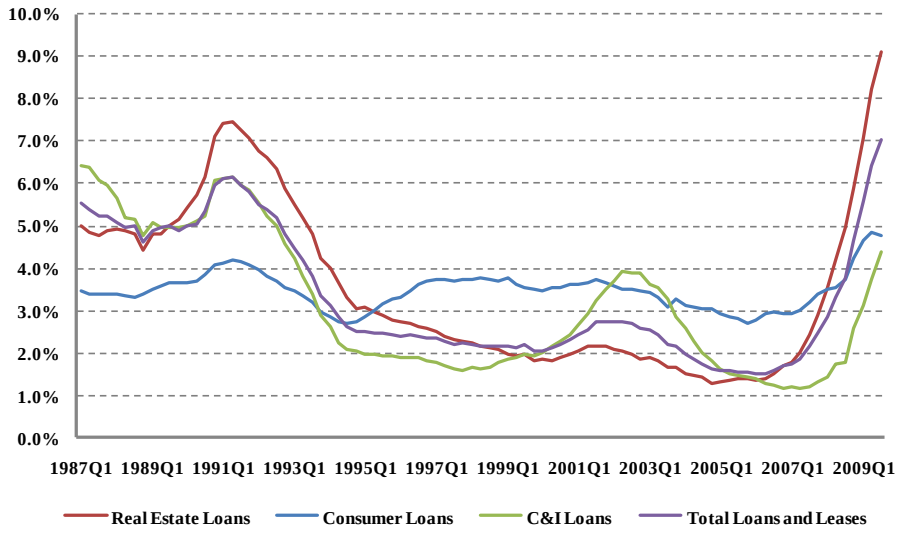
According to Figure 6, delinquency rates have also increased substantially, especially from the last quarter of 2007 onwards. With the exception of C&I loans[11], presented business segments achieved record levels for delinquency rates for more than 20 years. In order to better appreciate the impact of the 2007-2009 credit crisis in North American banks' assets quality, the average delinquency rate for total loans and leases between 1987 and September 2009 stood at approximately 3.3%, corresponding to less than half of the delinquency rate observed in the third quarter of 2009, which has reached to 7.0%. Even during the recession of 1990-1991, when the previous highest delinquency rate since 1987 was reached, total loans and leases' delinquency rate didn't surpass 6.2%.

Figure 5. Evolution of charge-off rates for insured United States-chartered commercial banks (seasonally-adjusted).
Charge-offs are measured net of recoveries as an annualized percentage of average loans. Source: The FED.



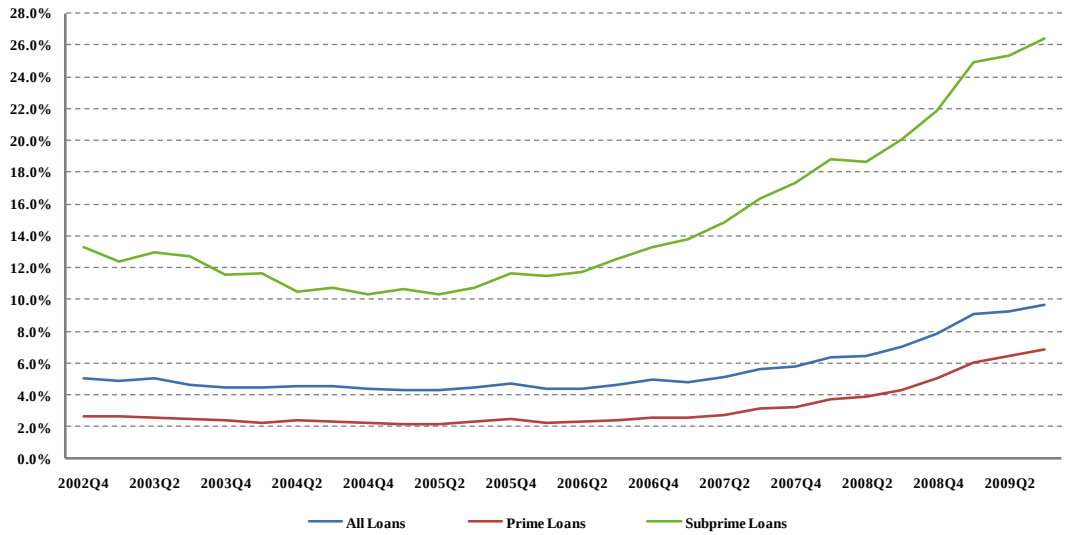
[11] The expression "C&I loans" stands for "Commercial and Industrial loans".

Figure 6. Evolution of delinquency rates for insured United States-chartered commercial banks (seasonally-adjusted).
Delinquency rates consider past due loans for thirty days or more and still accruing interest as well as nonaccruing loans, and are measured as a percentage of end-of-period loans. Source: The FED.



Focusing solely in mortgage loans, and based on MBA's NDS, it is clear that delinquency rates have increased steadily from the fourth quarter of 2007 onwards. Delinquency rates for subprime loans have risen to approximately 26.4% as of September 2009, while delinquency rates for prime loans have risen to circa 6.8% as of that same date. The credit crisis turned out to have such severe consequences that even prime loans' delinquency rates have almost tripled compared to the average levels registered for the period 2003-2006. Figure 7 illustrates the evolution of mortgage loans' delinquency rates for the period between the last quarter of 2002 and the third quarter of 2009.

Figure 7. Evolution of delinquency rates for mortgage loans (seasonally-adjusted). Delinquency rates consider past due loans for thirty days or more and are calculated as a percentage of the number of loans serviced (NDS reports do not collect information on the amounts of loans serviced). Source: MBA, NDS reports[12].



Not surprisingly, the states in which occurred the largest housing price declines were also generally the ones with the largest increases in delinquency rates. Table 2 presents the evolution of delinquency rates by state between June 2007 (peak for the North American housing prices) and September 2009. According to the performed analysis, delinquency rates in the states of Arizona and Nevada have more than tripled in the covered period, whilst in California it has almost tripled.

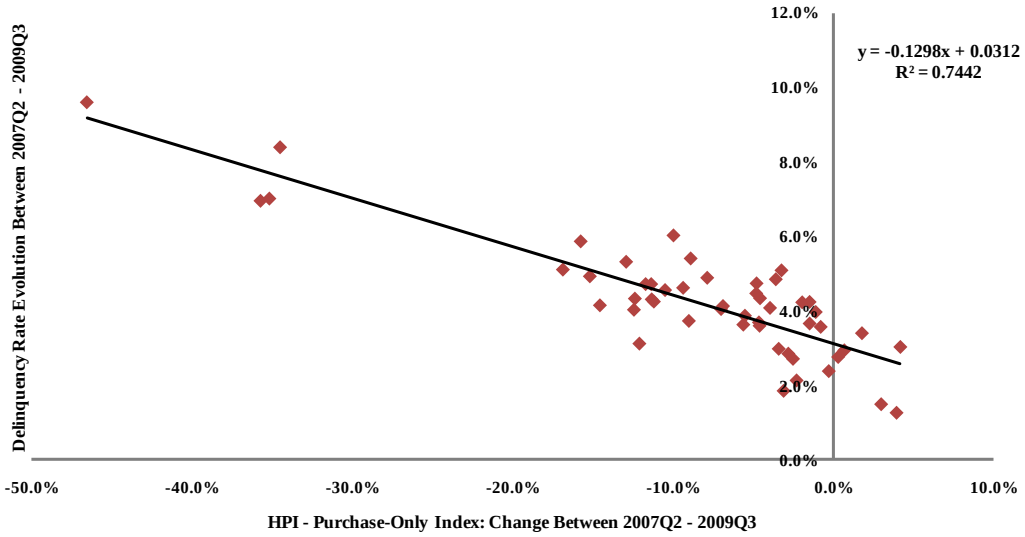
[12] NDS reports are estimated to cover approximately 85% of the outstanding first-lien residential mortgages in the USA.

Table 2. Evolution of delinquency rates for mortgage loans by state.
Delinquency rates consider past due loans for thirty days or more, and are calculated as a percentage of the number of loans serviced. Source: MBA, NDS reports.

	All Loans		Prime Loans		Subprime Loans	
State	2007Q2	2009Q3	2007Q2	2009Q3	2007Q2	2009Q3
Alaska	3.2%	5.1%	2.0%	3.4%	6.8%	11.7%
Alabama	6.2%	11.1%	3.5%	7.4%	16.8%	30.7%
Arkansas	5.4%	9.0%	2.8%	5.8%	15.6%	27.2%
Arizona	3.6%	11.9%	1.8%	9.4%	10.2%	27.1%
California	3.6%	10.5%	1.9%	8.8%	12.6%	26.0%
Colorado	3.9%	6.7%	1.9%	4.3%	11.0%	19.1%
Connecticut	4.1%	8.7%	2.1%	5.6%	14.2%	28.2%
District of Columbia	3.7%	7.4%	2.2%	5.6%	13.7%	22.9%
Delaware	4.0%	8.6%	2.4%	5.5%	12.7%	25.3%
Florida	5.2%	12.2%	2.9%	9.5%	14.0%	24.2%
Georgia	6.9%	12.9%	3.5%	8.5%	17.2%	29.3%
Hawaii	2.4%	6.7%	1.4%	4.9%	8.6%	21.1%
Iowa	4.2%	6.9%	2.6%	4.6%	14.5%	25.1%
Idaho	3.1%	7.8%	1.6%	5.7%	10.2%	23.5%
Illinois	5.1%	10.5%	2.5%	7.0%	15.3%	28.9%
Indiana	7.0%	11.8%	3.6%	7.2%	16.0%	28.7%
Kansas	4.6%	7.5%	2.5%	4.9%	13.1%	23.5%
Kentucky	5.7%	9.6%	3.0%	5.8%	15.2%	25.2%
Louisiana	7.3%	10.9%	4.0%	6.8%	17.7%	27.6%
Massachusetts	4.5%	9.3%	2.6%	6.7%	17.0%	32.2%
Maryland	4.2%	10.0%	2.1%	6.9%	13.8%	29.3%
Maine	4.7%	8.8%	2.6%	6.1%	14.6%	25.1%
Michigan	7.6%	12.6%	4.0%	8.3%	20.8%	33.5%
Minnesota	3.9%	7.0%	2.2%	5.2%	14.6%	23.8%
Missouri	5.6%	9.4%	2.8%	5.9%	17.2%	29.6%
Mississippi	9.3%	14.4%	4.9%	9.3%	21.5%	34.9%
Montana	2.6%	5.3%	1.6%	3.7%	9.9%	23.2%
North Carolina	5.5%	9.7%	3.0%	6.3%	15.5%	27.7%
North Dakota	2.8%	4.0%	1.9%	2.8%	10.9%	20.6%
Nebraska	4.3%	6.4%	2.5%	4.2%	13.1%	22.6%
New Hampshire	4.3%	8.5%	2.5%	6.1%	15.1%	29.0%
New Jersey	4.3%	9.0%	2.5%	6.4%	13.5%	25.3%
New Mexico	3.7%	7.8%	2.1%	5.5%	10.9%	22.8%
Nevada	4.4%	14.0%	2.4%	12.0%	11.6%	26.4%
New York	4.5%	8.8%	2.6%	5.9%	12.1%	25.6%
Ohio	6.7%	10.7%	3.5%	6.6%	15.8%	26.6%
Oklahoma	5.3%	8.4%	2.8%	5.1%	12.5%	22.3%
Oregon	2.4%	6.6%	1.4%	4.8%	8.7%	21.9%
Pennsylvania	5.6%	9.2%	3.0%	5.7%	15.0%	26.5%
Rhode Island	5.0%	10.3%	2.6%	7.5%	16.5%	30.2%
South Carolina	5.7%	9.9%	3.3%	6.8%	15.6%	26.9%
South Dakota	3.0%	4.5%	2.0%	2.9%	12.0%	21.0%
Tennessee	6.6%	11.1%	3.0%	6.6%	17.3%	30.4%
Texas	6.5%	9.8%	2.9%	5.3%	14.7%	25.2%
Utah	3.5%	8.4%	1.9%	6.0%	8.6%	23.6%
Virginia	3.7%	7.7%	1.9%	5.2%	13.4%	26.5%
Vermont	3.2%	5.5%	2.0%	4.1%	13.0%	24.3%
Washington	2.6%	6.9%	1.4%	4.8%	9.4%	25.1%
Wisconsin	4.0%	7.7%	2.2%	5.1%	14.7%	27.4%
West Virginia	6.8%	10.3%	4.5%	7.3%	18.1%	27.0%
Wyoming	2.5%	5.5%	1.4%	3.3%	9.4%	21.7%

The empirical relation between changes of housing prices and delinquency rates for mortgage loans across North American states is quite strong, as it can be seen in Figure 8. This figure depicts the evolution of both FHFA's HPI Purchase-Only Index and mortgage loans' delinquency rates between June 2007 and September 2009.

Figure 8. Evolution of housing prices and mortgage loans' delinquency rates across North American states between June 2007 and September 2009.
Each dot refers to a North American state. The equation and the R-squared displayed on the chart are for the linear regression between the change of the FHFA's HPI Purchase-Only Index and the evolution of mortgage loans' delinquency rate. Source: Own elaboration based on data provided by FHFA and MBA.



In this section it was presented a brief analysis of the recent evolution of the North American credit and housing markets, as well as the existing relation between housing prices' depreciation and the increase of mortgage loans' delinquency rates. In the next section it will be presented a brief synopsis of the most relevant facts concerning the credit crisis of 2007-2009.

2.2. The 2007-2009 Credit Crisis

The 2007-2009 credit crisis was triggered by high-risk borrowers' difficulties in meeting their mortgage loans repayments. General conviction during the first semester of 2007 was that difficulties experienced in the subprime sector would not seriously affect the broader economy. Nevertheless, mainly from the second semester of 2008 onwards, it rapidly spread to less riskier borrowers and to the remainder of the economy. The contagion was evident, worldwide and very fast. The purpose of this section is to present the main events of the 2007-2009 credit crisis. It was based on available public

information, with special focus on the analysis performed by the Federal Reserve Bank of St. Louis[13].

Time Period	Events
1st semester of 2007	• February 2007: HSBC announces that its credit losses for 2006 would be 20% higher than initially expected, as a result of housing market difficulties in the USA. This constituted the first major sign of difficulties in the North American subprime market. Also in February 2007, the Federal Home Loan Mortgage Corporation ("Freddie Mac") announces that it would cease buying riskier subprime mortgages; • April 2007: New Century Financial, one of the top subprime lenders in the USA, files for protection from creditors ("Chapter 11"); • June 2007: Bear Stearns suspends redemptions in two investment funds.
2nd semester of 2007	• August 2007: American Home Mortgage, once one of the Top 10 mortgage lenders in the USA, files for Chapter 11. European bank BNP Paribas suspends three investment funds worth EUR 2 billion, due to problems in the North American subprime market. As a result, the credit markets freeze, which leads the ECB to inject EUR 95 billion into the euro area banking system; • September 2007: The Bank of England is authorized to provide liquidity support for Northern Rock, UK's fifth-largest mortgage lender, after the bank's request for emergency financial support; • October 2007: Ben Bernanke warns housing market crisis will lower GDP growth forecasts for the USA in 2008; • December 2007: Joint action of the FED, the ECB and from the central banks of Canada, Switzerland and UK, with the purpose of stabilizing the credit markets.
1st semester of 2008	• January 2008: The World Bank projects global economic growth to slow down as a result of the credit crisis. Global stock markets fall

[13] "The Financial Crisis: A Timeline of Events and Policy Actions". Document available at http://timeline.stlouisfed.org/.

Time Period	Events
	sharply and as a response the FED lowers interest rates by 75 basis points, which was followed by an additional interest rate cut of 50 basis points only a few days later. Still in January 2008, Bank of America announces the acquisition of Countrywide Financial, a large North American lender that was facing financial difficulties since the beginning of the second semester of 2007; • February 2008: The UK's Government announces the nationalization of Northern Rock; • March 2008: JPMorgan Chase announces the acquisition of Bear Stearns, at that time the fifth-largest investment bank in the USA, in a deal backed by the Federal Reserve Bank of New York; • April 2008: The IMF estimates potential losses from the credit crisis to reach at least USD 945 billion and alerts to the growing contagion to other sectors.
2nd semester of 2008	• July 2008: The Government of the USA announces several measures to support Freddie Mac and the Federal National Mortgage Association ("Fannie Mae"). Still in July 2008, IndyMac Bank, F.S.B. is closed by the OTS; • September 2008: The FHFA places Fannie Mae and Freddie Mac in government conservatorship. Together, Fannie Mae and Freddie Mac own or guarantee approximately half of total residential mortgages outstanding in the USA. Also in September 2008, Lehman Brothers (at that time the fourth-largest investment bank in the USA) files for Chapter 11. This proved to be one of the most disruptive events of the 2007-2009 credit crisis, since financial and economic conditions considerably worsened afterwards. One day after Lehman Brothers had filed for Chapter 11, the Federal Reserve Board authorized the lending of up to USD 85 billion to the American International Group ("AIG") in return for a stake of 80% in the firm. Still in September 2008, the OTS closed Washington Mutual Bank, having JPMorgan Chase acquired its banking operations, and Citigroup bided for the banking operations of

Time Period	Events
	Wachovia Corporation. In Europe, Fortis was partially nationalized in a joint move by the Netherlands, Belgium and Luxembourg, Bradford & Bingley was nationalized by the UK's Government and Belgium, France and Luxembourg intervened in Dexia; • October 2008: Governments worldwide announce plans to intervene in the financial system. In the USA, the House of Representatives approves a USD 700 billion plan (known as the "Troubled Asset Relief Program"), with the purpose of acquiring toxic assets from financial institutions and which included a USD 250 billion facility to acquire stakes in North American banks in the form of preferred stock investments. Capital injections in banks worldwide continue: the UK's Government invests a total of GBP 37 billion in Royal Bank of Scotland, Lloyds TSB and HBOS. Iceland, one of the most severely hit countries by the credit crisis of 2007-2009, takes control of its banking system, by nationalizing the country's most relevant banks. Back to the USA, Wells Fargo acquires Wachovia Corporation, thus frustrating Citigroup's move in the end of the previous month, and PNC Financial Services Group Inc. acquires National City Corporation; • November 2008: The IMF approves a USD 16.4 billion loan to Ukraine and a USD 2.1 billion loan to Iceland. The Government of the USA injects USD 20 billion in Citigroup, after its shares lost more than 60% of its value in only one week. Additionally, the FED announces a USD 800 billion plan aimed to stabilize the financial system and to make more lending available to consumers, while the European Commission presents a EUR 200 billion economic recovery plan. Still in November 2008, the Federal Reserve Board approves the acquisition of Merrill Lynch by Bank of America; • December 2008: The FED cuts its key interest rate to a range of 0% to 0.25% (the lowest on record). The Government of the USA announces it will provide a total of USD 17.4 billion in loans to the national car industry and a few days later the Treasury Department

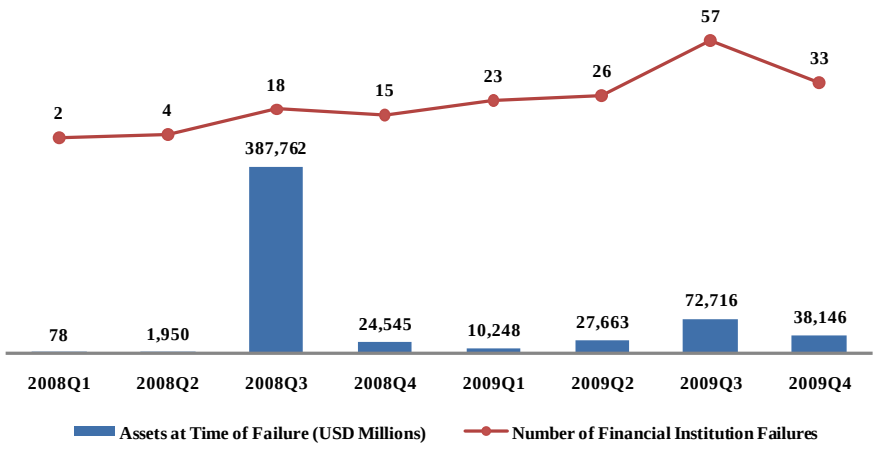
Time Period	Events
	intervenes in GMAC (the financial arm of General Motors).
1st semester of 2009	• January 2009: The Irish Government nationalizes the Anglo Irish Bank, while the Government of the USA invests a further USD 20 billion in Bank of America; • March 2009: The Government of the USA invests a further USD 30 billion in AIG and the FED announces that it will buy approximately USD 1.2 trillion worth of debt in order to stimulate lending and promote the country's economic recovery; • April 2009: G20 leaders reach an agreement, with measures worth USD 1.1 trillion, to help global economic recovery. The IMF raises its global estimate of losses related to the 2007-2009 credit crisis to USD 4 trillion and warns that banks worldwide may need USD 1.7 trillion in additional capital injections; • May 2009: The results of the stress tests performed on North American banks indicate that ten of the largest 19 banks need a total of approximately USD 75 billion in extra capital; • June 2009: General Motors files for Chapter 11. On a more positive tone, ten of the largest banks that received capital injections from the Government of the USA announce that they will be able to return the funds previously received. With the purpose of preventing future financial crises, the Government of the USA announces a reform of the banking system regulation.
2nd semester of 2009[14]	• July 2009: General Motors gets restructured and emerges from bankruptcy protection. The Government of the USA will own 61% of the Company; • August 2009: Fannie Mae requests an additional USD 10.7 billion from the Treasury Department; • November 2009: CIT Group, Inc. files for Chapter 11 and Fannie Mae requests an additional USD 15 billion from the Treasury Department.

[14] Up to November 30th 2009.

The 2007-2009 credit crisis had a severe and worldwide impact, both in terms of economic performance and financial system regulation. The banking system underwent a profound change – in the USA several banks went bankrupt or, otherwise, were acquired in order to avoid their collapse, the Government took control of several financial institutions and the investment banking industry ceased to operate and/or exist as it was long been known. Financial and economic conditions deteriorated mainly after Lehman Brothers' bankruptcy, which had a tremendous effect in economic agents' confidence. Governments worldwide announced large intervention plans in order to mitigate the effects of the financial and economic crisis, which consequently led to an escalation of their public deficits and of their public debt stocks.

Figure 9 depicts the evolution of financial institution failures in the USA between January 2008 and November 2009, considering commercial banks, thrifts and credit unions. The third quarter of 2008 is clearly influenced by the failure of the Washington Mutual Bank, which had total assets of approximately USD 353,070 million [15]. According to data obtained from iBanknet, between January 2008 and November 2009 it was registered a total of 178 financial institution failures, with corresponding total assets of USD 563,109 million. Figure 9 shows that financial institution failures increased substantially from the third quarter of 2008 onwards.

Figure 9. Evolution of financial institution failures in the USA between January 2008 and November 2009.
Figures include commercial banks, thrifts and credit unions. Source: iBanknet.



[15] This figure includes both Washington Mutual Bank (with total assets of USD 307,022 million) and Washington Mutual Bank FSB (with total assets of USD 46,048 million).

3. Literature Review

The determinants of credit losses used in its empirical modeling can be generally classified into two major classes – external and bank-specific factors. External factors are mainly related to economic indicators, such as GDP growth and changes in the unemployment rate, while bank-specific factors used to model credit losses include net interest margin, cost-to-income ratio and loan portfolio growth. Researchers tend to use both external and bank-specific factors as determinants of credit losses, based on the assumption that each bank's performance is dependent of intrinsic factors, but also of potential systematic issues arising from macroeconomic conditions.

3.1. External Determinants of Credit Losses

Hess, Grimes and Holmes (2008a) used GDP growth and both the level and change of unemployment rate as external macroeconomic factors to model credit losses of Australasian banks for the period between 1980 and 2005. While all factors did have the expected effects on banks' credit losses with a lag of one year (i.e., banks' credit losses increased with lower GDP growth, with higher levels of unemployment rates and positive changes in unemployment rates), they have concluded that the unemployment rate level was the most relevant external determinant of Australasian banks' credit losses. GDP growth and change of unemployment rate were highly negatively correlated and as a consequence those variables weren't included jointly in the same regression. The authors also used as external determinants of Australasian banks' credit losses the return on the national share index, changes in the housing price index and changes in the consumer price index[16]. The first two variables were found to have a negative impact on banks' credit losses, i.e., higher returns on the national share index and increases in the housing price index were associated with lower credit losses. Additionally, the return on the national share index had a greater explanatory power of Australasian banks' credit losses than changes in the housing price index. Although with limited significance, changes in the consumer price index were found to have a positive association with credit losses, having estimation results also shown that the

[16] The return on the national share index and changes in the housing price index were used as proxies for asset price shocks.

effects of this external factor tended to increase in time (i.e., contemporaneous changes had a reduced impact on credit losses, but it tended to increase with longer lags).

GDP growth and change of the unemployment rate were also used by Głogowski (2008) as external determinants of Polish banks' credit losses for the period between 1997 and 2006, having been concluded that those factors had the expected effects on credit losses. Additionally, the author analyzed if Polish banks' credit losses could also be influenced by adverse changes in the exchange rate, due to associated higher costs of loan repayments to households[17]. It was concluded that changes in the exchange rate didn't influence credit losses, even when it is taken into consideration each bank's share of foreign exchange loans. Głogowski (2008) also used as external determinants real interest rates and the employment level, having found evidence that an increase of the former and a decrease of the latter were associated with higher credit losses.

Quagliariello (2004) used static and dynamic panel models in order to study Italian banks for the period between 1985 and 2002, in terms of loan loss provisions and flow of new nonperforming loans. The author found that Italian banks tend to reflect smaller credit losses during phases of economic expansion, but still GDP growth is only significant if lagged by one and two years (being the latter's coefficient larger), thus suggesting that economic cyclical impacts tend to be delayed. A negative association between credit losses and unemployment rate changes was found by the author, suggesting that an increase of the unemployment rate would result in lower credit losses. This finding was unexpected and according to the author a possible explanation for such could be a potential overlapping between unemployment rate changes and GDP growth in what concerns to the capture of the business cycles' effects on credit losses.

Quagliariello (2004) also used as external determinants of credit losses interest rates on long term Treasury bonds, stock market's level of appreciation or depreciation and the spread between loans and deposits' interest rates for the Italian banking system. It was found a negative association between credit losses and long term interest rates of Treasury bonds, thus suggesting that this variable is likely to be a proxy for the business cycle, since interest rates are normally higher in phases of economic expansion, when credit losses are typically lower[18]. The stock market's level of appreciation or

[17] Polish banks have a significant share of foreign exchange loans to households, so the author analyzed the potential impact related to that fact.

[18] Higher interest rates can also implicate increased difficulties for borrowers to meet their obligations, and as a consequence, higher credit losses, for which reason the author initially considered the expected sign of this variable to be ambiguous.

depreciation was used as a proxy for financial markets' conditions. The author found a "boom and bust pattern", which means that a continued upward market phase precedes a steep decline of asset prices. Accordingly, the author found different signs for the lagged and the contemporaneous coefficients (the former assumed a negative sign while the latter had a positive one). Lagged interest rate spreads between loans and deposits had a positive association with credit losses, implying that larger spreads between loans and deposits are symptomatic of increased default risk (and thus of higher credit losses) and/or anticipate economic cyclical downturns. It is worth mentioning that, as stated before, this variable was calculated for the Italian banking system and therefore the used methodology doesn't consider each bank's specific conditions. Quagliariello (2004) used exactly the same determinants to study the flow of new nonperforming loans, having found evidence of significant positive associations between the dependent variable and interest rates on long term Treasury bonds and unemployment rate changes. Estimation results also demonstrated that the flow of new nonperforming loans had significant negative associations with GDP growth and interest rate spreads between loans and deposits.

The determinants of credit losses were also studied by Pain (2003), for a sample of UK's commercial and mortgage banks for the period between 1978 and 2000. It was found evidence of a negative association between GDP growth (both domestic and world GDP growth for commercial banks and domestic GDP growth only for mortgage banks) and credit losses, while the unemployment rate was found to be not significant. Real interest rates were found to have a positive association with credit losses, thus in accordance with Głogowski's (2008) conclusions. Influence on credit losses of capital and income gearing in the household and corporate sectors were also studied, having these factors found to be not significant[19]. The author also tested the statistical significance of asset price levels (foreign exchange rates, equity prices and real estate prices), having those variables also proved to be not significant.

In order to model nonperforming loans of Spanish banks for the period between 1984 and 2002, Jiménez and Saurina (2006) used as external determinants of nonperforming loans[20] GDP growth and real interest rates. The authors found a negative

[19] The author obtained evidence that if capital and income gearing in the household and corporate sectors were to be significant, then GDP growth and real interest rates would become not statistically significant.
[20] Although this study is focused on the determinants of credit losses, there's a strong relation between the increase of nonperforming loans and the increase of credit losses, for which reason it were also reviewed studies related to determinants of nonperforming loans.

influence of GDP growth and a positive effect of real interest rates (i.e., the stock of nonperforming loans increases with lower GDP growth and higher real interest rates).

Salas and Saurina (2002) used panel data to analyze the determinants of nonperforming loans of Spanish commercial and savings banks for the period between 1985 and 1997. The authors found a significant negative association between GDP growth rate (both contemporaneous and one-year lagged coefficients) and nonperforming loans. It was also used as external determinants of the dependent variable the families' indebtedness ratio (as measured by families' total liabilities over GDP) and firms' debt-to-equity ratio (as measured by firms' total liabilities over their respective market values). Both variables were found to be significant only for savings banks and their impact on nonperforming loans was dissimilar – the families' indebtedness ratio had a negative influence on nonperforming loans, while the firms' debt-to-equity ratio had a positive effect on the dependent variable. The authors expected both variables' coefficients to be positive and therefore the negative sign for the families' indebtedness ratio was somewhat difficult to interpret. The authors suggested that it could be due to the fact that families' debt is normalized by GDP and as a consequence it could be capturing the effects of the economic cycle. Finally, it was introduced a dummy variable with the purpose of analyzing the impact of regulatory changes introduced in 1988[21]. As expected by the authors, it was found evidence of a positive association between this variable and nonperforming loans (which was tested for savings banks only).

Credit loss experience was also studied by Sinkey and Greenawalt (1991), considering a sample of 154 North American commercial banks for the period between 1984 and 1987. Two model specifications were considered by the authors – a model with a broad definition of credit losses (which considered as credit losses the sum of net charge-offs and nonperforming loans) and a model with a narrower definition of credit losses (which considered as credit losses net charge-offs only).

Only one external determinant of credit losses was used by Sinkey and Greenawalt (1991) – each bank's location, in order to account for economic differences across regions. The analysis was performed using dummy variables, having the authors concluded for the existence of significant credit loss differences for banks of two

[21] Spanish central bank's regulation 22/1987 introduced a more rigorous definition of nonperforming loans, which had particular impact on savings banks, since collateralized overdue loans (including loans collateralized by mortgages) also became eligible as a nonperforming loan. Traditionally, mortgage loans were the most relevant business segment for Spanish savings banks.

regions of the USA in comparison to money-center banks for the model with a broad definition of credit losses (Southwest banks had higher credit losses in comparison to money-center banks, while Midwest banks' credit losses were lower). For the model with a narrower definition of credit losses, estimation results revealed significant credit loss differences between money-center banks and Southwest banks only.

3.2. Bank-Specific Determinants of Credit Losses

As bank-specific determinants of credit losses, Hess, Grimes and Holmes (2008a) considered each bank's share of total private sector loans, pricing of risks as measured by net interest margins, bank assets' growth rate, cost-to-income ratio and earnings before taxes and provisions (the latter variable was used as a proxy to study banks' potential income smoothing practices). It was found a positive association between banks' sizes (as measured by each bank's share of total private sector loans) and credit losses, thus indicating higher credit losses for larger banks. Nevertheless, the coefficient of this variable was generally significant only for the full sample of Australasian banks, i.e., for the country sub-samples this variable tended to be not significant.

Higher net interest margins were found to have a negative association with credit losses for the current and the two-year lagged terms, although generally not a significant one, since the two-year lagged term was the only one to be statistically significant, and only for the full sample of Australasian Banks (i.e., for the country sub-samples it proved to be not significant, thus demonstrating that net interest margins seemed to have little explanatory power). Bank assets' growth rates tended to be statistically significant only for lagged terms (generally, for lags of two or more years), having the authors found a positive association between lagged terms of this variable and credit losses (current terms' coefficients of bank assets' growth rates were negative, though not significant). Cost-to-income ratio was used as a cost efficiency proxy. It was found a significant positive association between credit losses and banks' current cost-to-income ratios and negative coefficients for cost-to-income ratios' lagged terms (although the latter were generally not significant). Therefore the authors concluded that high and increasing cost-to-income ratios were associated with higher credit losses[22].

[22] This conclusion is in accordance to one of the findings of Berger and DeYoung (1997), who used Granger-causality techniques and found that an increase in cost efficiency precedes a reduction in the stock of nonperforming loans.

Concerning earnings before taxes and provisions, Hess, Grimes and Holmes (2008a) found evidence of an income smoothing pattern, given the positive association between the current terms of this variable and credit losses. Additionally, the lagged terms' coefficients of earnings before taxes and provisions tended to be negative and frequently significant, which may indicate that credit losses may be recognized later in case of low earnings in a particular year[23].

In his study, Głogowski (2008) has used as bank-specific determinants of credit losses in his model final specifications each bank's capital adequacy ratio's deviation from sector median, the share of housing loans in loans to households, the share of loans to households in total loans to the nonfinancial sector, loan growth rate's deviation from sector mean and dummy variables to account for each bank's business profile, seasonality and regulatory changes adopted in 2004 and 2005[24]. It was found that higher credit losses were associated to banks with lower capital levels (although its influence proved to be significant only for short time lags). This variable was used in order to test the moral hazard hypothesis, i.e., the possibility that banks with lower capital ratios may lend to lower creditworthiness borrowers with the purpose of increasing returns in the short term, although usually at the expense of their loan portfolios' credit risk profile.

Głogowski (2008) also concluded that banks with higher shares of loans to households were the ones to present higher credit losses, which was unexpected, especially because studies performed in developed countries tend to demonstrate that loans to households are, in general, less risky than corporate loans. His finding can nevertheless be explained by the share of housing loans in loans to households, which is significantly higher, for instance, in euro area countries in comparison to Poland. The author also found evidence of a negative association between the share of housing loans in loans to households and credit losses, which indicates that housing loans are relatively less risky assets. Banks with higher loan growth rates (compared to the sector mean) were found to have higher credit losses, while the banks' business profile proved

[23] Evidence of provisions for credit losses being used to stabilize banks' net income was also found by other authors, including Arpa, Giulini, Ittner and Pauer (2001), Bikker and Hu (2002), Bikker and Metzemakers (2003), Cavallo and Majnoni (2001), Hasan and Wall (2003) and Quagliariello (2004). In contrast, Ahmed, Takeda and Thomas (1999) didn't find a statistically significant evidence of provisions for credit losses being used as an income smoothing technique.

[24] In 2004, there was a change in the regulatory loan classification rules in Poland (which resulted in "softer" rules and, subsequently, allowed for a decrease of banks' ratios of adversely classified loans), while in 2005 some of the Polish banks adopted for the first time the International Financial Reporting Standards for the preparation of their financial statements.

to have minor impact on credit losses[25]. Finally, the effects of regulatory changes were considered to be uncertain, given that the statistical significance of the respective dummy variables tended to vary between model specifications.

Quagliariello (2004) used as bank-specific determinants of credit losses each bank's performing loans' growth rate, the return on assets, the stock of nonperforming loans and the flow of new nonperforming loans. It was found a negative association between credit losses and performing loans' growth rate, thus diverging from conclusions of Głogowski (2008) on this matter. Quagliariello (2004) suggests that higher loan growth rates should not be immediately understood as a sign of upcoming higher credit losses, since credit growth may result from both demand and supply factors. Thus, Quagliariello (2004) concludes, it is not straightforward that banks registering higher loan growth rates are necessarily accepting lower creditworthiness borrowers. The author re-estimated his model using the difference between each bank's loan growth rate and the average loan growth rate for the Italian banking system, and the resulting coefficient still remained negative. Comparing to other researchers' results, a possible explanation for the author's conclusions may be the fact that he used only a one-year lagged loan growth rate coefficient, which eventually did not allow for sufficient "time" for nonperforming loans to emerge.

A positive association between credit losses and return on assets was found by Quagliariello (2004), suggesting that banks tend to use income smoothing techniques. Concerning the stock of nonperforming loans and the flow of new nonperforming loans, the author found evidence of a positive association between both variables and credit losses, thus suggesting (as expected) that banks' credit losses tend to reflect their portfolios' risk profile. Concerning the flow of new nonperforming loans, only two bank-specific determinants turned out to be statistically significant: each bank's one-year lagged performing loans' growth rate (negative association with the dependent variable) and cost-to-income ratio (positive association with the dependent variable for the contemporaneous coefficient and negative association with the dependent variable for the one-year lagged coefficient[26]). The author also used as proxies for each bank's

[25] The author found that credit losses were on average lower for specialized banks. In contrast, universal banks had a relatively higher sensitivity to unemployment rate changes, while corporate banks tended to have a comparatively higher sensitivity to GDP growth.

[26] Hess, Grimes and Holmes (2008a) arrived to similar conclusions in what concerns the signs of both contemporaneous and lagged cost-to-income coefficients (although lagged cost-to-income coefficients were not significant in their study). Quagliariello (2004) considered cost-to-income ratio to behave in a strange manner, but nevertheless he did not present a possible explanation for it.

risk taking behavior interest income measured as a percentage of total assets and the ratio of equity capital to total assets, having both variables proved to be not significant.

In order to study credit losses of UK's commercial and mortgage banks for the period between 1978 and 2000, Pain (2003) used as bank-specific variables each bank's overall credit growth, net interest margins, the share of loans to sectors characterized by riskier credit profiles, the loan portfolio's concentration (as measured by the Herfindahl index), the ratio of secured lending to households as a percentage of total loans, cost-to-income ratio, the number of employees per branch and the share of total assets as a percentage of UK's banking sector total assets. In what concerns each bank's overall credit growth, once more it wasn't found evidence that a rapid loan growth could imply higher credit losses, given that in some model specifications the lagged coefficient of this variable was found to be significantly negative (but still quite small). The author decided not to continue with overall credit growth as a determinant of credit losses in his study since the negative coefficient could be a result of credit demand's fall when overall economic conditions are worsening. That variable was replaced with lagged M4 lending. The author found aggregate lending growth rate to be statistically significant, thus suggesting that banks experiencing loan portfolio growth are prone to higher credit losses if other banks' loan portfolios are also increasing.

Net interest margins were found to be statistically significant only for mortgage banks, having estimation results revealed a positive association with credit losses. The ratio of secured lending to households (loans secured against residential real estate) as a percentage of total loans was also found to be significant only for mortgage banks, having estimation results revealed a negative association between this variable and credit losses, thus suggesting that collateral can mitigate credit losses for mortgage banks. The share of loans to riskier credit profile sectors[27] was statistically significant for commercial banks only, having shown the expected sign (i.e., positive association with credit losses). The author has also found evidence that commercial banks with less diversified loan portfolios were associated to higher credit losses, thus proving the benefits of portfolio diversification. Cost-to-income ratio proved to be clearly significant for mortgage banks (having estimation results revealed a negative association between this variable and credit losses), whilst for commercial banks it had

[27] The author found evidence that only loans to commercial real estate companies had a significant influence in banks' credit losses. Loans to other sectors, such as manufacturing, agricultural and personal unsecured borrowing, did not significantly affect banks' credit losses.

little effect on credit losses. Finally, the number of employees per branch and the share of each bank's total assets as a percentage of UK's banking sector total assets were both found to be not significant.

Particular attention was given to loan portfolio growth rate by Jiménez and Saurina (2006), concerning bank-specific determinants of Spanish banks' nonperforming loans for the period between 1984 and 2002. The authors found evidence that loan portfolio growth rates lagged four years have a significant positive effect on nonperforming loans, while loan portfolio growth rates lagged two or three years proved to be not statistically significant[28]. Jiménez and Saurina (2006) also used each bank's loan portfolio concentration by region and industry (as measured by the Herfindahl index) as bank-specific determinants of nonperforming loans. They found evidence that higher region concentration was associated to higher levels of nonperforming loans, while industry concentration was not statistically significant. Additionally, and similar to conclusions of Pain (2003) for UK's mortgage banks, the authors found that collateralized loans to households had a negative effect on nonperforming loans (i.e., higher shares of fully collateralized loans to households as a percentage of total loans were associated to banks with lower ratios of nonperforming loans). The authors also analyzed the potential relevance of each bank's market share on nonperforming loans, which revealed to be not significant.

On another study performed on Spanish banks' determinants of nonperforming loans, Salas and Saurina (2002) used as bank-specific variables the loan portfolio growth rate, the branch network growth rate, cost-to-income ratio, the share of loans without collateral to total loans of the private sector, the share of assets over total assets of the Spanish banking system (i.e., including commercial and savings banks), the net interest margin, the ratio of capital to total assets, the market share (based on the proportion of branches in each Spanish province, which was used as a proxy for each bank's market power) and risk premium (measured as the difference between each bank's interest income over total assets and the interbank interest rate). Loan portfolio growth rate had a significant positive effect only for savings banks (and only for the three-year lagged coefficient), while the branch network growth rate proved to have a

[28] Clair (1992), Foos, Norden and Weber (2009) and Keeton (1999) also found evidence that prior higher loan portfolio growth rates result in increased contemporaneous credit losses. Nevertheless, the conclusions concerning the effect of loan portfolio growth rates on credit losses are rather mixed, taking into consideration, for instance, findings provided by the studies performed by Pain (2003) and Quagliariello (2004), which were referred to earlier.

significant positive impact for both commercial and savings banks (although for distinct lagged coefficients). Cost-to-income ratio and the share of loans without collateral to total loans of the private sector were significant only for savings banks (both variables having a positive impact on nonperforming loans). The share of assets over total assets of the Spanish banking system and the ratio of capital to total assets were statistically significant only for commercial banks (both variables having a negative impact on nonperforming loans). The ratio of capital to total assets was used as a proxy for banks' risk-taking behavior – banks with lower capital ratios may be tempted to adopt a policy of rapid credit expansion in sectors of relatively higher profitability (and, as a consequence, higher risk sectors).

Net interest margin and market share were significant for savings banks only (the former variable having a negative impact on nonperforming loans and the latter one having a positive effect on the dependent variable). The authors expected a negative coefficient for net interest margin based on the assumption that its decrease could result in a riskier credit policy and consequently in a loan portfolio with an upcoming higher default probability. Concerning market share, its positive coefficient reveals that when market share increases banks lend to borrowers with lower credit quality. Risk premium was found to be not significant, either for commercial or savings banks. It is worth mentioning that coefficient signs for all statistically significant associations between the dependent variable and its determinants were as expected by the authors.

On their analysis of credit loss experience of North American commercial banks for the period between 1984 and 1987, Sinkey and Greenawalt (1991) used as bank-specific determinants of credit losses each bank's loan portfolio yield, the ratio of loans to assets, the ratio of volatile funds[29] to total liabilities and the ratio of equity to assets. For the model specification considering a broad definition of credit losses, the first three variables were found to have a significant positive association with credit losses, whilst the ratio of equity to assets was not significant. For the model specification considering a narrower definition of credit losses, estimation results revealed a significant positive association between the ratio of loans to assets and credit losses and a significant negative association between the ratio of equity to assets and credit losses.

[29] The definition of "volatile funds" used by the authors corresponds to the sum of federal funds purchased, large certificates of deposit, foreign deposits and other borrowed money.

4. The Methodology and Data

This study was based on a sample of 349 BHCs which were as of December 31st 2006 classified in peers 1, 2 or 3, in accordance with thresholds defined by the FED[30]. The total number of BHCs classified in one of the abovementioned peers as of December 31st 2006 was in fact higher in comparison to the total number of BHCs used in the sample due to various reasons (as of that same date there was a total of 421 BHCs classified in peers 1, 2 or 3). Firstly, there were financial institutions that changed their status from BHC to "Domestic Entity Other" and, as a result, those entities ceased to be subject to the FED's regulation. Secondly, financial institutions that were acquired between December 2006 and December 2008 by other non-BHC entities or by BHCs classified in peer 9 weren't also considered, as well as BHCs that are headquartered in Puerto Rico. Finally, financial institutions with less than 3 years of available financial data, as of December 2006, weren't also included in this study, since some of the credit loss determinants are dependent on such data availability.

Concerning financial institutions that were acquired by other BHCs classified in peers 1, 2 or 3, historical financial data was obtained by summing the amounts of the several captions used to build the bank-specific credit loss determinants. It is worth to mention that acquisitions of BHCs between December 2003 and December 2006 by other BHCs classified in peers 1, 2 or 3 were also considered and the same procedure was applied in order to obtain historical financial data.

The purpose of this study is to analyze the determinants of North American BHCs' credit losses reported in 2008, which to the author's knowledge was not carried out before by other researchers. As determinants of BHCs' credit losses, external and bank-specific factors were considered.

Since the used sample includes quite different BHCs in terms of geographic presence, external determinants of credit losses were based on information at national, regional and state levels, obtained from recognized North American public entities. To the author's knowledge, as there isn't available public information concerning BHCs' loan portfolio geographic distribution, it was necessary to set assumptions in order to define whether a given BHC develops its activities at a national, regional or state level and subsequently to allow for the use of external determinants of credit losses. Those

[30] See Appendix 1 for a list of the BHCs comprising the sample considered in this study.

assumptions were essentially based on the analysis of existing gaps between BHCs' loan portfolio sizes as of December 2008. Thus, on one hand, BHCs that were not classified in peer 1 were considered to develop their activities at a state-level solely. On the other hand, for BHCs classified in peer 1, the four largest BHCs[31] were considered to act on a national level, while the remaining BHCs classified in peer 1 were split into two groups – in the first group it were included BHCs with loan portfolios greater than USD 25 billion, which were considered to develop their activities at a regional level[32], whilst the second one grouped BHCs with loan portfolios below USD 25 billion, which were considered to act at a state level. It is acknowledged that used assumptions have obvious limitations, since it wasn't considered each BHC's actual loan portfolio geographic distribution. In addition, it is worth noting that larger BHCs also develop credit activities outside the USA, whereby to a certain extent their credit losses are also affected by other countries' economic conditions.

Bank-specific determinants of credit losses were based on BHCs' financial data obtained from the FED, particularly on regulatory fillings BHCs have to submit periodically to the regulator and that are publicly available through the NIC. Since BHCs' financial data was obtained from a single information source data, comparability issues across BHCs are mitigated. Quantitative data on BHCs available through the NIC is quite extensive, including financial statements, details of several captions of the financial statements and also regulatory capital ratios' calculation.

BHCs' credit losses reported in 2008 (the dependent variable used in this study), correspond to the charges reflected in BHCs' income statements in 2008 (in caption "provision for loan and lease losses"), measured as a percentage of the yearly average loan portfolio. Determinants of credit losses (i.e., independent variables) try to cover various aspects that may have influenced BHCs' credit loss experience in 2008. On one hand, external determinants were used in order to account for distinct macroeconomic conditions and impacts of the housing market crisis across regions and/or states of the USA. On the other hand, bank-specific determinants were used with the purpose of accounting for (i) each BHC's loan portfolio risk profile (including average spreads,

[31] Bank of America Corporation, Wells Fargo & Company, JPMorgan Chase & Co. and Citigroup Inc.. There is a considerable gap between the total amount of the loan portfolios of these four BHCs and the total amount of the loan portfolio of the fifth-largest BHC. Citigroup Inc., the fourth-largest BHC in terms of loan portfolio size as of December 2008, held USD 694,080 million in net loans and leases, while U.S. Bancorp, the fifth-largest BHC, held USD 184,651 million in net loans and leases at that same date.

[32] Considered regions are in accordance with the U.S. Census Bureau's Divisions: New England, Middle Atlantic, East North Central, West North Central, South Atlantic, East South Central, West South Central, Mountain and Pacific.

proportions of loans with riskier credit profiles and the share of restructured loans), (ii) credit growth aggressiveness, (iii) risk-taking behavior, (iv) the existence of significant off-balance sheet credit risk in the form of retained credit exposure in securitization activities, (v) the development of foreign credit activities, (vi) loan loss provisioning policies and (vii) the identification of BHCs' auditing firms. As far as the author is aware, some of the variables considered in this study have never been used before by other researchers, namely the proportion of restructured loans, retained credit exposure in securitization activities and the identification of BHCs' auditing firms. Table 3 lists all variables used in this study as determinants of BHCs' credit losses in 2008.

Table 3. Variables used as determinants of BHCs' credit losses in 2008.

Variable	Acronym	Description / Observations	Expected Sign
External Determinants of Credit Losses:			
GDP growth rate	$GDPGR_{08}$	GDP growth rate in 2008 (source: BEA).	-ve
Change of HPI Purchase-Only Index	$HPIPOV_{08}$	Change of HPI Purchase-Only Index in 2008 expressed in percentage points (source: FHFA).	-ve
Bank-Specific Determinants of Credit Losses:			
Loan portfolio average spread	$SAIRLL_{04-07}$	Loan portfolio average spread (over the 6 month LIBOR) for the period between December 2003 and December 2007	+ve
Loan portfolio growth rate	$LPGR_{05-07}$	Loan portfolio CAGR for the period between December 2004 and December 2007	+ve
Proportion of construction, land development and other land loans	$PCLDOLL_{07}$	Proportion of construction, land development and other land loans (as a percentage of total loans) as of December 2007	+ve
Proportion of consumer loans	PCL_{07}	Proportion of consumer loans (as a percentage of total loans) as of December 2007	+ve
Proportion of restructured loans	$PRLL_{07}$	Proportion of restructured loans (as a percentage of total loans) as of December 2007	+ve
Tier 1 capital ratio	$AT1CR_{04-07}$	Average Tier 1 capital ratio for the period between December 2003 and December 2007	-ve
Retained credit exposure in securitization activities	$PRCES_{08}$	Average retained credit exposure in securitization activities during 2008 (as a percentage of the yearly average loan portfolio)	+ve
Proportion of foreign loans	PFL_{07}	Proportion of foreign loans (as a percentage of total loans) as of December 2007	+ve/-ve
Past due and nonaccrual loans provisioning ratio	$PDNALPR_{07}$	Allowance for loan losses as a percentage of past due and nonaccrual loans as of December 2007	-ve
Auditing firm	AF_{08}	BHC's auditing firm in 2008 (dummy variable: 1 in case the auditing firm was one of the "Big Four"; 0 otherwise)	+ve

Both variables used as external determinants are expected to have a negative effect on BHCs' credit losses. GDP growth rate is a commonly used determinant of credit losses (as clearly pointed out in the literature review) and it should be expected that BHCs operating in more challenging economic conditions would have

comparatively higher credit losses. Change of HPI Purchase-Only Index in 2008 is also expected to have a negative impact in BHCs' credit losses, especially on those with higher exposures to residential real estate, since in case of default BHCs will likely recover a lower amount (given the collateral's depreciation).

Concerning bank-specific determinants of credit losses, there are several variables used to characterize BHCs' loan portfolio risk profile, all of which are expected to have a positive association with credit losses. The loan portfolio average spread is one of those variables – BHCs with higher spreads on their loan portfolios may lend to riskier borrowers and thus those BHCs are subject to comparatively higher credit losses.

BHCs with higher proportions of loans with riskier credit profiles are also expected to have higher credit losses. This study considers the proportion of construction, land development and other land loans as well as the proportion of consumer loans as loan types with riskier credit profiles. Given that the real estate sector was particularly hit in the context of the 2007-2009 credit crisis, this study considered as a bank-specific determinant of credit losses the proportion of construction, land development and other land loans held by BHCs since these loans are typically riskier in comparison to loans granted to companies operating in other business sectors. This variable is thus used to account for the impact on BHCs' credit losses of their exposure to commercial real estate, whilst the impact of their exposure to residential real estate is captured by one of the external determinants (change of HPI Purchase-Only Index). As mentioned in the literature review, Pain (2003) also found evidence that loans to commercial real estate companies had a significant influence on UK's commercial banks' credit losses. The share of consumer loans was also used as a bank-specific determinant of credit losses given that it generally constitutes the riskier loan type to individual borrowers.

The proportion of restructured loans was also used as a proxy for BHCs' loan portfolio risk profile, since loans may be restructured in order to relieve financial pressure on borrowers that were facing loan repayment difficulties. Thus, it should be expected a positive association between the share of restructured loans and reported credit losses.

Loan portfolio growth rate for the period 2005-2007 was also used as a bank-specific determinant of credit losses. It is expected that BHCs that expanded their credit activities at a faster pace should experiment higher credit losses, since faster growth rates may be associated with a deterioration of the loan portfolio risk profile.

In this study it was also used as a bank-specific determinant of credit losses BHCs' average Tier 1 capital ratio for the period 2004-2007. It is expected a negative association between this variable and reported credit losses, since BHCs with lower capital ratios may be tempted to adopt riskier credit policies with the purpose of increasing their returns in the short term, which would be in accordance with results of Głogowski (2008) and Salas and Saurina (2002).

Besides credit risk exposure from balance sheet items (i.e., the loan portfolio), BHCs may also have credit risk exposure related to off-balance sheet items, which include securitization activities, especially through credit enhancements BHCs grant to investors that acquired securities related to those financial instruments. Since credit losses may also arise from such activities, it was considered as a bank-specific determinant of credit losses the ratio of retained credit exposure in securitization activities during 2008 expressed as a percentage of the yearly average loan portfolio. It is expected a positive association between this variable and reported credit losses, since more extensive credit enhancements imply that BHCs will potentially bear a comparatively higher proportion of losses arising from securitization activities.

The proportion of foreign loans as a percentage of total loans was also used as a bank-specific determinant of credit losses. Its expected sign is uncertain, since geographical diversification may improve the loan portfolio risk profile (and thus higher shares of foreign loans would have a negative association with credit losses), but at the same time foreign borrowers' creditworthiness may be lower in comparison to domestic borrowers' creditworthiness (and as a result higher shares of foreign loans would have a positive association with credit losses).

Since this study is focused on the determinants of credit losses in a specific year, the provisioning level recorded in the end of the immediately previous year by each BHC may also prove to be a relevant variable. As a result it was used as a bank-specific determinant of credit losses the past due and nonaccrual loans provisioning ratio, which corresponds to the value of allowance for loan losses as a percentage of total past due and nonaccrual loans as of December 2007. It is expected a negative association between this variable and reported credit losses, based on the assumption that BHCs with lower delinquent loans' provisioning ratios in the end of 2007 may need to increase their provisions for loan losses at a faster pace than BHCs with higher provisioning ratios as of that same date.

Finally, with the purpose of finding if credit losses reported by BHCs in 2008 may have been influenced by the companies that provided auditing services, it was used a dummy variable as a bank-specific determinant of credit losses. This dummy variable separates the "Big Four" auditing firms from the remaining ones (the "Big Four" auditing firms refers to Deloitte, Ernst & Young, KPMG and PricewaterhouseCoopers). In 2008, from a total of 349 BHCs that comprised this study's sample, 147 BHCs (approximately 42%) were audited by one of the "Big Four" auditing firms. It can be argued that the "Big Four" auditing firms may have a comparatively higher influence over their clients in aspects or areas characterized by a higher degree of subjectivity. Loan loss provisioning is clearly one of those areas and as a result BHCs that were audited by one of the "Big Four" auditing firms may have reported comparatively higher credit losses. Thus, it is expected a positive association between this variable and BHCs' reported credit losses in 2008.

The estimated model for credit losses reported by North American BHCs in 2008 ($PLLL_{i08}$) is as follows:

$$PLLL_{i08} = Const + \alpha_1 GDPGR_{i08} + \alpha_2 HPIPOV_{i08} + \beta_1 SAIRLL_{i04-07} + \beta_2 LPGR_{i05-07} + \beta_3 PCLDOLL_{i07} + \beta_4 PCL_{i07} + \beta_5 PRLL_{i07} + \beta_6 AT1CR_{i04-07} + \beta_7 PRCES_{i08} + \beta_8 PFL_{i07} + \beta_9 PDNALPR_{i07} + \beta_{10} AF_{i08} + \varepsilon_{i08}$$

where $PLLL_{i08}$ is the provision for loan and lease losses for BHC i in 2008 expressed as a percentage of the yearly average loan portfolio. The determinants of credit losses on the right hand side of the equation are explained in Table 3 and ε_{i08} is the error term.

The most frequently used variable by other researchers that was not considered in this study was probably cost-to-income ratio. In fact, this variable was not deliberately used as a bank-specific determinant of credit losses since each bank's operating income is generally comprised in a significant part by income attributable to credit unrelated activities (e.g., interest income from credit unrelated activities, trading revenue, investment banking fees, securities brokerage and insurance activities income).

Figure 10 presents operating income breakdown (before interest expense) for the sample of BHCs considered in this study for the period between 2004 and 2008. It clearly shows that income attributable to credit unrelated activities has a considerable weight in BHCs' operating income during the covered period, ranging between 29.2%

and 35.7%. For BHCs classified in peer 1 those figures were even higher, ranging from 39.4% to 46.7%. This suggests that largest BHCs are comparatively more dependent on income generated from credit unrelated activities. Cost-to-income ratio was used as a bank-specific determinant of credit losses and/or flow of new nonperforming loans by several authors, including Hess, Grimes and Holmes (2008a), Pain (2003), Quagliariello (2004) and Salas and Saurina (2002).

Figure 10. Operating income breakdown (before interest expense).
Figures relate to the sample of 349 BHCs considered in this study and were calculated as simple averages in order to prevent largest BHCs from significantly influencing presented results. Source: Own elaboration based on data gathered from the NIC.

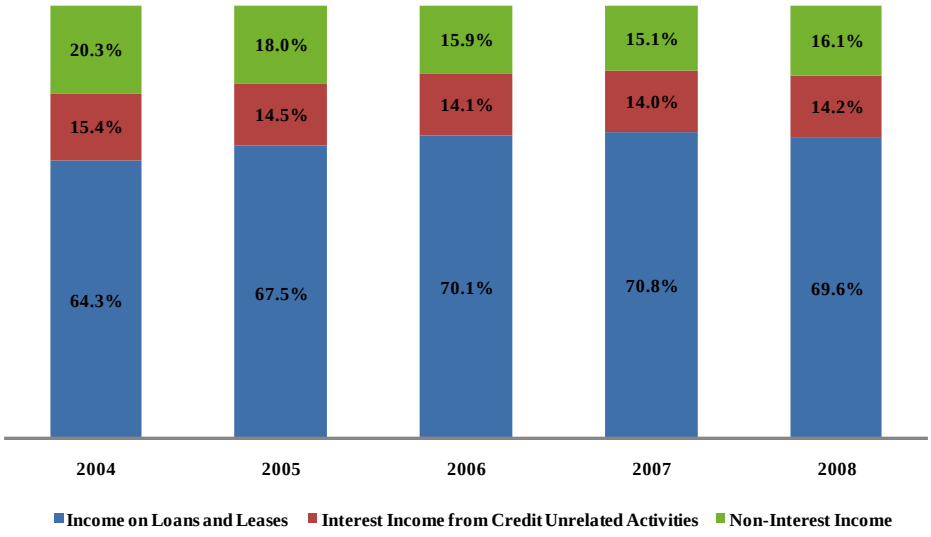


Table 4 presents descriptive statistics for the dependent variable and for bank-specific determinants of credit losses, while Table 5 presents descriptive statistics for external determinants of credit losses at national, regional and state levels. Table 5 only considers unique (i.e., unrepeated) observations of $GDPGR_{08}$ and $HPIPOV_{08}$, for which reason, for instance, at national level there is only one observation. Descriptive statistics show that credit loss experience in 2008 was quite dissimilar among BHCs, having credit losses ranged from 0.0% to 13.3%. The performed analysis also demonstrates that BHCs' internal characteristics (i.e., bank-specific determinants) diverge significantly and that macroeconomic conditions and housing market prices during 2008 were rather different across North American states and regions.

Table 4. Descriptive statistics for the dependent variable and for bank-specific determinants of BHCs' credit losses in 2008.

Variable	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	# of Obs.
$PLLL_{08}$	1.41%	0.89%	13.31%	0.00%	1.43%	2.979	15.683	349
$SAIRLL_{04-07}$	3.06%	3.02%	6.28%	-1.10%	0.79%	0.116	3.769	349
$LPGR_{05-07}$	12.82%	10.96%	55.88%	-8.38%	9.39%	1.634	4.498	349
$PCLDOLL_{07}$	17.73%	15.06%	82.95%	0.00%	12.88%	1.359	2.898	349
PCL_{07}	5.84%	3.28%	51.25%	0.02%	6.75%	2.217	7.468	349
$PRLL_{07}$	0.09%	0.00%	4.91%	0.00%	0.45%	8.207	74.179	349
$AT1CR_{04-07}$	11.25%	10.83%	33.64%	-4.68%	2.91%	2.075	16.223	349
$PRCES_{08}$	0.05%	0.00%	6.12%	0.00%	0.41%	11.539	155.002	349
PFL_{07}	0.87%	0.00%	55.23%	0.00%	4.72%	8.330	78.367	349
$PDNALPR_{07}$	91.92%	66.28%	1019.12%	2.68%	100.48%	4.912	32.126	349
AF_{08}	0.4212	-	1.0000	-	0.4945	0.321	(1.908)	349

Table 5. Descriptive statistics for external determinants of BHCs' credit losses in 2008 at national, regional and state levels.

Variable	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	# of Obs.
GDP growth rate ($GDPGR_{08}$):								
National level	0.70%	0.70%	0.70%	0.70%	n.a.	n.a.	n.a.	1
Regional level	0.89%	1.00%	2.03%	-0.38%	0.78%	(0.204)	(0.501)	9
State level	1.05%	1.20%	7.30%	-1.60%	1.56%	1.235	4.781	44
Change of HPI Purchase-Only Index ($HPIPOV_{08}$):								
National level	-8.24%	-8.24%	-8.24%	-8.24%	n.a.	n.a.	n.a.	1
Regional level	-7.21%	-5.52%	-0.53%	-22.21%	6.45%	(1.794)	3.702	9
State level	-5.63%	-3.61%	2.15%	-29.79%	6.67%	(2.238)	5.471	44

5. Empirical Results

5.1. Model Estimation

In order to model credit losses reported by North American BHCs in 2008 it was used a Two-Stage Least Squares estimator to ensure that heteroskedasticity-consistent standard errors are obtained[33]. Credit losses were modeled for the total sample (which comprised 349 BHCs) and also for two subsets, in order to analyze potential differences between BHCs based in their size. Accordingly, in the first subset it were included BHCs classified in peers 1 and 2 as of December 31st 2008 (total of 142 BHCs), while the second subset grouped BHCs classified in peers 3 and 4 as of that same date (total of 207 BHCs). Descriptive statistics for the dependent variable and for bank-specific determinants of credit losses relating to the two considered subsets are presented in Appendix 2, while Appendix 3 presents the correlation coefficients between the dependent variable and the potential explanatory variables for the total sample as well as for the two subsets.

Table 6 presents the results of the estimated model for the total sample and for the two considered subsets. Notwithstanding the fact that all coefficients present the expected signs[34], there are some relevant differences between the two subsets that will be further analyzed and discussed. While for the total sample both external determinants of credit losses are statistically significant, for subset I (i.e., for larger BHCs) only GDP growth rate in 2008 is significant, whereas for subset II (i.e., for smaller BHCs) only the change of HPI Purchase-Only Index in 2008 is significant. Thus, in 2008 larger BHCs' credit losses seemed to be influenced by the performance of the economy as a whole, whilst smaller BHCs' loan portfolios were sensitive to the housing market prices evolution.

[33] It was found evidence of heteroskedasticity in OLS equation residuals and as a consequence simple OLS estimation procedures would not produce consistent parameter estimates.
[34] $PRLL_{07}$ for subset II is the only exception, but nevertheless its coefficient is clearly not significant.

Table 6. Model estimation results.
"Subset I" relates to BHCs classified as of December 31st 2008 in peers 1 and 2, while "Subset II" groups BHCs classified as of December 31st 2008 in peers 3 and 4. T-statistics (corrected for the presence of heteroskedasticity) are presented in brackets.

Variables	Total Sample	Subset I	Subset II
Const	-0.0061 (-1.518)	-0.0027 (-0.497)	-0.0090** (-1.977)
External Determinants:			
$GDPGR_{08}$	-0.1940*** (-3.035)	-0.4456*** (-3.479)	-0.0604 (-1.012)
$HPIPOV_{08}$	-0.0295*** (-3.057)	-0.0049 (-0.314)	-0.0468*** (-4.030)
Bank-Specific Determinants:			
$SAIRLL_{04-07}$	0.4599*** (3.890)	0.3317** (2.180)	0.5920*** (4.094)
$LPGR_{05-07}$	0.0054 (0.717)	0.0035 (0.294)	0.0076 (0.696)
$PCLDOLL_{07}$	0.0353*** (4.276)	0.0578*** (4.717)	0.0214** (2.389)
PCL_{07}	0.0091 (1.277)	0.0186 (1.193)	0.0007 (0.088)
$PRLL_{07}$	0.5991 (1.305)	0.9538*** (3.177)	-0.0653 (-0.186)
$AT1CR_{04-07}$	-0.0344** (-2.112)	-0.0433 (-1.243)	-0.0354 (-1.564)
$PRCES_{08}$	0.1682*** (3.075)	0.1977 (0.969)	0.1817** (2.168)
PFL_{07}	0.0406*** (4.818)	0.0442*** (5.360)	-0.1396*** (-2.683)
$PDNALPR_{07}$	-0.0019*** (-4.057)	-0.0009* (-1.665)	-0.0023*** (-3.379)
AF_{08}	0.0070*** (5.460)	0.0078*** (3.786)	0.0049*** (3.221)
Number of Observations	349	142	207
Adjusted R^2	0.472	0.575	0.468
F-Statistic	26.969***	16.907***	16.094***

***, ** and * denote significance at 1%, 5% and 10%, respectively.

Estimation results suggest that higher loan portfolio average spreads are associated to higher credit losses. The loan portfolio average spread proved to be significant for the total sample and for both considered subsets, although for subset I only at the 5% level. Smaller BHCs' credit losses seemed to be more sensitive to this variable, being its impact in smaller BHCs clearly higher than in larger BHCs. Still on this matter, it was interesting to find that between 2004 and 2007 the loan portfolio average spread for subset II was systematically higher (in comparison to subset I), ranging from 25 basis points to 43 basis points[35].

Loan portfolio growth rate proved to be not statistically significant for all estimated models (i.e., total sample and both subsets), even though it was considered a relatively large time length (3 years)[36].

[35] Source: Own calculation based on data gathered from the NIC.
[36] Using a time length of 4 or 2 years would result in even less powerful t-statistics for the estimated coefficients of this variable.

In what refers to shares of loans with riskier credit profiles, only the proportion of construction, land development and other land loans proved to be significant (i.e., the share of consumer loans was not significant either for the total sample or for each of the subsets). The proportion of construction, land development and other land loans was simultaneously significant at the 1% level for the total sample and for larger BHCs, while for smaller BHCs it was significant at the 5% level. Therefore, estimation results demonstrate that commercial real estate loans tend to be riskier in comparison to other loan types. As pointed out in the literature review, Pain (2003) also found that the share of loans to commercial real estate companies had a positive association with UK's commercial banks' credit losses.

The proportion of restructured loans proved to be significant only for larger BHCs (at the 1% level), while for smaller BHCs the estimated coefficient was not significantly different from zero. This discrepancy between larger and smaller BHCs was not expected. A possible explanation for this finding may be the fact that (at least some of the) larger BHCs may have used credit restructuring to hide or delay the development of nonperforming loans in a much more expressive fashion than smaller BHCs. Nevertheless, the analysis of this hypothesis is beyond the scope of this study.

The average Tier 1 capital ratio was statistically significant solely for the total sample, at the 5% level. As a result, there was limited statistical evidence that less capitalized BHCs may be tempted to adopt riskier credit policies.

Retained credit exposure in securitization activities was found to be statistically significant for the total sample and for smaller BHCs (at the 1% and 5% levels, respectively). This finding was also unexpected and rather difficult to explain, as securitization activities are comparatively more relevant for larger BHCs, for which estimation results suggested that this variable didn't influence their credit losses in 2008 in a significant manner. Additionally, only four smaller BHCs had retained credit exposure in securitization activities during 2008 and those BHCs' reported credit losses were even lower than average credit losses for subset II. Still on this matter, it is worth mentioning that the correlation between this bank-specific determinant and credit losses was found to be negative for smaller BHCs[37].

[37] If those four BHCs happened to report credit losses in 2008 that were higher than average credit losses for comparable BHCs in terms of size (i.e., for Subset II) then this variable's statistical significance for smaller BHCs would be relatively intuitive; nevertheless, it was not the case. See Appendix 3 for correlation coefficients between the dependent variable and potential explanatory variables (for the total sample as well as for both considered subsets).

The proportion of foreign loans was significant for the total sample and for both considered subsets at the 1% level. Nevertheless, estimation results suggest that this variable's effect on BHCs' credit losses was clearly different between larger BHCs and smaller BHCs. The coefficient's sign was positive (higher proportions of foreign loans were associated to higher credit losses) for larger BHCs (and also for the total sample), thus suggesting that larger BHCs' foreign borrowers' credit profiles adversely affected credit losses in 2008. For smaller BHCs this variable's coefficient sign was negative, thus indicating that, for smaller BHCs, the proportion of foreign loans has actually managed to behave as an effective tool for portfolio diversification. This conclusion is corroborated by the correlation coefficients previously calculated for both subsets separately – while for larger BHCs it was found a positive correlation between the proportion of foreign loans and credit losses, for smaller BHCs the correlation coefficient was negative. In what concerns the total sample, it was found a positive association between the proportion of foreign loans and reported credit losses in 2008 (although the coefficient assumes a lower value in comparison to subset I), indicating that larger BHCs had a comparatively stronger role in the determination of the existing association between this variable and credit losses (which is intuitive, given that credit activities in foreign countries are mainly developed by larger BHCs).

The provisioning ratio of past due and nonaccrual loans was significant for smaller BHCs and for the total sample, at the 1% level, and for larger BHCs, although only at the 10% level. There isn't a clear explanation for such dissimilar conclusions between larger and smaller BHCs concerning this variable's statistical significance. Nevertheless, estimation results suggest that BHCs with lower provisioning ratios in the end of 2007 had indeed to increase their provisions for loan losses at a faster pace than BHCs with higher provisioning ratios as of that same date.

Being audited by one of the "Big Four" auditing firms also proved to have a significant impact on credit losses registered in 2008, especially for larger BHCs. Conclusions for the total sample demonstrate that in 2008 BHCs audited by one of the "Big Four" auditing firms registered credit losses which were higher by 70 basis points in comparison to BHCs that weren't audited by one of those auditing firms. The impact of this variable on credit losses was more than 50% higher for larger BHCs in comparison to smaller BHCs (78 basis points and 49 basis points for larger BHCs and smaller BHCs, respectively). Thus, it was found evidence that the "Big Four" auditing

firms seem to have a comparatively higher influence over their clients' loan loss provisioning policies (in comparison to the remaining auditing firms).

Although this study is focused in BHCs' credit losses reported in 2008 it is also interesting to analyze its historical evolution. Figure 11 illustrates the evolution of weighted average credit losses for the total sample as well as for both considered subsets for the period between 2004 and 2008[38]. It is interesting to note that for the last five years BHCs classified in peers 1 and 2 as of December 31st 2008 have systematically registered higher credit losses, in comparison to BHCs classified in peers 3 and 4 as of that same date. The existing gap among both groups has widened considerably in the last two years of the covered period, and especially in 2008. In fact, between 2004 and 2006, the gap between subset I and subset II ranged between 22 basis points and 30 basis points; in 2007, it increased to 58 basis points and in 2008 it has reached 139 basis points, which is almost five times higher in comparison to the gap observed in 2006.

Since credit loss figures are weighted average, these conclusions are nevertheless influenced by the four largest BHCs, which have incurred in substantial credit losses during the 2007-2009 credit crisis. Figure 12 demonstrates that the four largest BHCs have systematically incurred in higher credit losses in comparison to the remaining BHCs classified in peers 1 and 2, as of December 31st 2008, and that the existing gap between them has significantly increased after 2006. It is also interesting to note that, excluding the four largest BHCs, weighted average credit losses for subset I and subset II were actually similar between 2004 and 2007.

[38] The figures for the total sample and for subset I are obviously similar due to the fact that credit loss figures are weighted-average.

Figure 11. Evolution of weighted average credit losses.
Source: Own elaboration based on data gathered from the NIC.

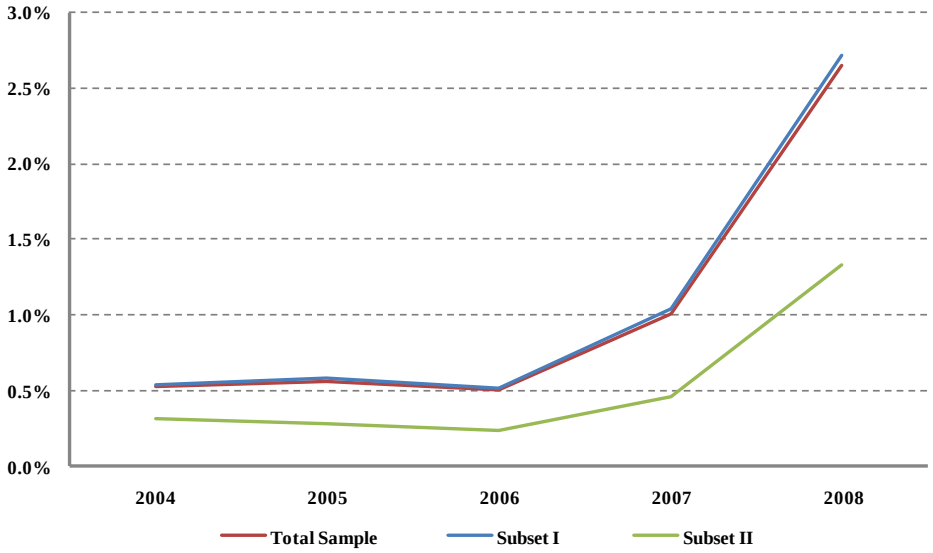
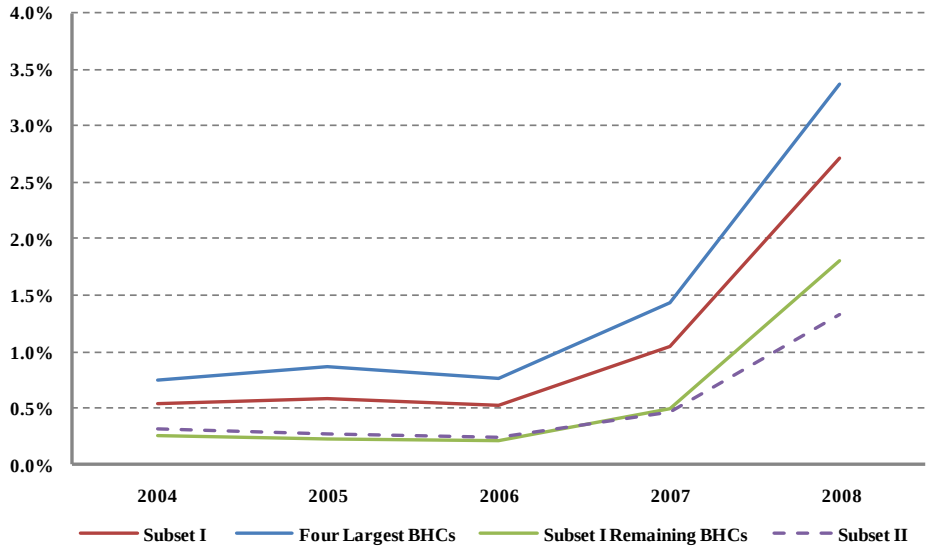


Figure 12. Evolution of weighted average credit losses for BHCs included in subset I.
Source: Own elaboration based on data gathered from the NIC.



5.2. Hypotheses Tests for Predefined BHCs' Groups

A set of hypotheses tests was performed after model estimation with the purpose of testing whether credit loss experience in 2008 was similar across predefined BHCs' groups. It was used t-tests for differences between means and Mann-Whitney tests for differences between medians in order to analyze predefined groups' measures of central tendency.

The performed hypotheses tests grouped BHCs taking into consideration their size and their listing status as of December 31st 2008, as well as their geographic location.

Test #1: Credit losses in 2008 were similar for larger BHCs and smaller BHCs.

This test was based on the two subsets previously defined for model estimation ("Subset I" and "Subset II"). It will be tested if the means and the medians of credit losses were statistically similar between BHCs classified in peers 1 and 2 as of December 31st 2008 and BHCs classified in peers 3 and 4 as of that same date. Test #1's specifications are as follows:

- T-test for differences between means:

  H_0: $Mean_{Subset\ I} - Mean_{Subset\ II} = 0$

  H_1: $Mean_{Subset\ I} - Mean_{Subset\ II} <> 0$

- Mann-Whitney test for differences between medians:

  H_0: $Median_{Subset\ I} - Median_{Subset\ II} = 0$

  H_1: $Median_{Subset\ I} - Median_{Subset\ II} <> 0$

Table 7 presents results for Test #1. Considering a significance level of 5% the null hypotheses of equal means and equal medians are rejected. For a significance level of 1%, only the hypothesis of equal medians is rejected, although the test's p-value was very close to the critical level of 1%. Thus, estimation results point out differences in credit loss experience in 2008 between larger BHCs and smaller BHCs, having larger BHCs registered comparatively higher credit losses in 2008. These conclusions are more pronounced based on the Mann-Whitney test for differences between medians. This test's conclusions confirm the empirical notion underlying the analysis presented in the end of the previous section, which suggested that larger BHCs incurred in higher credit losses in 2008 in comparison to smaller BHCs.

Table 7. Hypotheses test results – Test #1**.**
"Subset I" relates to BHCs classified as of December 31st 2008 in peers 1 and 2, while "Subset II" groups BHCs classified as of that same date in peers 3 and 4.

T-Test for Differences Between Means:

Group	# of Obs.	Mean	Std. Dev.	Std. Error Mean
Subset I	142	1.63%	1.63%	0.14%
Subset II	207	1.25%	1.25%	0.09%

Variances[1]	D. Freedom	T-Statistic	P-Value
Equal Variances Assumed	347	2.430	0.016
Equal Variances Not Assumed	250.2	2.316	0.021

Mann-Whitney Test for Differences Between Medians:

Group	# of Obs.	Median	Mean Rank	Sum of Ranks
Subset I	142	1.09%	192.09	27,276.50
Subset II	207	0.82%	163.28	33,798.50

Mann-Whitney U	Wilcoxon W	Z	P-Value
12,270.50	33,798.50	-2.621	0.009

[1] Results of Levene's test for equality of variances: F = 4.580; p-value = 0.033.
Considering a significance level of 5% the hypothesis of equal variances is rejected.

Test #2: Credit losses in 2008 were similar for unlisted BHCs and listed BHCs.

The necessary information to group BHCs according to their listing status as of December 31st 2008 was gathered from Bloomberg[39]. It will be tested if the means and the medians of credit losses were statistically similar between unlisted BHCs and listed BHCs as of December 31st 2008. Test #2's specifications are as follows:

- T-test for differences between means:

  H_0: $Mean_{Unlisted} - Mean_{Listed} = 0$

  H_1: $Mean_{Unlisted} - Mean_{Listed} <> 0$

- Mann-Whitney test for differences between medians:

  H_0: $Median_{Unlisted} - Median_{Listed} = 0$

  H_1: $Median_{Unlisted} - Median_{Listed} <> 0$

Table 8 presents results for Test #2. Even for a significance level of 1% the null hypotheses of equal means and equal medians are rejected. Thus, estimation results show that credit loss experience in 2008 differed between unlisted BHCs and listed BHCs, having the latter registered higher credit losses in 2008. It is worth noting test #2's results are comparatively more powerful, suggesting there was a clearer distinction

[39] See Appendix 1 for identification of unlisted and listed BHCs as of December 31st 2008.

of credit loss experience between unlisted BHCs and listed BHCs (in comparison to test #1, which compared credit loss experience between larger and smaller BHCs).

Table 8. Hypotheses test results – Test #2.
"Unlisted" relates to unlisted BHCs as of December 31st 2008, while "Listed" groups listed BHCs as of that same date.

T-Test for Differences Between Means:

Group	# of Obs.	Mean	Std. Dev.	Std. Error Mean
Unlisted	184	1.18%	1.18%	0.09%
Listed	165	1.66%	1.64%	0.13%

Variances[1]	D. Freedom	T-Statistic	P-Value
Equal Variances Assumed	347	-3.156	0.002
Equal Variances Not Assumed	294.5	-3.102	0.002

Mann-Whitney Test for Differences Between Medians:

Group	# of Obs.	Median	Mean Rank	Sum of Ranks
Unlisted	184	0.77%	158.95	29,246.50
Listed	165	1.17%	192.90	31,828.50

Mann-Whitney U	Wilcoxon W	Z	P-Value
12,226.50	29,246.50	-3.139	0.002

[1] Results of Levene's test for equality of variances: F = 9.897; p-value = 0.002.
The hypothesis of equal variances is rejected, even for a significance level of 1%.

Test #3: Credit losses in 2008 were similar among BHCs regardless of their geographic location.

This test was based on each BHC's geographic location, considering BHCs that were assumed to develop their activities at a regional level or at a state level. It will be tested if the means and the medians of credit losses were statistically similar for BHCs developing their activities in distinct geographic regions. Considered regions are, in accordance with the U.S. Census Bureau's Regions, Midwest, Northeast, South and West. Test #3's specifications are as follows:

- T-test for differences between means:

  H_0: $Mean_{Region\ i} - Mean_{Region\ j} = 0$

  H_1: $Mean_{Region\ i} - Mean_{Region\ j} <> 0$

- Mann-Whitney test for differences between medians:

  H_0: $Median_{Region\ i} - Median_{Region\ j} = 0$

  H_1: $Median_{Region\ i} - Median_{Region\ j} <> 0$

Table 9 presents results for Test #3. Test results show that credit loss experience in 2008 was, in general, different for BHCs developing their activities in distinct geographic regions, especially considering the results of Mann-Whitney tests for differences between medians. In fact, for a significance level of 5%, the null hypothesis of equal medians is not rejected only for the test comparing credit loss experience of BHCs located in the Midwest and in the South. Still for a significance level of 5%, the null hypothesis of equal means is not rejected for the tests comparing credit loss experience of (i) BHCs located in the Midwest and in the South and of (ii) BHCs located in the Midwest and in the West. It is worth noting that for BHCs located in the Midwest and in the South, test results for the null hypotheses of equal means and equal medians were similar, whilst test results for the null hypotheses of equal means and equal medians were clearly different for BHCs located in the Midwest and in the West.

In addition, Test #3's results show that (i) credit losses in 2008 of BHCs developing their activities in the West were higher than the ones of BHCs located in other regions (especially considering results of Mann-Whitney tests for differences between medians) and (ii) credit losses in 2008 of BHCs developing their activities in the Northeast were lower than the ones of BHCs located in other regions.

Table 9. Hypotheses test results – Test #3.
P-values already consider results of Levene's tests for equality of variances.

Descriptive Statistics:

Group	# of Obs.	Mean	Median	Std. Dev.	Std. Error Mean
Midwest	106	1.63%	1.11%	1.74%	0.17%
Northeast	62	0.57%	0.47%	0.49%	0.06%
South	119	1.27%	0.88%	1.27%	0.12%
West	58	2.04%	1.85%	1.31%	0.17%

T-Test for Differences Between Means - T-Statistics:

Region j \ Region i	Midwest	Northeast	South	West
Midwest	n.a.			
Northeast	5.916***	n.a.		
South	1.782*	-5.332***	n.a.	
West	-1.545	-8.018***	-3.707***	n.a.

Mann-Whitney Test for Differences Between Medians - Z Statistics:

Region j \ Region i	Midwest	Northeast	South	West
Midwest	n.a.			
Northeast	-6.230***	n.a.		
South	-1.863*	-5.225***	n.a.	
West	-2.848***	-7.457***	-4.610***	n.a.

***, ** and * denote significance at 1%, 5% and 10%, respectively.

6. Conclusions

This study analyzes the determinants of credit losses experienced by North American BHCs in 2008. The analysis is based on BHCs' historical financial data and on information collected from recognized North American public entities. It was chosen provision for loan and lease losses as a percentage of the yearly average loan portfolio as the dependent variable. Determinants of BHCs' incurred credit losses in 2008 included external and bank-specific factors. As far as the author is aware, some of them are a novelty of this study, namely the proportion of restructured loans, retained credit exposure in securitization activities and the identification of BHCs' auditing firms.

Concerning external factors, credit losses were found to be sensitive to GDP growth in larger BHCs, while smaller BHCs' credit losses were clearly influenced by housing market price evolution. Sensitivity of smaller BHCs to housing market price evolution is coherent with the fact that higher credit losses in 2008 have been incurred by BHCs operating in the states more affected by the housing crisis. The author is aware of the limitations resulting from the assumptions taken to consider whether each BHC developed its activities at a national, regional or state level. The imposition of assumptions resulted from the absence of available public information concerning BHCs' loan portfolio geographic distribution.

Results of this study point to a clear risk-return relation – higher credit losses were associated to loan portfolios with higher average spreads, higher shares of construction and land-related loans (which are typically riskier assets) and higher proportions of restructured loans. The latter variable proved to be statistically significant only for larger BHCs. This is an interesting result, as it can sign that credit restructuring may have been used by some of the larger BHCs as a tool to hide or delay the development of nonperforming loans. Further investigation should be pursued, depending on whether adequate information to evaluate this issue is available.

Another relevant finding of this study refers to the impact of foreign loans on BHCs' credit losses reported in 2008. While for larger BHCs higher proportions of foreign loans resulted in higher credit losses, for smaller BHCs estimation results show that foreign loans seem to have worked as an effective tool for portfolio diversification. This result raises an interesting question about larger BHCs' credit activities: historically how does compare the profitability of domestic credit activities and foreign credit activities for those BHCs? Further investigation may focus on the analysis of the

historical contribution of foreign credit activities to larger BHCs' profits and compare it with domestic credit activities' performance.

This study also demonstrated that smaller BHCs with lower provisioning ratios for their delinquent loans as of December 2007 were forced to increase their provisions for loan losses at a faster pace in 2008. Thus, this result indicates that banking regulators should be aware whenever similar financial institutions (in terms of their loan portfolios' risk profiles) show clearly dissimilar provisioning ratios among it selves.

The eventual greater influence of the major auditing firms proved to be a significant determinant of credit losses incurred by North American BHCs in 2008, having estimation results shown that larger BHCs' credit losses were more sensitive to this variable. Concerning retained credit exposure in securitization activities, results were found to be rather ambiguous.

Other important results from this study refer to the fact that larger and listed BHCs incurred in higher credit losses in 2008 comparatively to smaller and unlisted BHCs, respectively. Moreover, BHCs developing their activities in the West registered comparatively higher credit losses, while BHCs developing their activities in the Northeast incurred in comparatively lower credit losses. Are larger and listed BHCs more prone to engage in riskier credit activities in order to maximize their profits? Or, did comparatively higher credit losses incurred by those BHCs in 2008 constitute an exception? These questions should also be subject to further investigation.

As a final remark, there are several alternative proxies that could have been used as measures to assess BHCs' credit loss experience in 2008. Concerning this matter, Hess, Grimes and Holmes (2008b) have promoted a discussion on the potential credit loss experience proxies and one of their main conclusions is that provisions for loan losses are only partially followed by corresponding charge-offs for Australasian banks. Therefore, further investigation may consider analyzing if the observed loan loss provisioning levels during the 2007-2009 credit crisis were indeed followed by corresponding charge-offs afterwards and/or if there were abnormal recovery levels of previously charged-off loans during the 2007-2009 credit crisis.

7. References

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8. Appendix

Appendix 1. List of BHCs used in this study. Data as of December 31st 2008; figures are in USD Millions.

RSSD ID	BHC Designation	Peer Group	Listed / Unlisted	Net Loans and Leases	Provision for Loan and Lease Losses
1073757	Bank of America Corporation	1	Listed	937,731	26,923
1120754	Wells Fargo & Company	1	Listed	870,143	15,492
1039502	JPMorgan Chase & Co.	1	Listed	738,022	21,237
1951350	Citigroup Inc.	1	Listed	694,080	33,674
1119794	U.S. Bancorp	1	Listed	184,651	3,096
1131787	Suntrust Banks, Inc.	1	Listed	128,680	2,474
1132449	Citizens Financial Group, Inc.	1	Unlisted	109,465	1,929
1074156	BB&T Corporation	1	Listed	97,095	1,423
3242838	Regions Financial Corporation	1	Listed	97,034	2,057
1070345	Fifth Third Bancorp	1	Listed	82,806	4,560
1068025	Keycorp	1	Listed	75,728	1,835
1025608	Bancwest Corporation	1	Unlisted	54,267	743
1249196	TD Banknorth Inc.	1	Unlisted	50,584	334
1199844	Comerica Incorporated	1	Listed	49,770	686
1378434	Unionbancal Corporation	1	Listed	48,848	515
3594612	Marshall & Ilsley Corporation	1	Listed	48,782	2,038
1037003	M&T Bank Corporation	1	Listed	48,213	412
3587146	Bank of New York Mellon Corporation, The	1	Listed	42,966	182
1027004	Zions Bancorporation	1	Listed	41,224	649
1068191	Huntington Bancshares Incorporated	1	Listed	40,561	1,080
1078529	BBVA USA Bancshares, Inc.	1	Unlisted	37,918	476
1245415	Harris Financial Corp.	1	Unlisted	36,608	782
2816906	Taunus Corporation	1	Unlisted	35,466	41
1199611	Northern Trust Corporation	1	Listed	30,530	105
1078846	Synovus Financial Corp.	1	Listed	27,459	700
2132932	New York Community Bancorp, Inc.	1	Listed	22,098	8
1826056	RBC Bancorporation (USA)	1	Unlisted	21,237	369
1094640	First Horizon National Corporation	1	Listed	20,996	1,080
1080465	Colonial Bancgroup, Inc., The	1	Listed	16,287	729
1199563	Associated Banc-Corp	1	Listed	16,122	202
2307280	Utrecht-America Holdings, Inc.	1	Unlisted	13,861	56
1130780	FBOP Corporation	1	Unlisted	13,712	140
2389941	TCF Financial Corporation	1	Listed	13,173	192
1883693	BOK Financial Corporation	1	Listed	12,760	208
1027518	City National Corporation	1	Listed	12,220	124
1117129	Fulton Financial Corporation	1	Listed	11,965	120
1075612	First Citizens Bancshares, Inc.	1	Listed	11,562	66
1049341	Commerce Bancshares, Inc.	1	Listed	11,472	109
1020902	First National Of Nebraska, Inc.	1	Unlisted	11,426	249
1048773	Valley National Bancorp	1	Listed	10,055	29
1141599	South Financial Group, Inc., The	1	Listed	9,987	344
1097614	Bancorpsouth, Inc.	1	Listed	9,749	56
1888193	Wilmington Trust Corporation	1	Listed	9,568	116
1117156	Susquehanna Bancshares, Inc.	1	Listed	9,540	64
1111435	State Street Corporation	1	Listed	9,113	-
1079740	Whitney Holding Corporation	1	Listed	8,942	135
1205688	Citizens Republic Bancorp, Inc.	1	Unlisted	8,939	282
1102367	Cullen/Frost Bankers, Inc.	1	Listed	8,736	38
2694814	UCBH Holdings, Inc.	1	Listed	8,480	223
1118797	First Banks, Inc.	1	Unlisted	8,373	368
2734233	East West Bancorp, Inc.	1	Listed	8,070	231
1839319	Privatebancorp, Inc.	1	Listed	7,941	190
2260406	Wintrust Financial Corporation	1	Listed	7,630	57
1095674	Arvest Bank Group, Inc.	1	Unlisted	7,573	62
1843080	Cathay General Bancorp	1	Listed	7,340	104
1070804	Firstmerit Corporation	1	Listed	7,333	59
3212091	New York Private Bank & Trust Corporation	1	Unlisted	7,271	47
1079562	Trustmark Corporation	2	Listed	6,866	76
1025309	Bank of Hawaii Corporation	1	Listed	6,428	61
1117026	National Penn Bancshares, Inc.	2	Listed	6,244	32

Appendix 1 (cont.). List of BHCs used in this study. Data as of December 31st 2008; figures are in USD Millions.

RSSD ID	BHC Designation	Peer Group	Listed / Unlisted	Net Loans and Leases	Provision for Loan and Lease Losses
1090987	MB Financial, Inc.	2	Listed	6,085	126
2747644	Umpqua Holdings Corporation	2	Listed	6,058	108
1076217	United Bankshares, Inc.	2	Listed	5,954	25
1094314	Central Bancompany	2	Unlisted	5,886	31
1104231	International Bancshares Corporation	1	Listed	5,799	20
3005332	F.N.B. Corporation	2	Listed	5,726	72
1020180	Bremer Financial Corporation	2	Unlisted	5,695	42
1029884	Pacific Capital Bancorp	2	Listed	5,635	218
2477754	Investors Bancorp, Mhc	2	Listed	5,635	18
1249347	United Community Banks, Inc.	2	Listed	5,603	184
1031449	SVB Financial Group	2	Listed	5,399	101
1208184	First Midwest Bancorp, Inc.	2	Listed	5,264	70
1075911	First Citizens Bancorporation, Inc.	2	Unlisted	4,954	32
1098303	Old National Bancorp	2	Listed	4,711	51
1123670	First Interstate Bancsystem, Inc.	2	Unlisted	4,682	33
1247334	Capitol Bancorp Ltd.	2	Listed	4,653	82
2706735	Texas Capital Bancshares, Inc.	2	Listed	4,480	27
3133637	Provident Financial Services, Inc.	2	Listed	4,479	15
1490701	Johnson Financial Group, Inc.	2	Unlisted	4,466	22
1142336	Park National Corporation	2	Listed	4,391	70
1071306	First Commonwealth Financial Corporation	2	Listed	4,366	23
1049828	UMB Financial Corporation	1	Listed	4,358	18
1247633	Provident Bankshares Corporation	2	Listed	4,285	38
1199732	Irwin Financial Corporation	2	Listed	4,244	331
2107707	Dickinson Financial Corporation II	2	Unlisted	4,214	158
1086533	Hancock Holding Company	2	Listed	4,210	37
2003975	Glacier Bancorp, Inc.	2	Listed	4,053	28
2349815	Western Alliance Bancorporation	2	Unlisted	4,021	68
1060627	Firstbank Holding Company	2	Unlisted	3,999	33
1022764	Central Pacific Financial Corp.	2	Listed	3,950	172
2894230	Discount Bancorp, Inc.	2	Unlisted	3,937	18
2875332	Pacwest Bancorp	2	Unlisted	3,925	49
1427239	Eastern Bank Corporation	2	Unlisted	3,895	40
2126977	Banner Corporation	2	Listed	3,886	63
1200393	Corus Bankshares, Inc.	2	Listed	3,836	588
1053272	Pinnacle Bancorp, Inc.	2	Unlisted	3,771	10
2291914	Iberiabank Corporation	2	Listed	3,767	13
1105425	Sterling Bancshares, Inc.	2	Listed	3,745	29
1029222	CVB Financial Corp.	2	Listed	3,683	27
1208559	First Merchants Corporation	2	Listed	3,677	28
1031346	Frontier Financial Corporation	2	Listed	3,666	122
1208661	Amcore Financial, Inc.	2	Listed	3,656	203
1117192	Harleysville National Corporation	2	Listed	3,635	16
1139279	NBT Bancorp Inc.	2	Listed	3,593	27
1070448	Wesbanco, Inc.	2	Listed	3,563	33
1245620	Bank Leumi Le-Israel Corporation	2	Unlisted	3,562	15
1109599	Prosperity Bancshares, Inc.	2	Listed	3,530	10
1071397	S & T Bancorp, Inc.	2	Listed	3,526	13
2925657	Pinnacle Financial Partners, Inc.	2	Listed	3,344	11
1136661	Ocean Bankshares, Inc.	2	Unlisted	3,326	188
2900261	Hanmi Financial Corporation	2	Listed	3,291	73
1199602	1st Source Corporation	2	Listed	3,265	17
1029464	W.T.B. Financial Corporation	2	Unlisted	3,196	55
1203602	First Busey Corporation	2	Listed	3,159	98
1247893	Plains Capital Corporation	2	Unlisted	3,134	13
2495039	Taylor Capital Group, Inc.	2	Listed	3,105	144
1048867	Community Bank System, Inc.	2	Listed	3,097	8
1135972	Mercantil Commercebank Holding Corporation	2	Unlisted	3,035	77
1201934	Chemical Financial Corporation	2	Listed	2,933	49
1106516	First National Bank Group, Inc.	2	Unlisted	2,804	10

Appendix 1 (cont.). List of BHCs used in this study. Data as of December 31st 2008; figures are in USD Millions.

RSSD ID	BHC Designation	Peer Group	Listed / Unlisted	Net Loans and Leases	Provision for Loan and Lease Losses
3114654	Imperial Capital Bancorp, Inc	2	Unlisted	2,755	78
1133286	Bancfirst Corporation	2	Listed	2,724	11
1139242	Sun Bancorp, Inc	2	Listed	2,703	20
1364071	First State Bancorporation	2	Listed	2,676	72
1071276	First Financial Bancorp	2	Listed	2,651	19
1136803	Independent Bank Corp.	2	Listed	2,622	11
3012554	Hampton Roads Bankshares, Inc.	2	Listed	2,570	1
1064278	Intrust Financial Corporation	2	Unlisted	2,568	8
1098844	Renasant Corporation	2	Listed	2,538	23
1062621	Southwest Bancorp, Inc.	3	Listed	2,512	19
1209828	Midwest Banc Holdings, Inc.	2	Listed	2,465	72
1248304	Sandy Spring Bancorp, Inc.	2	Listed	2,452	33
1201925	Independent Bank Corporation	3	Listed	2,436	68
1132654	Integra Bank Corporation	2	Listed	2,432	66
1136670	Riverside Banking Company	2	Unlisted	2,390	81
1206546	Heartland Financial Usa, Inc.	2	Listed	2,389	29
1025541	Westamerica Bancorporation	2	Listed	2,338	3
1204627	Metropolitan Bank Group, Inc.	2	Unlisted	2,321	11
1070644	Community Trust Bancorp, Inc.	3	Listed	2,318	11
1097025	Republic Bancorp, Inc.	2	Listed	2,300	16
1133437	SCBT Financial Corporation	3	Listed	2,300	11
2856377	Virginia Commerce Bancorp, Inc.	3	Listed	2,279	25
1029428	First Regional Bancorp	3	Listed	2,274	92
1206911	Old Second Bancorp, Inc.	3	Listed	2,265	19
2502049	Stellarone Corporation	3	Unlisted	2,250	21
1401109	American Chartered Bancorp, Inc.	2	Unlisted	2,192	36
2078816	Columbia Banking System, Inc.	2	Listed	2,192	41
1076431	First Bancorp	3	Listed	2,183	10
1133277	Green Bankshares, Inc.	3	Listed	2,175	53
1061679	Alpine Banks of Colorado	3	Unlisted	2,084	8
1200692	Parkway Bancorp, Inc.	3	Unlisted	2,082	8
1053580	Farmers & Merchants Investment, Inc.	3	Unlisted	2,078	5
2961879	Nara Bancorp, Inc.	3	Listed	2,065	49
1029893	West Coast Bancorp	3	Listed	2,039	47
1199974	First American Bank Corporation	3	Unlisted	2,027	40
1404799	Lakeland Bancorp, Inc.	3	Listed	2,010	24
1050712	Valley View Bancshares, Inc.	2	Unlisted	2,002	6
1107205	Amarillo National Bancorp, Inc.	3	Unlisted	1,992	18
1097089	Bank of the Ozarks Inc.	2	Listed	1,992	19
1249598	Orion Bancorp, Inc.	3	Unlisted	1,988	14
1060328	Cobiz Financial Inc.	3	Listed	1,988	40
1209109	Mainsource Financial Group, Inc.	3	Listed	1,966	21
2303910	Enterprise Financial Services Corp	3	Listed	1,948	22
1137770	Woodforest Financial Group, Inc.	3	Unlisted	1,948	11
1201671	BTC Financial Corporation	3	Unlisted	1,930	22
3142349	Midamerica Financial Corporation	3	Unlisted	1,930	22
1848003	Cascade Bancorp	3	Listed	1,924	85
2244358	Security Bank Corporation	3	Listed	1,922	128
1085509	Capital City Bank Group, Inc.	3	Listed	1,921	32
1094828	Simmons First National Corporation	3	Listed	1,918	9
1491409	Home Bancshares, Inc.	3	Unlisted	1,916	27
2611718	Amboy Bancorporation	3	Unlisted	1,884	15
1971693	Union Bankshares Corporation	3	Listed	1,878	10
1245590	Standard Bancshares, Inc.	3	Unlisted	1,863	11
2608763	Mercantile Bank Corporation	3	Unlisted	1,830	21
1115349	Washington Trust Bancorp, Inc.	3	Listed	1,818	5
1208906	Lakeland Financial Corporation	3	Listed	1,815	10
3101784	Liberty Bancshares, Inc	3	Unlisted	1,803	19
2367921	Tompkins Financial Corporation	3	Listed	1,799	5
1486517	Chinatrust Capital Corporation	3	Unlisted	1,794	69

Appendix 1 (cont.). List of BHCs used in this study. Data as of December 31st 2008; figures are in USD Millions.

RSSD ID	BHC Designation	Peer Group	Listed / Unlisted	Net Loans and Leases	Provision for Loan and Lease Losses
1076262	City Holding Company	3	Listed	1,790	10
3254952	Guaranty Bancorp	3	Listed	1,787	34
2033226	South Plains Financial, Inc.	3	Unlisted	1,784	18
1026801	Fremont Bancorporation	3	Unlisted	1,750	14
2634696	Macatawa Bank Corporation	3	Unlisted	1,738	37
2339133	Great Southern Bancorp, Inc.	3	Listed	1,722	52
3003178	Center Financial Corporation	3	Listed	1,691	15
1417333	State Bankshares, Inc.	3	Unlisted	1,682	13
1427501	Community Bankshares, Inc.	3	Unlisted	1,680	33
1048803	Hudson Valley Holding Corp.	3	Unlisted	1,678	11
1048997	Smithtown Bancorp, Inc.	3	Listed	1,677	3
2049302	Intervest Bancshares Corporation	3	Unlisted	1,677	11
1080595	Community Bancshares Of Mississippi, Inc.	3	Unlisted	1,677	3
1082067	Ameris Bancorp	3	Listed	1,656	35
1085013	Seacoast Banking Corporation Of Florida	3	Listed	1,650	89
1364110	Vineyard National Bancorp	3	Unlisted	1,643	109
1132104	First South Bancorp, Inc.	3	Listed	1,617	21
1199992	Shorebank Corporation, The	3	Unlisted	1,610	25
1031627	Americanwest Bancorporation	3	Listed	1,598	89
1133473	FNB United Corp.	3	Unlisted	1,588	27
1067804	Hillcrest Bancshares, Inc.	3	Unlisted	1,576	36
1030170	Trico Bancshares	3	Listed	1,563	21
3047109	New Frontier Bancorp	3	Unlisted	1,547	38
1102312	First Financial Bankshares, Inc.	2	Listed	1,545	8
1096505	First Security Bancorp	3	Unlisted	1,542	4
2158156	Central Bancshares, Inc.	3	Unlisted	1,537	8
2942702	Sturm Financial Group, Inc.	3	Unlisted	1,514	21
1138012	Banctrust Financial Group, Inc.	3	Listed	1,503	15
2687795	Cambridge Financial Group, Inc.	3	Unlisted	1,496	3
1097306	Bancplus Corporation	3	Unlisted	1,491	7
1130249	Camden National Corporation	3	Listed	1,483	4
1058398	Durant Bancorp, Inc.	3	Unlisted	1,482	8
1245291	Hills Bancorporation	3	Unlisted	1,478	12
2807614	Pennsylvania Commerce Bancorp, Inc.	3	Listed	1,464	7
1204560	First Bancshares, Inc.	3	Unlisted	1,461	8
1208595	First Financial Corporation	3	Listed	1,455	8
1116609	Univest Corporation Of Pennsylvania	3	Listed	1,437	9
1063262	First Olathe Bancshares, Inc.	3	Unlisted	1,436	22
2858951	Bancorp, Inc., The	3	Listed	1,432	13
1081118	Fidelity Southern Corporation	3	Unlisted	1,410	37
2532402	Sinopac Bancorp	3	Unlisted	1,409	29
1141348	Minnwest Corporation	3	Unlisted	1,395	12
1492219	First Mutual Bancorp of Illinois, Inc.	3	Unlisted	1,377	76
3102585	Temecula Valley Bancorp Inc.	3	Unlisted	1,373	39
2705943	Cnlbancshares, Inc.	3	Unlisted	1,361	17
2233950	Olney Bancshares of Texas, Inc.	3	Unlisted	1,347	4
1249730	S. Y. Bancorp, Inc.	3	Listed	1,338	4
1059715	American National Corporation	3	Unlisted	1,335	21
3124381	Community Bancorp	3	Listed	1,332	66
1249712	Porter Bancorp, Inc.	3	Unlisted	1,330	5
2344799	Metrocorp Bancshares, Inc.	3	Unlisted	1,325	13
1099328	Mercantile Bancorp, Inc.	3	Unlisted	1,321	24
1141647	Star Financial Group, Inc.	3	Unlisted	1,308	6
1100037	Cadence Financial Corporation	3	Listed	1,308	29
2981831	Southern Community Financial Corporation	3	Unlisted	1,296	8
1098732	Farmers Capital Bank Corporation	3	Listed	1,296	5
1207431	Stark Bank Group, Ltd.	3	Unlisted	1,295	26
2509413	Rockville Financial Mhc, Inc.	3	Listed	1,292	2
2592714	Hometown Community Bancorp, Inc.	3	Unlisted	1,285	-
1478017	First Community Bancshares, Inc.	3	Listed	1,283	7

Appendix 1 (cont.). List of BHCs used in this study. Data as of December 31st 2008; figures are in USD Millions.

RSSD ID	BHC Designation	Peer Group	Listed / Unlisted	Net Loans and Leases	Provision for Loan and Lease Losses
2682996	Cardinal Financial Corporation	3	Listed	1,282	5
2345068	Legacytexas Group, Inc.	3	Unlisted	1,276	8
1399765	1867 Western Financial Corporation	3	Unlisted	1,268	5
1109991	North American Bancshares, Inc.	3	Unlisted	1,267	6
2332750	Capital Corp of the West	3	Listed	1,255	55
2326629	ANB Corporation, The	3	Unlisted	1,252	6
2867542	Premierwest Bancorp	3	Listed	1,243	23
2741156	Capital Bank Corporation	3	Unlisted	1,240	4
2568362	Cascade Financial Corporation	3	Unlisted	1,239	7
1121229	Dacotah Banks, Inc.	3	Unlisted	1,235	2
1245705	West Suburban Bancorp, Inc.	3	Unlisted	1,234	10
1039454	Sterling Bancorp	3	Listed	1,229	8
1919770	Big Sandy Holding Company	3	Unlisted	1,224	8
1056161	Trinity Capital Corporation	3	Unlisted	1,224	8
2634874	Heritage Commerce Corp	3	Listed	1,224	16
2457943	TIB Financial Corp.	3	Unlisted	1,203	26
2125813	QCR Holdings, Inc.	3	Unlisted	1,197	11
1123072	Fishback Financial Corporation	3	Unlisted	1,197	8
1247679	Summit Financial Group, Inc.	3	Unlisted	1,193	16
2306649	Premier Bancshares, Inc.	3	Unlisted	1,191	40
2343662	Horizon Financial Corp.	3	Listed	1,189	27
1095982	First M & F Corporation	3	Unlisted	1,159	20
1966671	Whitaker Bank Corporation Of Kentucky	3	Unlisted	1,159	9
1209145	Bridgeview Bancorp, Inc.	3	Unlisted	1,157	13
2781910	Farmers & Merchants Bancorp	3	Unlisted	1,157	8
1075984	Palmetto Bancshares, Inc.	3	Unlisted	1,155	6
1134322	Firstbank Corporation	3	Unlisted	1,146	8
2325350	Lone Star National Bancshares--Texas, Inc.	3	Unlisted	1,143	11
1207486	Marquette National Corporation	3	Unlisted	1,135	6
3434624	Banorte Usa Corporation	3	Unlisted	1,121	5
1132672	First United Corporation	3	Unlisted	1,120	13
1081873	Community Bankshares, Inc.	3	Unlisted	1,110	25
2066886	Rogers Bancshares, Inc.	3	Unlisted	1,109	15
1205398	Bank of Highland Park Financial Corporation	3	Unlisted	1,107	3
2704562	Danvers Bancorp, Inc.	3	Unlisted	1,107	4
1138861	State Bancorp, Inc.	3	Listed	1,104	17
1032464	Financial Institutions, Inc.	3	Listed	1,103	7
3186585	Peoplesbancorp, Mhc	3	Unlisted	1,099	0
1048812	Arrow Financial Corporation	3	Listed	1,097	2
2697347	FVNB Corp.	3	Unlisted	1,088	4
1210066	West Bancorporation, Inc.	3	Listed	1,086	17
1130865	Suffolk Bancorp	3	Listed	1,084	2
1070578	Peoples Bancorp Inc.	3	Listed	1,082	28
2004141	Wilson Bank Holding Company	3	Unlisted	1,081	7
1133503	Canandaigua National Corporation	3	Unlisted	1,077	4
1123915	Klein Financial, Inc.	3	Unlisted	1,076	5
1054514	Landrum Company	3	Unlisted	1,068	7
2896458	Bancorp Rhode Island, Inc.	3	Unlisted	1,063	5
1126046	Stockman Financial Corporation	3	Unlisted	1,061	3
1106879	Broadway Bancshares, Inc.	3	Unlisted	1,053	5
1055315	F & M Bancorporation Inc.	3	Unlisted	1,049	7
2651590	Peapack-Gladstone Financial Corporation	3	Listed	1,043	2
2322304	First Mariner Bancorp	3	Unlisted	1,022	15
2291624	Bank of Kentucky Financial Corporation, The	3	Unlisted	1,019	5
1245068	Southside Bancshares, Incorporated	3	Listed	1,007	14
2038409	Hawthorn Bancshares, Inc	3	Unlisted	996	8
2836801	First Security Group, Inc.	3	Unlisted	994	16
1491360	First Bank Corp	3	Unlisted	994	8
1938865	Southeastern Bank Financial Corporation	3	Unlisted	991	9
1206591	Centrue Financial Corporation	3	Unlisted	990	8

Appendix 1 (cont.). List of BHCs used in this study. Data as of December 31st 2008; figures are in USD Millions.

RSSD ID	BHC Designation	Peer Group	Listed / Unlisted	Net Loans and Leases	Provision for Loan and Lease Losses
1103177	American State Financial Corporation	3	Unlisted	984	8
1126475	Anchor Bancorp, Inc.	3	Unlisted	981	12
1202052	NEB Corporation	3	Unlisted	980	3
1128358	Frandsen Financial Corporation	3	Unlisted	973	4
1133932	First Bancorp, Inc., The	3	Unlisted	972	5
1249002	Fidelity Bancshares (N.C.), Inc.	3	Unlisted	966	2
1134498	Inwood Bancshares, Inc.	3	Unlisted	959	1
2560263	First National Community Bancorp Inc	3	Unlisted	958	3
1066713	Sunflower Banks, Inc.	3	Unlisted	953	2
1085170	Colony Bankcorp, Inc.	3	Unlisted	944	13
1143481	Bank of Granite Corporation	3	Listed	940	30
1083934	Pab Bankshares, Inc.	3	Unlisted	937	18
2976396	Sierra Bancorp	3	Listed	930	19
2907822	MBT Financial Corp.	3	Unlisted	923	18
2835514	Boiling Springs, MHC	3	Unlisted	909	7
1140510	Alliance Financial Corporation	3	Unlisted	902	6
2388878	Beacon Bancorp	3	Unlisted	900	2
2149622	National Bank of Indianapolis Corporation, The	3	Unlisted	891	7
1098620	German American Bancorp, Inc.	3	Unlisted	884	4
1136139	Vist Financial Corp.	3	Unlisted	880	5
2868129	Centerstate Banks of Florida, Inc.	3	Unlisted	879	7
1209136	Horizon Bancorp	3	Unlisted	877	8
1427275	Stearns Financial Services, Inc.	3	Unlisted	847	48
2378440	Columbia Bancorp	3	Unlisted	839	43
1023239	Merchants Bancshares, Inc.	3	Unlisted	838	1
2869733	Pacific Mercantile Bancorp	3	Unlisted	834	16
1135824	Emprise Financial Corporation	3	Unlisted	833	2
1111088	Century Bancorp, Inc.	3	Unlisted	825	4
2947882	National Bancshares, Inc.	3	Unlisted	815	5
1057588	Commerce Bank And Trust Holding Company	3	Unlisted	809	9
1207600	Princeton National Bancorp, Inc.	3	Unlisted	788	3
1081239	Crews Banking Corporation	3	Unlisted	784	9
1398807	Republic First Bancorp, Inc.	4	Unlisted	775	7
3186576	Citizens National Banc Corp.	3	Unlisted	741	2
2066868	Banc Ed Corp., The	3	Unlisted	740	2
1143623	Citizens and Northern Corporation	3	Unlisted	736	1
1066209	Lauritzen Corporation	3	Unlisted	728	8
1126354	Minnehaha Banshares, Inc.	3	Unlisted	728	7
1202708	Baylake Corp.	3	Unlisted	716	18
1075694	Southern Bancshares (N.C.), Inc.	3	Unlisted	711	2
2293329	Prosperity Banking Company, The	3	Unlisted	704	25
1143762	Founders Group, Inc.	3	Unlisted	700	18
2324429	Royal Bancshares of Pennsylvania, Inc.	3	Unlisted	672	22
1048764	Center Bancorp, Inc.	3	Unlisted	670	2
1130584	RCB Holding Company, Inc.	3	Unlisted	654	2
2803719	Midwest Bankcentre, Inc.	3	Unlisted	650	3
1204814	SBC, Incorporated	4	Unlisted	642	14
3100358	Florida Community Banks, Inc.	4	Unlisted	598	60
2467689	Commerce Bancshares Corp.	3	Unlisted	580	3

Appendix 2. Descriptive statistics for the dependent variable and for bank-specific determinants of BHCs' credit losses in 2008 – Subset I.

Variable	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	# of Obs.
$PLLL_{08}$	1.63%	1.09%	13.31%	0.00%	1.63%	3.216	18.014	142
$SAIRLL_{04-07}$	2.83%	2.73%	6.28%	-1.10%	0.88%	0.136	4.828	142
$LPGR_{05-07}$	11.41%	9.54%	49.53%	-3.52%	8.65%	1.677	4.345	142
$PCLDOLL_{07}$	15.18%	12.78%	82.95%	0.00%	11.59%	1.853	7.475	142
PCL_{07}	6.75%	4.00%	27.12%	0.03%	6.60%	1.048	0.079	142
$PRLL_{07}$	0.11%	0.00%	4.91%	0.00%	0.54%	7.189	54.498	142
$AT1CR_{04-07}$	10.81%	10.45%	29.23%	-4.68%	2.94%	1.030	15.431	142
$PRCES_{08}$	0.08%	0.00%	2.75%	0.00%	0.37%	5.773	35.294	142
PFL_{07}	1.97%	0.00%	55.23%	0.00%	7.24%	5.263	30.579	142
$PDNALPR_{07}$	91.69%	66.70%	1019.12%	2.68%	108.30%	5.970	43.934	142
$GWIL_{08}$	0.2183	-	1.0000	-	0.4146	1.378	(0.102)	142
AF_{08}	0.7606	1.0000	1.0000	-	0.4283	(1.234)	(0.484)	142

Appendix 2 (cont.). Descriptive statistics for the dependent variable and for bank-specific determinants of BHCs' credit losses in 2008 – Subset II.

Variable	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	# of Obs.
$PLLL_{08}$	1.25%	0.82%	8.54%	0.00%	1.25%	2.399	7.524	207
$SAIRLL_{04-07}$	3.22%	3.13%	5.91%	1.71%	0.67%	0.658	1.367	207
$LPGR_{05-07}$	13.78%	11.81%	55.88%	-8.38%	9.76%	1.604	4.548	207
$PCLDOLL_{07}$	19.48%	16.66%	75.21%	0.34%	13.44%	1.118	1.370	207
PCL_{07}	5.21%	3.12%	51.25%	0.02%	6.79%	3.047	13.207	207
$PRLL_{07}$	0.09%	0.00%	4.61%	0.00%	0.38%	9.195	100.052	207
$AT1CR_{04-07}$	11.55%	11.08%	33.64%	7.30%	2.86%	2.965	17.372	207
$PRCES_{08}$	0.03%	0.00%	6.12%	0.00%	0.43%	14.103	201.154	207
PFL_{07}	0.11%	0.00%	4.47%	0.00%	0.53%	6.155	41.274	207
$PDNALPR_{07}$	92.08%	65.32%	750.31%	9.68%	95.02%	3.831	18.576	207
$GWIL_{08}$	0.0821	-	1.0000	-	0.2752	3.066	7.474	207
AF_{08}	0.1884	-	1.0000	-	0.3920	1.605	0.583	207

Appendix 3. Correlation coefficients between the dependent variable (BHCs' credit losses) and potential explanatory variables. This table is reported to the total sample.

	$PLLL_{08}$	$GDPGR_{08}$	$HPIPOV_{08}$	$SAIRLL_{04\text{-}07}$	$LPGR_{05\text{-}07}$	$PCLDOLL_{07}$	PCL_{07}	$PRLL_{07}$	$AT1CR_{04\text{-}07}$	$PRCES_{08}$	PFL_{07}	$PDNALPR_{07}$	AF_{08}
$PLLL_{08}$	1.0000												
$GDPGR_{08}$	-0.2636	1.0000											
$HPIPOV_{08}$	-0.3138	0.4964	1.0000										
$SAIRLL_{04\text{-}07}$	0.4094	0.0327	-0.1655	1.0000									
$LPGR_{05\text{-}07}$	0.1537	0.0069	-0.1627	0.2422	1.0000								
$PCLDOLL_{07}$	0.4643	-0.0073	-0.0910	0.5706	0.3390	1.0000							
PCL_{07}	-0.0855	-0.0445	0.0620	-0.1864	-0.2268	-0.3342	1.0000						
$PRLL_{07}$	0.3607	-0.1066	-0.0537	0.1805	-0.0311	0.2340	-0.0671	1.0000					
$AT1CR_{04\text{-}07}$	-0.1345	0.0309	0.0612	0.0000	0.0038	-0.0915	0.0057	-0.0128	1.0000				
$PRCES_{08}$	0.0220	0.0258	0.0486	-0.0374	-0.0700	-0.1310	0.1223	-0.0087	0.1687	1.0000			
PFL_{07}	0.0475	-0.0038	0.0104	-0.1872	0.0005	-0.1865	-0.0175	-0.0304	-0.0775	0.1197	1.0000		
$PDNALPR_{07}$	-0.2189	0.0919	-0.0780	-0.1555	0.0599	-0.1177	-0.0850	-0.0919	0.1007	-0.0385	0.0879	1.0000	
AF_{08}	0.1376	0.0063	-0.0282	-0.3070	-0.1975	-0.1904	0.1396	0.0859	-0.0139	0.1107	0.1172	0.0397	1.0000

Appendix 3 (cont.). Correlation coefficients between the dependent variable (BHCs' credit losses) and potential explanatory variables. This table reports to Subset I, which includes BHCs classified in peers 1 and 2 as of December 31st 2008.

	$PLLL_{08}$	$GDPGR_{08}$	$HPIPOV_{08}$	$SAIRLL_{04\text{-}07}$	$LPGR_{05\text{-}07}$	$PCLDOLL_{07}$	PCL_{07}	$PRLL_{07}$	$AT1CR_{04\text{-}07}$	$PRCES_{08}$	PFL_{07}	$PDNALPR_{07}$	AF_{08}
$PLLL_{08}$	1.0000												
$GDPGR_{08}$	-0.3433	1.0000											
$HPIPOV_{08}$	-0.1824	0.4460	1.0000										
$SAIRLL_{04\text{-}07}$	0.3925	0.0058	-0.1219	1.0000									
$LPGR_{05\text{-}07}$	0.0195	0.0668	-0.1845	0.0860	1.0000								
$PCLDOLL_{07}$	0.5062	0.0064	0.0242	0.5083	0.1990	1.0000							
PCL_{07}	-0.0950	-0.0542	0.0709	-0.1688	-0.3240	-0.3767	1.0000						
$PRLL_{07}$	0.5814	-0.1964	-0.1020	0.2696	-0.0205	0.3836	-0.0737	1.0000					
$AT1CR_{04\text{-}07}$	-0.1046	0.0399	0.0404	0.0318	0.1380	0.0633	-0.1247	0.0745	1.0000				
$PRCES_{08}$	0.0471	0.0406	0.0461	-0.0236	0.0255	-0.1709	0.1785	-0.0033	-0.4185	1.0000			
PFL_{07}	0.0380	0.0111	0.0268	-0.1963	0.0563	-0.2725	-0.0596	-0.0454	-0.0862	0.1940	1.0000		
$PDNALPR_{07}$	-0.1899	0.0950	-0.2112	-0.1524	0.2370	-0.1481	-0.0629	-0.0926	0.1315	-0.0976	0.1336	1.0000	
AF_{08}	0.1377	0.0364	-0.0603	-0.1873	-0.1876	-0.1624	0.1036	0.0848	-0.0977	-0.0011	0.0162	-0.0104	1.0000

Appendix 3 (cont.). Correlation coefficients between the dependent variable (BHCs' credit losses) and potential explanatory variables. This table reports to Subset II, which includes BHCs classified in peers 3 and 4 as of December 31st 2008.

	$PLLL_{08}$	$GDPGR_{08}$	$HPIPOV_{08}$	$SAIRLL_{04-07}$	$LPGR_{05-07}$	$PCLDOLL_{07}$	PCL_{07}	$PRLL_{07}$	$AT1CR_{04-07}$	$PRCES_{08}$	PFL_{07}	$PDNALPR_{07}$	AF_{08}
$PLLL_{08}$	1.0000												
$GDPGR_{08}$	-0.2144	1.0000											
$HPIPOV_{08}$	-0.4349	0.5268	1.0000										
$SAIRLL_{04-07}$	0.5377	0.0335	-0.2266	1.0000									
$LPGR_{05-07}$	0.2989	-0.0306	-0.1557	0.3350	1.0000								
$PCLDOLL_{07}$	0.5073	-0.0259	-0.1648	0.6125	0.3916	1.0000							
PCL_{07}	-0.1092	-0.0317	0.0604	-0.1648	-0.1526	-0.2916	1.0000						
$PRLL_{07}$	0.0817	-0.0437	-0.0086	0.0947	-0.0362	0.1364	-0.0699	1.0000					
$AT1CR_{04-07}$	-0.1363	0.0171	0.0724	-0.0916	-0.1052	-0.2228	0.1189	-0.0940	1.0000				
$PRCES_{08}$	-0.0094	0.0232	0.0521	-0.0255	-0.1100	-0.0996	0.0818	-0.0166	0.5395	1.0000			
PFL_{07}	-0.0779	-0.0031	-0.0374	-0.0402	-0.1114	-0.0308	-0.0461	-0.0273	0.0122	-0.0165	1.0000		
$PDNALPR_{07}$	-0.2527	0.0924	0.0234	-0.1706	-0.0613	-0.1024	-0.1028	-0.0923	0.0772	0.0007	-0.0216	1.0000	
AF_{08}	0.0214	0.0456	0.0068	-0.2324	-0.1357	-0.0930	0.0847	0.0906	0.1990	0.1588	-0.0361	0.1007	1.0000