Profitability Performance of Banks in the EU: 
A Cross Country Analysis from 2009-2010

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I. Introduction................................................................................................................. 5
II. Literature Review.................................................................................................... 12
III. Data Description.................................................................................................... 20
IV. Hypothesis............................................................................................................ 38
V. Results.................................................................................................................... 44
VI. Conclusion............................................................................................................ 63

References................................................................................................................ 64

Figures
1. Real GDP Growth, 2008-10.................................................................................. 22
2. Return on Equity, 2008-10.................................................................................. 22
3. Change in Non-Performing Loans to Total Gross Loans & Total Debt Instruments, 2008-10........................................................................................................... 23
4. Percent Change in House Prices, 2008-10.............................................................. 25
5. Percent Change in Value Added Construction in GDP, 2008-10.............................. 27
6. House Prices and Value Added Construction/GDP in Germany, 2006-10............. 28
8. Net Foreign Assets as a Percent of GDP, 2008-10................................................... 33
9. Change in RoE and GDP Growth, 2009.................................................................. 47
10. Change in RoE and GDP Growth, 2010................................................................. 47
11. Change in NPL Ratio and GDP Growth, 2009...................................................... 48
12. Change in NPL Ratio and GDP Growth, 2010...................................................... 48
13. Change in RoE and House Prices, 2009............................................................... 54
14. Change in RoE and House Prices, 2010............................................................... 54
15. Change in NPL Ratio and House Prices, 2009...................................................... 55
16. Change in NPL Ratio and House Prices, 2010...................................................... 55
17. Change in RoE and Value Added Construction/GDP, 2009................................. 56
18. Change in RoE and Value Added Construction/GDP, 2010................................. 56
19. Change in NPL Ratio and Value Added Construction/GDP, 2009....................... 57
20. Change in NPL Ratio and Value Added Construction/GDP, 2010....................... 57
27. Change in NPL Ratio in 2009 and Net Foreign Assets/GDP in 2008
28. Change in NPL Ratio in 2010 and Net Foreign Assets/GDP in 2009
29. Changes in Net Interest Income and Non-Interest Income as % of Total Assets, 2009 (Percentage Points)
30. Changes in Net Interest Income and Non-Interest Income as % of Total Assets, 2010 (Percentage Points)

Tables
1. Relationship Between Bank Profitability and GDP Growth, 2009-2010
2. Change in Return on Equity, 2009
3. Change in Return on Equity, 2010
4. Change in the Non-Performing Loan Ratio, 2009 and 2010
5. Determinants in the Changes in Return on Equity, 2009 and 2010
Introduction

The purpose of many financial innovations is to give the private sector access to inexpensive capital. However, unregulated financial products led to unchecked investor risk and ultimately triggered a financial storm that left banks in Europe under stress since 2008. Developments in the interconnected banking sector exposed the existence of a negative feedback loop between the financial sector and the real economy, with the financial crisis inducing a contraction in economic activity in late 2008 and early 2009.

The impact of the most recent global financial crisis on bank profitability has not been analyzed broadly for the European Union. This study aims to describe the decline in bank profitability and increase in non-performing loans following the crisis at a cross-country level. Also, it highlights the differences in performance between 2009 and 2010. In addition to GDP growth, several variables designed to capture the causes and effects of the global financial crisis are included. Delving deeper into the global financial crisis by using crisis-specific variables allows us to better pinpoint the transmission channel of economic slowdown that eroded balance sheets in the European Union.

Before the extent of the financial crisis can be appreciated, it is important to examine the events that preceded the crisis around the world. The origins of the 2008 global financial crisis can be traced back to the bursting of the dot com bubble in 2000 and the horrible terrorist attacks of September 11, 2001. To stave off a larger recession, the Federal Reserve cut interest rates to historic lows. In the mean time, emerging Asian economies and oil-rich nations were entering into a time of fantastic economic abundance. Consumption in these economies lagged behind rising income levels. For example, China ran huge trade surpluses with the U. S. and other developed countries, which helped them accumulate over $1 trillion in foreign reserves. They
used these reserves to purchase U.S. stocks, bonds and Treasury bills, both to peg their exchange rates at an export-friendly level and to hedge against the depreciation of their own currencies against the dollar (Brunnermeier 2009). The net inflow of foreign saving to the United States, which was about 1-1/2 percent of our national output in 1995, reached about 6 percent of national output in 2006 (Bernanke, 2009a). This foreign subsidized liquidity combined with low U.S. interest rates fueled the credit bubble. Easy credit conditions meant that obtaining a loan was cheap, especially a housing loan. The Federal government, starting with the Clinton administration's Mortgage Reinvestment Act, was pushing mortgage loans to as many people as possible. Home ownership reached a record high of 69% in 2004.

Lending standards around this time were quite poor. Rose and Spiegel (2009) note that weaknesses exposed in national and international financial regulatory frameworks were one of the potential causes of the global financial crisis. According to White (2008), the Federal Housing Administration was loosening the down-payment standards at the same time the U.S. Department of Housing and Urban Development was putting increased pressures on lenders to extend mortgages to a broader set of potential borrowers. Good mortgage customers were running out, causing brokers to enter into the lives of less credit worthy Americans. Loans to less credit worthy individuals, or subprime mortgage loans, lie at the heart of the financial crisis. In addition to these borrowers having weak credit histories, many subprime mortgages were extended without any substantial information about the borrower's income, often with no down payment, and often with tricky or adjustable terms. Background checks seemed unnecessary because house prices were only expected to rise, and the subprime borrower could simply refinance the loan by using the increased value of the house.
On the other side of the fence, investor's risk appetites increased. Demand rose for new, high-yield products. Innovative structured finance departments composed of market geeks who were located well beyond the reach of the Securities and Exchange Commission discovered a way to "securitize" these mortgages into bonds. Securitization is the process by which pools of loans, both good and bad, are bundled together, tranched, and used as collateral for securities. In this case, subprime mortgages were securitized into mortgage-backed securities (MBS's). This allowed Wall Street to transform relatively illiquid, individual financial assets into liquid and tradable capital market instruments. According to Brunnermeier (2009), in the case of default, the owners of the asset-backed security have the power to seize and sell the underlying collateral assets. In 2006, the MBS market grew to become the most important sector of the overall bond market in the United States, accounting for a third of all new bond issues.

The IMF Global Financial Stability Report in October of 2007 noted that the first problem with the U.S. subprime market was the "originate and distribute" model. Banks could choose not to hold the credit risk they originated by repackaging loans and passing them on to various other investors, thereby off-loading risk and also reducing their incentives to monitor the borrower. Also, the owner of those mortgages was no longer the original lender: the lenders had sold the MBS's off to banks and hedge funds, increasing the degree of separation between originators and the ultimate investors.

Another problem was that the complexity of these instruments limited investors' ability to monitor their risk. Investors needed to rely heavily (and often blindly) on ratings provided by credit rating agencies. Agencies like Moody's and Standard and Poor's gave MBS's investment-grade, "AAA" ratings. These loans also carried government guarantees by one of several large

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1 A mortgage bond is unlike the plain vanilla corporate or government bonds. It is a claim on the cash flows from a pool of thousands of individual home mortgages, with houses being the
government agencies: Fannie Mae, Freddie Mac and Ginnie Mae. These enterprises were publicly traded but government sponsored organizations that securitized large amounts of U.S. mortgages. If a homeowner defaulted, the government would cover their debt.

Following the U.S. housing market peak in 2005, house prices declined and levels of both defaults and delinquencies for subprime mortgages began to increase. The rise in short-term interest rates and the slowdown in the real estate market affected borrower's ability and willingness to repay these loans. Asset backed securities were then downgraded. This placed additional pressure on banks with serious exposure to mortgage-related assets to reprice the value of their MBS's. Due to the high loan to value ratios and debt to income ratios, it only took a small fall in house prices to lead to significant difficulties.

Larger than expected losses in the mortgage market first hit the news in July of 2007 when two Bear Stearns hedge funds went under. Banks around the world had to recognize significant losses on instruments where the underlying assets were subprime mortgages. This was not necessarily because those assets had fallen sharply, but because of the anticipation of additional future defaults. A small German bank called IKB was the first European bank to fall victim to the subprime crisis during the summer of 2007 (Brunnermeier 2009).

As mortgage finance became more difficult to obtain, the housing market entered into a downward spiral. According to the ECB's Financial Stability Review 2008, interbank lending ceased and banks became more dependent on the overnight market. Stocks of unsold homes rose, and house prices fell, resulting in numerous evictions, foreclosures and prolonged unemployment. By May 2008, one third of subprime mortgages were seriously delinquent or in foreclosure.
In the Fall of 2008, the true severity of the crisis began to unfold. The Treasury and the Federal Reserve spent the first weekend of September nationalizing both Fannie Mae and Freddie Mac, who hold a large portion of the many small and distressed mortgages. The next week, Lehman Brothers, the most exposed of the remaining investment banks on Wall Street, began to crumble. Since the government refused to bail out creditors, Lehman Brothers was forced to file for chapter 11 bankruptcy protection on September 15th, 2008. The liquidity stresses challenged consumer confidence in even the largest financial institutions. AIG, a "too-big-to-fail" firm was not allowed to go under. Instead, the Federal Reserve created a complex bailout plan to save it on September 16th for eighty billion dollars. The ECB's Banking Sector Stability Report (2007) noted that vulnerabilities matured in unexpected ways, resulting in disruptions in large and liquid money markets. The reserve primary fund, one of the largest and oldest money market funds, "broke the buck." It was found to have $800 million dollars of exposure to worthless Lehman commercial paper. In addition to money market dissolution, risk premiums rose sharply, and affected corporate borrowing. Central banks needed to act swiftly to restored order in financial systems.

Bernanke (2009b) notes that the crisis exposed the need for improvement in supervisory practices and internal communication, particularly the need for maintaining strong risk-management practices in good times as well as bad. In early October, Congress passed the Troubled Asset Relief Program (TARP), which forcibly injected capital into the nation's biggest banks. The Government utilized both conventional and unconventional policy measures, slashing rates to zero, then initiated two rounds of quantitative easing and the more recently implemented operation twist.
Around the world, the global interdependence of financial systems was much worse than policymakers expected. Financial problems and failures from large financial institutions like Lehman Brothers in the United States almost immediately became a serious issue for their banking counterparts throughout the world. Erhmann et al. (2009) finds that financial integration with U.S. markets played a central role in making the crisis global. The original shock in the U.S. financial system led to the disruption in the financial systems of advanced and developing European countries and others around the world. In addition to invading other economies, it gradually transmitted from the financial sector to the real economy.

According to the IMF's Global Financial Stability Report, the bank funding difficulties of the crisis were first felt in Europe. EU banks withstood adverse disturbances with continued growth in lending until September 2008. Bank's balance sheets in Europe were strong, well capitalized and resilient, and the shocks observed in the U.S. seemed manageable (ECB Bank Sector Stability Report 2007). Growth was broad based; meaning banks had lots of trading, high net interest income and high non-interest income. Banks experienced low level of impairment charges until the first half of 2007. However, this share of profits that had been due to fee and commission income (net interest income) and by trading activities is non-recurrent in nature. Even though EU banks were strong at the time the financial crisis unraveled, the crisis exposed vulnerabilities and banks could not cope with the magnitude of the crisis.

Risks continued to increase throughout 2008 on account of a broad-based decline in both global and domestic demand. Instabilities in the labor market brought about rising unemployment levels and decreasing disposable income. At the same time, corporate sector indebtedness increased, worsening the likelihood that either the households or firms would have the ability to refinance or service their debt. Potential credit losses of banks across Europe
increased, reinforcing the negative feedback loop between the financial sector and the real economy. Swift policy making by national authorities saved the financial system from total collapse. However, the European Central Bank (ECB), national governments and the IMF are still busy repairing the damage created by the crisis.

Bank profitability deteriorated in the EU as a whole from the last quarter of 2008 and the first quarter of 2009. However, some countries in the EU suffered a large contraction in economic activity, while others came off relatively lightly. The most affected countries had severe asset price bubbles, large financial sector exposures and were dependent on external capital flows because of large current account deficits. A cross-country analysis of bank profitability is useful to display the difference in performance across the European Union. Microeconomic and macroeconomic variables have been selected to determine how the crisis affected bank profitability.
The literature concerning the impact of the global financial crisis is increasing daily, although it varies across different studies in terms of economic methods and sample periods. Traditionally, research on bank profitability has been conducted on the individual bank level. During the recent decade though, the macro-prudential perspective on the stability of financial systems has gained in importance. The literature can be broken down into two categories, individual country analysis and cross-country analysis. Most of the recent cross-country empirical studies focus either on the transmission channels of the crisis, or on the impact that the crisis had on overall output. Although these cross-country comparisons tested different hypothesis, they were relevant in shaping the choice of explanatory variables for this study. The studies that focus on bank profitability concentrate their analysis on the banking system of an individual country. Their findings vary, but that can be explained through the use of different variables and data sets over different time periods.

Lane and Milesi-Ferretti (2008) attempt to understand the cross-country variation in the macroeconomic impact of the global financial crisis of 2008 and 2009 by examining initial conditions measured by pre-crisis variables. They assume that the global crisis most adversely affected production in countries that were most reliant on credit expansion during the pre-crisis period. Also, the prevalence of real estate and asset price bubbles was a key to international financial transmission. Variables such as the growth in domestic credit, as well as measures of growth in asset prices, are correlated with the subsequent declines in output growth and demand. To replicate this in their study, they focus on three crisis measures related to output, private consumption and total domestic demand using macroeconomic and financial variables including GDP per capita, the current account balance, ratio of private credit to GDP and a series
of variables intended to encompass financial openness. They found a strong link between pre-crisis domestic financial factors (fast private credit growth), external imbalances (current account deficits) and lower growth rates. In other words, growth declines relative to pre-crisis growth rates were larger in countries that were growing faster prior to the crisis.

Rose and Spiegel (2009) use hindsight to attempt to model the causes of the crisis and why it's severity differs across countries. They use variables to represent a countries population and income (GDP per capita), and a number of regulatory variables including foreign bank competition. Various measures of domestic credit growth and non-performing loans are included because during the boom, many countries experienced dramatic increases in the extension of domestic credit, both for investment and consumption, causing the leverage of firms and households to explode.

According to Rose and Spiegel (2009), the bubble in equity was paralleled by a run-up in other asset prices, especially in real estate values. It is widely agreed that the real estate boom was fueled by easy credit conditions along side of loose financial conditions. Bernanke (2009) notes that the housing boom was fueled in "large-part" by a rapid expansion in mortgage lending. As global economic activity slowed and equity prices fell, those countries that had experienced the greatest increases in equity prices during the boom period found themselves most vulnerable. Interestingly, Rose and Spiegel (2009) find that only one variable, equity market run-up prior to the crisis, is a robust predictor of crisis severity. Other plausible crisis variables like the change in real estate values or lax regulatory environment did not predict crisis severity. They acknowledge that international linkages may be opaque and not be easily quantified with observable data.
The impact of the global financial crisis has varied widely on economic activity has varied widely across countries. While originating in the advanced economies, it emanated around the rest of the world strongly. Berkmen et al. (2009) focus on revisions of GDP growth forecasts before and after the crisis to attempt to explain the difference in cross-country impact across developing countries and emerging economies. They use explanatory variables to capture four alternative transmission mechanisms including trade linkages, financial linkages, underlying vulnerabilities and financial structure, and overall policy framework. Based on cross-country regressions, it was found that financial vulnerabilities, specifically the degree of leverage and cumulative credit growth and exchange rate policy, explain a large share of variation in the growth forecast revisions across the forty European countries that they tested.

As the crisis can be rooted in advanced economies, emerging market economies that have close financial ties with advanced economies are expected to be affected severely. Prior to the crisis, many developing countries were taking advantage of favorable conditions in world markets. Easier access to cross-country borrowing had fueled rapid credit growth. When the crisis hit, capital flows reversed. In many cases, this translated into a collapse of credit and balance sheet problems. Credit growth clearly had an impact on bank profitability. Countries with more leveraged domestic financial systems and more rapid credit growth in lending to the private sector tended to suffer larger downward revisions to their growth outlooks. Also, exchange-rate flexibility clearly helped in buffering the impact of the shock, and countries with a pegged-exchange rate regimes fared significantly worse. Berkmen et al. (2009) found the main transmission avenue to have been financial channels, especially through rapid credit growth and high leverage, with the damage being heightened by pegged exchange rates. Also, a larger stock of lending from advanced economies contributed to a more severe downturn in growth revisions.
Berglof et al. (2009) studied the crisis using a small sample of Central and Easter Europe countries using actual growth rates as opposed to revisions in GDP growth forecasts. They find that external debt liabilities, a decline in export volumes in 2008Q4, real effective exchange rate appreciation relative to 2002, FDI liabilities as a share of GDP, and political instability tended to add to the depth of the output declines in Q4 2008 and Q1 2009.

Interestingly, with the exception of four countries, emerging Europe was largely unaffected until September 2008. These four countries were Kazakhstan and the Baltic States. The Baltic States were in the midst of a credit boom that peaked and started to falter before the bulk of the crisis hit. After the fall of Lehman Brothers, economic activity contracted sharply and immediately, while confidence in Euro banks fell almost as fast. FDI inflows, which the Baltics were dependent on, turned negative. These countries' international financial positions that were built up over the boom years became unsustainable when easy credit extension ceased (Buiter 2009). The intensity of the global financial crisis has been remarkable in terms of both its severity and reach. In addition to effecting emerging market economies, Milesi-Ferretti found that several advanced economies in Europe including France, Germany, Switzerland and the United Kingdom were heavily exposed to the U.S. subprime mortgage market.\(^2\) That November, many countries were experiencing declines in domestic credit growth for the first time in years. According to Berglof et al. (2009), that as of 2009 non-performing loans were still below their expected levels in most countries in emerging Europe.

Giannone et al. (2010) also studies the cross-country variation on output growth during the crisis using institutional factors and business cycles. They attempt to check whether the negative

\(^2\) According to the U.S. Treasury survey of U.S. portfolio liabilities as of end-June 2007, which reports the amount of U.S.-issued private mortgage backed securities held by foreign residents on a country-by country basis.
effect on output of credit regulatory quality is explained by the fact that credit quality is likely correlated with risk taking. It was found that policies that favor liberalization in credit markets negatively affect a country's resilience to the recent recession with respect to output decline between 2009 and 2008. This makes an economy vulnerable to shocks. Also, they find that bank ownership and foreign bank competition have a statistically significant negative impact on growth, while interest rate control and private sector credit are not significant.

There are also several studies that test the effect that foreign ownership had on bank profitability. In the bank profitability study by Rumler and Waschiczek (2010), it was found that banks that engaged in other activities outside of business lending were more profitable than banks that had a large share of their capital devoted to conventional lending. Foreign ownership had a negative impact on bank profitability and higher capital ratio increased bank profits.

The wealth of an economy is both directly and indirectly affected by the impact of foreign asset price bubbles. Globalization and financial integration allows for direct exposure through the holding of foreign assets, and indirect exposure through the international transmission of asset price shocks across borders (Krugman 2008). Also, the extreme risk aversion that can be expected to follow a financial crisis can disrupt cross-border lending and borrowing opportunities. Therefore, financial integration can mean that no country is safe because domestic macroeconomic behavior can be affected even if there are no shocks to domestic production.

The Baltic states experienced severe increases in foreign ownership before the crisis from Nordic banks. This not only hurt the Baltics during the crisis, but also harmed the investors in the Nordic countries when their investments went sour. Berger (2007) finds that foreign-owned banks have generally achieved much higher penetration in developing nations. The efficiency disadvantages of foreign-owned banks relative to domestically owned banks tend to outweigh the
efficiency advantages in developed nations on average, and this situation is generally reversed in
developing nations, like the Baltic states.

There are several recent papers that attempt to explain the causes and effects of the 2008
crisis at an individual country level. Dietrich, et al. (2009) analyses the profitability of
commercial banks in Switzerland from 1999-2008. In addition to analyzing the entire period
between 1999-2008, their study is broken down into two periods to capture the impact of the
variables are expressed in terms of internal and external determinants. The internal determinants
include bank and market specific characteristics and the external determinants consist of
macroeconomic factors. Many of their results were significant in the pre-crisis period, but
insignificant during the crisis period. For example, they found that the more efficient the bank,
the higher the profitability. However, this is not significant during the crisis period. Apparently,
bank profitability is much less driven by efficiency during the crisis years.

Most bank profitability literature is concerned with bank ownership structure, size of the
bank, diversity of risk and bank competition. The recent study by Lindbolm et al. (2010) focuses
on Swedish bank returns and risk taking. They found that banks performed well, with the
exceptions of credit losses mainly in the Baltics. Half of the credit losses in 2009 that was
concentrated in four large commercial banks occurred in the Baltic States. According to
Lindbolm et al. 2009, in order to compensate for decreasing leverage during the crisis, banks
increased their credit spread on lending. Banks were able to finance their long-term borrowing
with cheaper short-term credits. This declined at the end of 2009 when bank customers moved
towards a larger share of short-term loans.
Lindbolm and Wilesson later replicated this study on Swedish banks on all banks in 24 European countries in 2011. Although it is very different, this study is the most similar to our study. Instead of focusing on specific countries, Lindbolm and Wilesson divided their study into regions within Europe. They found that the financial crisis effected profitability of banks differently depending on their regional belonging. For example, profitability of banks in Eastern Europe (including the Baltic States) was cut by two-thirds in 2007 and 2009. And for the average bank in South Europe (including Ireland), profitability was cut in half from 2008-2009. Also, because they were less exposed to interest rate and credit risk, savings banks seemed to have weathered the financial storm better than commercial banks.

A common empirical result is that bank profits are pro-cyclically driven, especially by GDP growth. There are individual country analyses that study the effect that the business cycle has on non-performing loans. The study by Kent and D'Arcy (2000) examines cyclical lending behaviors in Australia and suggests that the business cycle is the primary reason for an increase of non-performing loans. The potential for banks to experience substantial losses on their loan portfolios increases towards the peak of the expansionary phase of the business cycle. However, at the top of the cycle, banks appear to be relatively healthy, displaying high profitability and low non-performing loan ratios. This can be applied to the global financial crisis. The favorable macroeconomic environment in the years leading up to the crisis was conducive to favorable credit conditions and lower non-performing loans. Of course, once the crisis struck and the value of collateral decreased, non-performing loan ratios began to increase. Even the riskiest of borrowers tend to benefit from prosperous economic conditions.

Using bank level data for 80 countries in the 1988–95 period, Demirgüç-Kunt and Huizinga (1998) analyze how bank characteristics, macroeconomic conditions and the overall
banking environment affect both interest rate margins and bank returns. In considering both measures, this study provides a decomposition of the income effects of a number of determinants that affect depositor and borrower behavior, as opposed to that of shareholders. Results suggest that macroeconomic and regulatory conditions have a pronounced impact on margins and profitability. Larger market concentration ratios lead to higher profits, while the effect of foreign ownership varies between industrialized and developing countries. In particular, foreign banks have higher margins and profits compared to domestic banks in developing countries, while the opposite holds in developed countries. They also find a positive correlation between bank profitability and the business cycle.

The study by Rajan and Dahl (2003) empirically analyzes non-performing loans in public sector banks in India. They evaluated how NPL's respond to terms of credit, bank size and macroeconomic conditions. It was found that terms of credit had a significant impact on banks' NPL's in the presence of bank size and macroeconomic shocks. Similar to the findings of Kent and D'Arcy (2000), the macroeconomic environment, including aggregate economic activity and the business cycle, may have a differential effect on NPL's due to the differential response of borrowers and lenders. Borrowers would benefit from increased economic activity by lowering potential defaults. Lenders on the other hand, have noted that an improvement in financial conditions may involve greater risk taking by banks and higher loan losses.
Data Description

The crisis-related financial problems in Europe were similar to the problems in the United States. Each state, like each country, told a different story. Since Germany is one of the few countries with money, it's catching grief from the rest of Europe, much like situation on Wall Street. Like Florida, Ireland got sucked into the property bubble, and is one of the worst affected countries in Europe. The Baltic States were too dependent on foreign direct investment. Slovenia and Slovakia, like the mid-west, experienced just how interconnected Main Street is with Wall Street. Greece is poor and living off its richer neighbors. Italy let bad governance squander great natural resources. Given different types and magnitudes of exposure, bank profitability varied to a great extent across the EU. The variation in impact of EU countries is due in part to the country-specific heterogeneity in terms of economic and institutional environment (Poghosyan and Hesse (2009)). Since each country was affected differently, a cross-country analysis is useful in determining what caused the large deterioration in bank profitability.

In the following paragraphs, the necessity of the macroeconomic variables will be explained. The country-level variables are obtained from the IMF’s International Financial Statistics, World Bank World Development Indicators, World Bank Financial Structure database, BIS, and Eurostat databases. The balance sheet indicators are based on annual data originating from the ECB Statistical Data Warehouse through year 2010. Consolidated banking data contains information on the aggregate consolidated profitability, balance sheets and solvency of EU banks. It should be understood that country-level indicators differ in terms of both coverage and definitions.
The impact of macroeconomic variables on bank performance has been recently highlighted in the literature. A common important variable influencing bank profitability is the economic activity of the country. Slower growth affects profits and earnings of firms and households, and thus their ability to honor their financial obligations. Economic activity is represented in this study by real GDP growth.

Starting in the beginning of the third quarter of 2008, economic activity came to a halt. This stressed economic environment continued through 2009, with all EU countries except for Poland experiencing negative GDP growth in 2009 (Figure 1). The most acute deterioration in output occurred in the three Baltic States. However GDP growth made a comeback in 2010. With the exception of Greece, all countries reported positive GDP growth in 2010.

Against the backdrop of the serious downturns of macroeconomic conditions in the EU, bank profitability declined as well. The majority of this profit deterioration was felt in the forth quarter of 2008. 16 countries displayed negative growth in aggregate return on equity (RoE) (Figure 2). Most of these banks reported either substantial profit declines or total losses for 2008.

Along side of profitability erosion, the credit quality of banks' loan portfolios has suffered significant downturns as well. With the exception of Cyprus, non-performing loan ratios (NPL) increased in all EU countries (Figure 3).

However, GDP growth is a broad ranging, catch-all term that cannot be expected to (and does not) accurately represent the macroeconomic conditions throughout the European Union following the crisis. In addition to GDP growth, several crisis specific variables, an index of house prices, value added construction in GDP, change in private credit/GDP, and Financial Openness, are included to model the financial turmoil.
Figure 1: Real GDP Growth, 2008-10

Figure 2: Return on Equity, 2008-10
The conversation about the financial crisis commonly centers on the appreciation of real estate values. Weaknesses in housing markets worldwide were an important trigger in unleashing the financial market turmoil. Many countries that experienced house price booms also underwent a process of financial liberalization (Anderson and Kennedy (1994)) and a period of easing monetary policy (Ahearne et. al (2005)). The period preceding the global financial crisis consisted of ample liquidity and a low, long-term interest rate environment at the start of the 21st century. This caused house prices to rise along side of stable economic growth.

A steady, real increase in house prices that is based on long-standing, calculated fundamentals is a blessing for any economy. Since property is a leveraged investment, it acts as collateral for loans. Property price increases tend to raise leverage, especially in the household sector. Higher house prices allowed borrowers to take out more credit against their homes, causing first time buyers to take out bigger mortgages, while existing homeowners increased the
size of their mortgages (Bernanke 2009a). Under normal circumstances, an increase in the value of residential real estate helps to relieve the liquidity constraint that most households face. The availability of a wide variety of financial products, like home equity loans, increases consumer welfare by expanding access to finance and allowing for a more efficient allocation of desired consumption.

The household sector is not the only portion of the economy that can benefit from increased property values. Investment in construction becomes popular and prosperous, creating a demand for construction workers and new equipment. Property increases are also a source of increased tax revenue. Both transaction taxes and valuation-based tax receipts are higher, allowing for tax cuts and expenditure increases by fiscal authorities (Cecchetti (2009)). Also, the financial sector benefits. More financial products leads to more trading, and more trading leads to more fee and commission based income for financial intermediaries.

Unfortunately, the years leading up to the crisis were not normal circumstances. Both the public and the private sector fell victim to huge miscalculations. The increase in house prices was nothing more than artificial, unjustified appreciation caused by a combination of deregulation, speculation and over-confidence. A bubble had developed, expanded and burst. Households shifted their consumption from the future into the present after mistaking that this bubble was a permanent increase in wealth.

House Prices declined drastically in the Baltic States and Ireland, Czech Republic and Bulgaria (Figure 4). In the other EU member countries, the decline in house prices was much smaller but still present.
Both the households and the investors who lent to them were in trouble. Because the assets are leveraged, property price booms also put lenders at risk. Impairment of these assets, then, means impairment of financial intermediaries' balance sheets (Cecchetti (2009)). The 'originate and distribute' model that securitized both residential and commercial mortgages split up the risks into many different pieces, making it almost impossible to price these securities. Also, the increased tax revenue disappeared and left behind a worse fiscal deficit.

The miss pricing of mortgage-backed securities and the underlying property that they depended upon also distorted the allocation of capital. Buiter (2009) suggests that the real estate sector was so fragile because investment was channeled away from more productive areas into "unproductive residential construction." Believing that house prices would continue to rise caused a demand for construction and over-rewarded construction investment. The result was not only too many houses and other empty buildings, but also too many construction workers and

Figure 4: Percent Change in House Prices, 2008-10
the construction equipment they operated. The construction sector has historically witnessed cyclical patterns to its developments. According to the European Commission, construction activity tends to have more amplified peaks and troughs than those for the economy as a whole. This could be due to large projects being postponed or cancelled during periods when economic output slows or contracts. These may be linked to consumer confidence, the availability of credit (often in the form of mortgages), political events (such as a construction boom in Germany following reunification), or general economic cycles (Stawińska (2010)).

In the years leading up to the crisis, Spain, Poland and Cyprus experienced a highly concentrated construction sector. Around one quarter of all persons employed in the Polish non-financial business economy were employed within construction activities in 2007 (Stawińska (2010)). Against this backdrop, the recent credit crisis and economic downturn have had some serious implications for the EU’s construction sector as a whole. Employment has fallen sharply in many of the Member States, particularly in Spain and the Baltic countries. This downsizing of the workforce has an indirect effect on profitability. The contraction of the industrial sectors is reflected in declining output and inevitably had an impact on the number of persons employed. There were much stronger rates of decline in some Member States, particularly in the Baltic Member States and Spain. The construction workforces of Latvia and Spain shrank by about one third between the first quarter of 2008 and the third quarter of 2009. The decline in this sector would make hundreds of thousands of laborers jobless in the EU, which would lead to a higher default rate because these people would have trouble repaying their bank loans.
In 2009, 18 Member States had a decrease in construction activity from the previous year. The most drastic drop in construction was felt in the Baltic States and Ireland. In 2010, 23 countries displayed a decline in value added construction (Figure 5). Change in value added construction is important to include because some countries didn't see a huge drop in house prices, but noticed decline in their construction sector. For example, Germany's house prices remained consistent throughout the crisis, while their devotion to construction declined (Figure 6). The increase in housing prices and increase in devotion to the construction sector are important factors determining the low bank profits caused by the global financial crisis. As noted in the literature, the most affected countries in the EU experienced severe asset bubbles. For example, Ireland was one of the countries worst affected by the crisis mainly due to its domestic and international exposure to the volatile property market. Low property values from the currency crisis in 1992-1993 in conjunction with the rapid increase in domestic income levels.
caused house prices to increase. The economy began the “Celtic Tiger” years. Beginning in 1994, Ireland was blessed with an “economic miracle” (Beblavý et. al 2011) accompanied with rapid output, high employment levels and productivity growth. This economic growth was supplemented in 1997 with low interest rates caused by entry into the EMU and reinforced with the depreciation of the euro against the dollar around 1999.

Because of their convenient geographic location, low corporate tax rate and primarily English speaking citizens, many technological companies positioned their headquarters in Ireland. However, the dot come bubble burst in 2001 and spurred an international recession. Ireland transitioned their growth from the telecommunications industry to the construction sector. Irish banks took advantage of the cheap credit from foreign banks and provided loans to the construction sector.

Figure 6: House Prices and Value Added Construction/GDP in Germany, 2006-10
In many countries, the increase in house prices caused a subsequent surge in household debt. In Ireland, a vicious cycle started. Rising property investment was fueled by rapid credit expansion. The loose financial conditions and free-spirited lending practices were partially blamed for spurring the magnitude of the real estate boom. Banks were thriving on high fees and high interest rates, building reserves and expanding balance sheets. However, after the collapse of several key U.S. institutions, worldwide confidence in the financial system faltered. Assets in banks valued at current market prices were less than what they were originally worth. Banks began to cut back on new loans, and sectors depending on this funding began to contract. As seen in Ireland, easy credit conditions fueled the appreciation of house prices and consequently, the construction sector. The decline in property prices and the collapse of the construction sector crushed the Irish bank system.

Given what Rose and Spiegel (2009) noted about the simultaneous bubble in equity, another plausible causal crisis variable is a variable for credit. House prices indirectly affect credit demand through wealth effects. Because a large share of loans is secured with property, banks are more willing to supply loans to the private sector when house prices are high (Hofmann (2001). Therefore, along with a jump in house prices, the private sector experienced a rapid credit expansion and the banking sector experienced excess global liquidity in the years leading up to the crisis (Figure 7). In some cases, like in the Baltic Countries, the government would not want to destroy this momentum, resulting in a larger credit bubble (Beblavý et. al 2011). After the crisis, there was a flight to quality and deleveraging of risk. Because of the continued uncertainty of lending conditions, weak capital positions and rising loan losses, banks tightened their regulations and lending standards. In order to compensate for crumbling asset prices and increasing non-performing loan ratios, banks stopped lending to the private sector to
Eastern Europe was hit most by declining bank lending. Prior to the crisis, these emerging economies received the most inflow of foreign capital and cross-border lending. In the years leading up to 2008, all three of the Baltic states told the same story. The three countries displayed some of the strongest expansion in Europe, with each economy growing above its potential. All three countries benefited from an EU accession related convergence boost. Their growth was driven largely by domestic demand and improving exports, fueled by substantial real wage increases and a lower unemployment rate, which resulted in a large current account imbalance. This created a large credit bubble that was subsidized by stimulus funding from the EU. The economies are now facing sharp credit crunch. Private sector credit, which had been cleanse their balance sheets. According to the IMF, demand for credit declined as firms cut their output and households reduced their consumption, decreasing their need for credit.

**Figure 7: Cumulative Change from 2004-2008 in Private Sector Credit Growth/GDP**
increasing until 2007, started to decline. Overall, the Baltic Tigers lost their roar. Their fast expansion led to one of the deepest recessions in the world.

Estonia, Latvia and Lithuania are married under the common name of ‘The Baltic States’ because of structural similarities that they share. Their size and openness along with foreign exchange regime and labor market flexibility was designed for rapid financial integration into the EU. Moreover, according to *The Economist*, they constituted an investment heaven of relatively low taxes, a cheap labor force and consumers hungry for everything “western”, from telecommunications to shoes. Elements within their macroeconomy tend to show a degree of co-movement (Beblavý et. al 2011). While these countries were simultaneously damaged by the financial storm of 2008, each weathered the turbulence differently. Estonia and Latvia were hit hard initially, with Lithuania getting worse at a later stage in the recession.

Despite its many problems, Estonia fared the best. Estonia experienced one of the fastest growth rates among emerging market countries during 2000 to 2007. Higher than expected income growth and a rapid foreign-financed credit infusion spurred a real estate boom, particularly in residential housing via mortgage loans. According to the OECD, private sector credit largely mirrored capital inflows. Since Estonia was following the strict criteria that is required to adopt the Euro (common currency zone's budget deficit, debt and inflation criteria), policy makers had limited authority to manage the capital inflow. The tightening of lending regulation, plunge of house prices and the subsequent fall in consumer confidence forced Estonia to be on of the first countries to enter into a recession in 2008.

Latvia seems to have come off the worst of the three countries. Latvia comes close to the United States' output decline during the Great Depression. Following the recession, Latvian unemployment reached the highest in the EU, hitting 23%. Those who do have a job saw falling
wages, causing them to spend less and fuel the recession even more. Latvian economic authorities are shrinking the economy and tightening the fiscal budget by slashing spending and raising taxes and internally devaluing their currency.

Lithuania followed a similar 'boom' as its neighbor, Estonia. Quick, economic expansion in Lithuania prior to the crisis caused current account imbalances. Rapid credit growth that was spurred by capital inflows was largely in foreign exchange. Banks were increasingly exposed to real estate, which risked the asset quality of bank and financial sector stability. As the economies of Western Europe began to slow, the prospect of Lithuania’s exports was undermined. These falling exports were accompanied by a large drop in domestic demand.

There was also a strong presence of Nordic banks that provided cheap credit to the Baltic countries. These Scandinavian banks steered clear of subprime mortgages and had less off-balance sheet exposure, but the downturn in the Baltic States affected them. Instead of investing in U.S housing derivatives, Nordic banks invested in the booming economies of their neighboring countries in Central and Eastern Europe, their closest neighbors being the Baltics. When the Subprime mortgage write downs began to catch up with banks in the EU, the investment strategy of the Nordic banks went sour.

In some cases, a larger international portfolio could be beneficial to a country by providing valuable diversification in times of crisis. However, larger capital inflows from the Baltic expansion period were one of the main causes of higher growth before of the crisis. Prior to the crisis, these economies received the most inflow of foreign capital and cross-boarder lending (Beblavý, et al. (2011)). The sudden halt of capital inflows and contraction in credit after the onset of the crisis was what led to such a severe recession in the Baltics. Measures of external debt liabilities would be a possible measure that captures the intensity of reliance on foreign
banks. After the crisis hit, foreign banks pulled back funds and contracted credit. Net foreign assets as a percent of GDP could proxy for this transmission channel (Figure 8).

The existing literature provides evidence that there is a strong association between bank profitability and several macroeconomic determinants. Based on this literature and on country-level background information, below are the dependent variables used in this study:

**Return on Equity (RoE)** is measured by the ratio of shareholder's profits to total assets. RoE measures a company's efficiency of generating profits from every dollar of net assets. It measures a bank's profitability by revealing how much profit a bank generates with the money their shareholders have invested, and how they use this investment to generate earnings growth.

**Non-Performing Loan Ratio (NPL)** is the ratio of non-performing loan to total loans. Bank nonperforming loans to total gross loans are the value of nonperforming loans divided by
the total value of the loan portfolio. Non-performing loans can measure banks strength, credit risk and balance sheet quality (Rose and Spiegel (2009a) and Giannone (2010)).

According to the IMF, a loan is nonperforming when payments of interest and principal are past due by 90 days or more, or at least 90 days of interest payments have been capitalized, refinanced or delayed by agreement, or payments are less than 90 days overdue, but there are other good reasons to doubt that payments will be made in full. According to the ECB statistical warehouse, Non-performing assets and provisioning indicators should be interpreted with caution, since the definitions of impaired assets (non-performing and doubtful assets) and provisions differ between countries. Due to a restructuring of the ECB statistical data warehouse, consolidated banking data on non-performing loans is not available for all of the years that I would have liked to have tested. Also, there are missing values for the non-performing loan ratio in 2010.

While modeling the housing bubble that burst around the globe would be beyond the scope of this paper, macroeconomic determinants were chosen carefully to replicate the bubble. Three variables are included in this study to encompass the effect that housing market bust had on bank profitability over and above the effect that real GDP growth had on profitability. Below is a list of the following country and crisis specific determinants of bank profitability used as explanatory variables:

**Real GDP growth** is added to capture macroeconomic imbalances that range from industry to household consumption. It is used to measure the effect that output and economic activity had on bank profitability following the crisis. It was collected from the IMF’s World Economic Outlook Statistical database and is the percent change from the previous year.
Non-interest income is the income a bank generates primarily from fees and commissions, like deposit and transaction fees. Essentially, it is any income generated out of a transaction that does not actually involve the funds of the bank. This fee-based income is usually non-recurrent in nature. It was collected from the ECB’s consolidated banking data.

Net interest income is the difference between the revenue that is generated from interest on a bank’s assets (commercial loans, mortgages, etc.) and the expenses associated with paying out its liabilities (personal savings accounts). The excess revenue that is generated from the spread between interest paid out on deposits and interest earned on assets is the net interest income. Net-interest income is usually most banks’ largest revenue component. It was collected from the ECB’s consolidated banking data.

An Index of House Prices was found using data from the Bank for International Settlements' International Financial Statistics. This data was divided into subsections: monthly, quarterly, half-yearly, and annually. The data was converted into the yearly average price for each country and is presented as the percent changes over the previous period. According to BIS, there are no specific international standards for property price statistics and the data differs from country to country. An accurate sample was not available for all countries over the time period tested, including Luxemburg and Romania. To check for accuracy, final data points were compared with OECD data for house prices.

Residential house prices were selected for this study over commercial and property prices. Historically, commercial real estate tends to lag behind residential real estate by about two years. House prices initially were impacted more severely by the financial crisis. The
severity may have been due to speculation by real estate developers and brokers in the United States that spilled over into other economies.

**Value Added Construction** was collected from the Eurostat database. It represents the amount of construction added (or subtracted) each year. The data was provided as a percent of GDP. The change and house prices and the change in value added construction/GDP represent similar determinants, the former represents the overall change in prices while the latter represents the change in volume of the industry.

**Change in Private Sector Credit/GDP** is the cumulative percent change of private sector credit from the years 2004-2008. These years were chosen to capture the buildup of credit expansion in the EU leading up to the crisis. It is found in the World Bank Financial Structure database.

I would have also liked to have looked at bank credit outstanding for real estate activities to determine how much of a bank's loan portfolio was devoted to the real estate sector. Property prices may also have a positive effect on loan demand by stimulating construction activity. Unfortunately, since we are looking at the broader European Union, specific data is not available.

**Financial Openness** is measured by the net foreign assets of a country. Net foreign assets are the sum of foreign assets held by monetary authorities and deposit money banks, less their foreign liabilities. This accumulated net position is divided by GDP. Net Foreign Assets is entered into the regression equations as a lagged variable to take into account the contraction in cross-country borrowing from the previous year. The data is located in the World Bank’s World Development Indicators, which is sourced from the IMF’s International Financial Statistics.
Since there are four countries, Baltic States (Estonia, Latvia and Lithuania) and Ireland, that are consistently outliers, a dummy variable, \textbf{Baltic/Ireland} is also included to capture the impact that they had on bank profitability. The idea here is to investigate whether these four countries overstated the downturn in economic activity in the European Union.

Overall, declining GDP growth, real estate prices, equity prices, and financial openness have put strains on both corporate and bank balance sheets and credit growth to the private sector has significantly worsened. In some countries, governments had to intervene in the domestic financial sector with deposit guarantees, liquidity support, capital injections or equity purchases as financial sector indicators worsened. In particular, banks that lent heavily for real estate purposes, both mortgage lending and construction lending and equity purchases have suffered losses with the collapse of these asset prices.
Hypothesis

The impact of the financial market turmoil has been felt across a broadening range of both advanced and emerging economies around the world. Since the current crisis that originated in the financial sector spilled over into many other economic sectors, it emphasizes the importance of linking macroeconomic conditions to the strength of the banking system. A healthy banking system will almost always translate prosperously to the real economy. On the other hand, a broken banking channel can destroy economic activity.

The crisis impacted bank profitability in years 2009 and 2010 differently. In order to compare the variation in impact of bank profits, separate specifications are run for each year. It is possible to pool the data and combine both years in one regression. However, the inclusion of the necessary interaction terms leads to the same outcome of running two separate OLS regression equations. Additionally, the separately run OLS regressions better capture the dramatic difference between 2009 and 2010. Thus, we run two sets of equations, one for year 2009 and another set for year 2010. The most basic specifications focus on the independent effect that real GDP growth had on bank profits and on asset quality.

To begin, the univariate analysis is estimated by including only GDP growth in the specification. The change in return on equity is regressed on GDP growth and in a separate equation, the change in the non-performing loan ratio is regressed on GDP growth. If it is found that GDP growth is significant, it can be concluded that GDP growth is related to bank profitability. If it is found that GDP growth is insignificant, the study will go further to include other macroeconomic variables related to the crisis.

Credit risk increases as the economic situation deteriorates. Consistent with the literature, it is assumed that there is empirical evidence of a negative relationship between the growth in
real GDP and non-performing loans (Kent and D'Arcy (2000); Salas and Suarina (2002); Rajan & Dhal (2003); and Jimenez and Saurina (2005); Banerjee (2011)). The explanation provided by the literature for this relationship is that strong positive growth in real GDP usually translates into more income. This improves the debt servicing capacity of borrower and in turn contributes to lower non-performing loans.

Conversely, a sluggish microeconomic environment is a source of vulnerabilities in the financial system. Slower growth affects profits and earnings of firms and households, and thus their ability to honor their financial obligations. When there is a slowdown in the economy, especially during recessions (low or negative GDP growth), credit quality deteriorates and the level of NPLs should increase, thus reducing bank returns. Most studies show a positive relationship between GDP growth and bank profitability. When the economy is doing well, banks will be able to lend more, collecting income from interest and non-interest income.

Consistent with previous findings (Demirguc-Kunt and Huizinga (1999); Dietrich et. al (2009) Banerjee (2011)), it is expected that there is a positive association between bank profitability and economic activity.

The existence of real estate and asset price bubbles were key transmission channels of the financial crisis (Lane and Milesi-Ferretti (2008)). Changes in house prices are anticipated to have a negative effect on the non-performing loan ratio given their effect on private sector wealth. An increase in GDP may lead to a higher valuation of property. Homeowners respond by increasing their spending and borrowing in order to smooth consumption. Rising house prices seem to coincide with overheated domestic demand (Case et. al (2001)). Since property price increases tend to raise household wealth, collateral is worth more. In keeping with the literature, significant declines in nominal asset prices were associated with a rise in non-
performing loans and weakened balance sheets. When house prices deteriorate, creditworthiness worsens and households and firms will have trouble repaying their loans. People found that with falling home prices they could not refinance their loans, and were then stuck with higher, unaffordable rates.

Also, house prices are anticipated to have a positive effect on bank profits because of their effect on liquidity. Mortgage lending is a significant activity for a number of large foreign banks (Ahearne et. al (2005)). Increasing house prices near the end of the 20th century helped kick-started the innovation in real lending through MBS’s and other housing related financial products. These structured financial products produce high fee income for banks. However, concentrations of exposures within specific sectors like residential real estate added additional sources of risk to banks’ balance sheets. MBS' were devalued, and banks with significant exposure had to write down these assets. Also, while increased lending and fee income initially raised bank profits, the financial crisis of 2008 left investors worldwide cautious, and slowed trading activities in 2009.

Property prices and the share of construction in GDP both exert a strong influence over banks' credit risk. Construction activity depends positively on the ratio of property prices to construction costs (Hofmann (2001))\(^3\). An increase in property prices will therefore increase construction activity, and lead to a higher demand for credit. Residential construction sectors abroad are much more vulnerable to corrections in local house prices (Ahearne et. al (2005)); when house prices increase, construction activity should increase as well. It can be predicted that construction activity would have a positive impact on bank profitability. Conversely, a decline in construction activity, leaving many workers jobless, would negatively affect bank

\(^3\) Tobin’s q-theory states that investment activity depends positively on the ratio of the market value of capital to the costs of acquiring it.
profits. In Australia, there is a long history of slumps in building activity leading to banking problems (Kent and Lowe 1997). As the share of activity taken up by construction grows, therefore, the economy's overall credit quality is likely to decline. It can therefore be assumed that a decrease in construction activity would lead to an increase in the NPL ratio.

The compression of yields prior to the global financial crisis, coupled with easier access to cross-country borrowing, had fueled rapid credit growth. This favorable macroeconomic environment had been conducive to easy credit conditions and lower non-performing loans. However, when the crisis hit, it translated into financial constraints and a collapse of credit, and in some cases into severe balance sheet problems.

Firms and households are typically credit constrained, and they can only borrow when they offer collateral. Essentially, their borrowing capacity depends on their net worth. Since borrowers' net worth is pro-cyclical, the borrowing capacity of households and firms increases in economic upswings and decreases in economic downswings. An increase in real GDP is predicted to trigger increases in real lending. Higher output indicates higher real incomes, which will in turn increase the willingness of banks to extend loans. On the other hand, credit demand may build up because an unexpected change in real GDP may trigger increases in consumption and investment demand, subsequently leading to higher credit demand.

Areas with higher real GDP growth should imply easier access to and higher demands for credit because lending standards are usually relaxed with higher growth and collateral is typically worth more. However, weak economic growth exposes banks to risk and could lead to a worsening of the credit quality of banks' loan portfolios and increases the probability of loan defaults. Leading up to the crisis, banks were lending more. When the crisis struck, collateral value dropped, unemployment rose, and people had trouble repaying these outstanding loans.
Consistent with previous findings, it can be assumed that in countries with high indebtedness and strong credit growth experienced larger bank profitability collapses with the global recession (Berkmen (2009)). The more a country expanded their credit prior to the crisis, the higher their NPL ratio. It can be expected that there is a positive relationship between private sector credit growth and non-performing loans. Conversely, it can be expected that an expansion in credit would have a negative impact on bank profitability (RoE). Banks are typically able to expand lending when the economy is booming and generate more fee income due to increased activity in the stock market. However, when the crisis hit, more people had trouble repaying their loans, thus reducing bank profits.

Financial openness is also expected to play a role in declining bank profits. Countries that borrowed more from advanced economies were hit harder by the crisis. As soon as the crisis occurred, foreign finance froze. Consistent with the literature, it can be expected that the financial crisis would hit hardest those countries with large current account deficits and large net external liabilities (Berglof (2009)). On the one hand, financial openness can directly affect the productivity of an economy by spurring financial innovation and increasing competitiveness of the stock market. It could smooth business cycle fluctuations, but during more drastic times, could harm the economy. Both Demirguc-Kunt and Huizinga (2000) and Dietrich et. al (2009) find that foreign-owned banks are less profitable in developed countries than domestic banks. Since countries that borrowed more from foreign countries were impacted more by the crisis, it can be assumed that there is a negative relationship between RoE and Net Foreign Assets/GDP. Also, there should be a positive relationship between the NPL ratio and Net Foreign Assets/GDP.

As bank profits declined in 2009, it can be expected that banks would adjust for this profit loss by changing their income source 2010. Since RoE increased in all countries except for
Greece in 2010, it is clear adjustments were made. In fact, the June 2011 issue of the ECB Financial Stability Review noted that already in the first half of 2010, Euro Area banks’ net interest income was lower, on an annualized basis, than in 2009. It would therefore be useful to determine where bank profitability was coming from, either from non-interest income or net-interest income. It can be assumed that banks would adjust to non-interest income as the prospects of a strong macroeconomy remain dismal.
Results

The financial crisis aggravated many weaknesses and exposed vulnerabilities in the European Union’s (EU’s) banking sector. As financial intermediaries of the economy, the banking industry was significantly affected by the crisis. Unfortunately, the extent of the lax financial practices were noticed only after the bubble burst. According to Berglof et. al (2009), most countries in Europe did not feel the crisis until after Lehman fell in September of 2008. While countries in the European Union are still battling the aftermath of the financial crisis today, the bulk of the crisis was felt in 2009. Emphasis will be placed on comparing empirical analysis of 2009 with 2010. It is important to note that the following results are specific to this financial crisis and should not be applied generally to all crises.

The explanatory power of the model is higher for 2009 than for 2010. Macroeconomic determinants have been analyzed in the context of cross-country comparative studies using aggregated data of each country. Consistent with our findings, Berkmen et al. (2009) find that the impact on economic activity has varied widely across countries. European bank sector losses following the crisis were partly due to write downs on their structured product portfolios. However, the deterioration of the macroeconomic environment that began in the third quarter of 2008 had a more significant impact, triggering an increase in loan losses and a decrease in net-interest revenue.

The results for GDP growth are reported in Table 1. Overall, the effect that the severe post-crisis economic contraction had on the aggregate country-level bank profitability was mixed. Consistent with the hypothesis, there exists a statistically significant positive relationship in 2009 between the change in RoE and GDP growth. However, this relationship seems to be heavily influenced by four countries; the three Baltic States (Estonia, Latvia and Lithuania) and
Ireland (Figure 9) (Banerjee (2011)). To account for these outliers, the dummy variable, \textit{Baltic/Ireland}, is included in the specification along side of GDP growth. With the inclusion of the \textit{Baltic/Ireland} dummy variable, GDP growth becomes insignificant. GDP growth is not a good proxy for the decline in bank profitability.

For year 2010, both GDP growth and RoE increased. When the change in RoE is regressed onto GDP growth, the relationship is statistically insignificant. GDP growth does not affect bank profitability. This confirms the findings of Dietrich et. al (2009), who determine that the GDP growth rate does not affect bank profitability. Interestingly, the four outlier countries disappear in 2010 (Figure 10). It is possible that because these countries had such a huge deterioration in both profits and GDP growth, even slightly positive profits would yield such a sharp positive correction in 2010. To confirm that the outliers disappear, the \textit{Baltic/Ireland} dummy variable is added to the specification along with GDP growth. The dummy variable and the entire equation are insignificant.

To test the effect that GDP growth had on asset quality, the change in the non-performing loan ratio is regressed onto GDP growth. Consistent with the hypothesis, there exists a statistically significant negative relationship between the change in the NPL ratio and GDP growth. Weak economic performance exposes banks to risk as low economic growth promotes the deterioration of credit quality, and increases the probability of loan defaults. However, in the simple scatterplot below, there are again four outlier countries that are overstating the downturn in asset quality (Figure 11). When the \textit{Baltic/Ireland} dummy variable is included with GDP growth, GDP growth becomes statistically insignificant and the dummy is significant. Again, GDP growth does not capture the increase in the non-performing loan ratio in the EU. In 2010 however, the relationship between the change in the NPL ratio and GDP growth is negative and
statistically significant, albeit with a weak correlation (.2246). While RoE partially bounced back in 2010 (Figure 2), the NPL ratio continued to increase (Figure 3) which may explain the significance. When the Baltic/Ireland dummy variable is included in the specification, the GDP growth remains significant, but the dummy variable is insignificant. In 2010, the phenomena of the outlier countries no longer exists (Figure 12).
Figure 9: Change in RoE and GDP Growth, 2009

Figure 10: Change in RoE and GDP Growth, 2010
Figure 11: Change in NPL Ratio and GDP Growth, 2009

Figure 12: Change in NPL Ratio and GDP Growth, 2010
Since GDP growth is insignificant and cannot explain the downturn in bank profitability or asset quality, the other potential causal variables are added into the specification. Going forward, each variable is added into the regression equation, retaining GDP growth as a cause throughout. Figures 13 through 28 compare the effects that each variable had on profitability and asset quality in 2009 compared with 2010. The outliers that are present in 2009 largely disappear in 2010.

As outlined above, it is clear that overzealous housing market played a key role in the downturn of the European banking system. It can be expected that there was a worsening of balance sheets in countries where there was a sharp decrease in house prices and a concurrent contraction in construction activity. When all of the explanatory variables are added into the specification for 2009 (the change in House Prices, the change in Value Added Construction/GDP, the change in Private Sector Credit/GDP for years 2004-2008, and Net Foreign Assets/GDP), 75% of the relationship can be explained, but only the change in construction activity is significant at the 5% level (GDP growth is significant at the 10% level) (Table 2). From the regressions that only include house prices and construction, there is compelling evidence that house prices and construction effected profitability. In 2009, the change in house prices and change in construction is statistically significant and positive with a high correlation (.757) (Table 2).

The results for the NPL ratio are reported in Table 4. When the change in the NPL ratio is regressed on all four of the explanatory variables, only Credit growth is statistically significant. Before the crisis, credit expansion provided loans to many households. When the crisis hit and output fell, those households had trouble servicing their debt and the asset quality of banks' balance sheets deteriorated. Consistent with the hypothesis, credit growth is significant, its
coefficient is in the positive direction and the correlation is strong (.7077). From these results, it seems as though the change in house prices and the change in construction activity is important to the decline bank profitability, while the expansion of credit prior to crisis is important to the increase in the NPL ratio. Interestingly, Net Foreign Assets/GDP was not significant. It seems to be affecting profitability at the individual country level, but at the cross-country level there was no significant relationship.

Again however, there are distinct outliers present, both with the relationship between RoE and the change in House Prices (Figure 13) and the relationship between RoE and the change in Construction activity (Figure 17). When the Baltic/Ireland dummy is included in the regression equation along side of the four variables, the only significant variable is the dummy variable (Table 2). Countries, like the Baltics and Ireland, that experienced a run-up in real estate values are typically viewed as those who suffered more severely in the crisis. For the rest of the EU, it is possible that mortgage lenders have substantially reduced their exposure to the housing market by securitizing a significant portion of loans that they originate, thus reducing the risk and keeping their balance sheet relatively clean.

Interestingly, when the change in the NPL ratio is regressed onto the four variables and the Baltic/Ireland dummy, the same statistically significant positive relationship between the NPL ratio and the change in credit growth exists along with the dummy (Table 4). The variable for credit expansion seems to explain the increase in the NPL ratio in 2009, over and above the huge impact of the outlier countries. The explanatory power of the model is also high, at 76%.

Like in 2009, the relationship between the change in the NPL ratio and the four variables in 2010 is statistically significant, and the variable for credit growth is significant at the 5% level and possesses a negative coefficient (Table 4). Although, the correlation is low (.339). When the
dummy variable is included, the credit growth variable remains significant, while the dummy is
insignificant. In 2010, the relationship between RoE and the four variables is statistically
significant (Table 3). However, the only variable that is significant (at the 10% level) is Net
Foreign Assets/GDP\textsubscript{-1}. The coefficient on the variable is negative, suggesting that an increase in
foreign assets would yield lower profitability. This result is consistent with the hypothesis.
However, the relationship is weak at best, as only 35% can be explained. Interestingly, this
relationship holds even after the Baltic/Ireland dummy is added. In 2010, the relationship
between RoE, House Prices, GDP growth and NFA/GDP\textsubscript{-1} is statistically significant. However,
the only variable significant is NFA/GDP\textsubscript{-1}, at the 1% level, with a negative coefficient.
Consistent with the hypothesis, countries that saw an increase in NFA/GDP\textsubscript{-1} would have a
decrease in profitability (Table 3). When the Baltic/Ireland variable is included in 2010,
NFA/GDP\textsubscript{-1} remains statistically significant (at the 10% level) and negative, and the dummy is
not. What is interesting about this relationship is that it doesn’t exist in 2009 (Table 2). This
could be because NFA/GDP\textsubscript{-1} is entered as a lagged variable. Therefore, the effect of the 2009
contraction in cross-country borrowing following the crisis would effect 2010 and not 2009.

When banks expanded their lending prior to the crisis, more loans outstanding were on
their balance sheets. The effects of the crisis in 2008 made it difficult for households and firms
to keep making payments on their loans in 2009 and 2010, which increased the NPL ratio for
banks across Europe, not just in the Baltic States and Ireland. The insignificant Baltic/Ireland
dummy variable confirms that the outliers are not important in 2010 (Table 4).

Judging by the sharp contraction in GDP growth, it would seem as though GDP growth
was the main determinant in the simultaneous deterioration in profitability and asset quality in
the EU. However, when looking closer at the crisis, other factors played a key role in low RoE
and high NPL. House prices and construction activity seemed to be the main deterents of low profitability, while credit expansion seemed to increase the non-performing loan ratio.

Overall, it is clear that there are four outlier in 2009, the Baltic States and Ireland that disappear in 2010. Also, profitability was not as low in 2010. Prior to the crisis, banks across Europe increased their leverage. Once the crisis hit, banks found it difficult to remain highly leveraged and cut back on lending. This would reduce the income and thus RoE. It would appear that banks adjusted their profitability measures towards fee based, non-interest income, while moving away from interest income. Net interest income should rise as the yield curve steepens (long-term rates rise faster than short-term rates) because the bank is able to pay depositors a relatively low rate, while it can charge its borrowers a higher rate. Conversely, due to the flattening of the yield curve, banks’ net interest income from retail consumer activities should be lower, in particular in countries where a significant proportion of loans are granted at rates that are fixed for a long term. Since interest rates already hit rock-bottom, net interest income may, for the time being, lose its role as a major growth driver.

Regression analysis of the relative influence that net-interest and non-interest income has on return on equity are estimated both for 2009 and 2010. Results are reported in Table 5. In 2009, it was found that net-interest income was more important in influencing Return on Equity. The coefficient on the changes of interest income is positive and it is statistically significant at the 1% level. However, because of moderate credit expansion in 2010, the growth of interest income remain restrained. When the same regression is run in 2010, net-interest income is no longer important. Non-interest income becomes positive and significant at the 1% level. According to the June 2011 issue of the ECB Financial Stability Review, non-interest income from normal fees and commissions remained fairly stable, but strong increases in other less
stable sources of income, such as profit from securities and foreign exchange trading activities, had increased the share of total non-interest income in total operating income near the end of 2009. With respect to unusual fee and commission income, underwriting fees are likely to support non-interest income because of sizable debt refinancing and new issuance by sovereign debt funds. Therefore, non-interest income increased not only in absolute terms, but also in relative terms as a share of total operating income (Figures 29 and 30).
Figure 13: Change in RoE and House Prices, 2009

Figure 14: Change in RoE and House Prices, 2010
Figure 15: Change in NPL Ratio and House Prices, 2009

Figure 16: Change in NPL Ratio and House Prices, 2010
Figure 17: Change in RoE and Value Added Construction, 2009

Figure 18: Change in RoE and Value Added Construction, 2010
Figure 19: Change in NPL Ratio and Value Added Construction, 2009

Figure 20: Change in NPL Ratio and Value Added Construction, 2010
Figure 21: Change in RoE and Cumulative Percent Change in Private Sector Credit Growth, 2009

Figure 22: Change in RoE and Cumulative Percent Change in Private Sector Credit Growth, 2010
Figure 23: Change in NPL Ratio and Cumulative Percent Change in Private Sector Credit Growth, 2009

Figure 24: Change in NPL Ratio and Cumulative Percent Change in Private Sector Credit Growth, 2010
Figure 25: Change in RoE 2009 and Net Foreign Assets as a Percent of GDP, 2010

Figure 26: Change in RoE 2010 and Net Foreign Assets as a Percent of GDP, 2009
Figure 27: Change in NPL Ratio 2009 and Net Foreign Assets as a Percent of GDP, 2008

Figure 28: Change in NPL Ratio 2010 and Net Foreign Assets as a Percent of GDP, 2009
Figure 29: Changes in Net Interest Income and Non-Interest Income as % of Total Assets, 2009 (Percentage Points)

Figure 30: Changes in Net Interest Income and Non-Interest Income as % of Total Assets, 2010 (Percentage Points)
Conclusion

The Global Financial Crisis was truly remarkable in both its' severity and global reach. The financial market turmoil that began in the United States in 2007 and 2008 has led to the most sever financial crisis since the Great Depression and left large repercussions on the real economy throughout the world. The simultaneous appreciation of asset price and equity bubbles triggered a full-blown liquidity crisis that seriously impacted bank profitability in EU member states. However, each country was not affected equally. Crisis related variables were largely insignificant once the dummy variable for the Baltic States and Ireland was included in the specification. However, private sector credit growth/GDP and Net Foreign Assets/GDP\textsuperscript{1} are significant over and above the dummy variable. Also, as RoE bounced back in 2010 because banks adapted their income in the low interest rate environment. In 2009, net-interest income had a significant impact on profitability performance. This relationship changed in 2010 with non-interest income having a significant impact on profitability developments.
References


Lis, S. de, J.M. pages, and J. Saurina, "Credit Growth, Problem Loans and Credit Risk Provisioning" In Spain, Banco de Espana-Servicio de Estudios, Documente deTrabajo no 0018. (2000).


Poghosyan, Tigran and Heiko Hesse, "Oil Prices and Bank Profitability: Evidence from Major Oil-Exporting Countries in the Middle East and North Africa." International Monetary Fund, October 2009.


White, Lawrence, "How Did We Get Into This Financial Mess?," CATO Institute Briefing Paper no. 110. (2008).
Table 1: Relationship Between Bank Profitability and GDP Growth, 2009-2010.

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<td>-0.308</td>
<td>1.885</td>
<td>3.381</td>
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<td>1.663</td>
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<td>GDP Growth</td>
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<td>1.603</td>
<td>1.454</td>
<td>-0.604</td>
<td>-0.157</td>
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<td>-0.427</td>
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<td>6.441</td>
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<tr>
<td>( R^2 )</td>
<td>0.58820</td>
<td>0.77476</td>
<td>-0.01589</td>
<td>0.05015</td>
<td>0.41115</td>
<td>0.5309</td>
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<td>F</td>
<td>36.70981***</td>
<td>43.99638***</td>
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<td>1.63361</td>
<td>17.75759***</td>
<td>14.58106***</td>
<td>6.79318**</td>
<td>3.23393*</td>
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</table>

Note: Dependent variable in the top panel is the percent change in return on equity and percent change in the non-performing loan ratio. *, **, *** denote significance at 10, 5 and 1 percent levels respectively. OLS estimation, with standard errors in parenthesis. GDP growth is the growth in real GDP in from 2008-2009, and 2009-2010 respectively. Baltic/Ireland is a dummy variable taking the value of 1 if the EU country is Estonia, Latvia, Lithuania or Ireland. Sample includes all EU countries except Romania for 2009 RoE, all EU countries except Romania and Luxembourg for 2010 RoE and 2009 NPL, all EU countries except Czech Republic, France, Finland, Ireland, Luxembourg, Sweden and Slovenia.
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<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>15.905</td>
<td>10.224</td>
<td>17.719</td>
<td>9.205</td>
<td>17.686</td>
<td>11.691</td>
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<tr>
<td></td>
<td>(4.343)**</td>
<td>(4.822)**</td>
<td>(4.846)***</td>
<td>(4.955)**</td>
<td>(5.008)***</td>
<td>(5.403)***</td>
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<td>GDP Growth</td>
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<td>0.980</td>
<td>2.633</td>
<td>0.891</td>
<td>1.788</td>
<td>0.679</td>
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<td></td>
<td>(0.865)**</td>
<td>(0.945)**</td>
<td>(0.904)***</td>
<td>(0.953)**</td>
<td>(0.927)***</td>
<td>(1.000)**</td>
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</tr>
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<td>House Prices</td>
<td>0.827</td>
<td>0.581</td>
<td>1.140</td>
<td>0.604</td>
<td>0.595</td>
<td>0.340</td>
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<tr>
<td></td>
<td>(0.343)**</td>
<td>(0.338)**</td>
<td>(0.341)***</td>
<td>(0.338)**</td>
<td>(0.425)**</td>
<td>(0.410)**</td>
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<td>Value Added</td>
<td>0.708</td>
<td>0.257</td>
<td>0.717</td>
<td>0.244</td>
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<td>Construction/GDP</td>
<td>(0.322)**</td>
<td>(0.365)**</td>
<td>(0.336)**</td>
<td>(0.381)**</td>
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<tr>
<td>Private Sector</td>
<td>-0.586</td>
<td>-0.596</td>
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<td></td>
<td></td>
<td></td>
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<td>Credit/GDP</td>
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<td>(0.556)</td>
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<td>Net Foreign</td>
<td>0.423</td>
<td>0.350</td>
<td>0.466</td>
<td>0.638</td>
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<td></td>
<td></td>
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<tr>
<td>Assets/GDP,1</td>
<td>(0.892)</td>
<td>(0.757)</td>
<td>(0.934)</td>
<td>(0.864)</td>
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<td></td>
<td></td>
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<tr>
<td>Baltic/Ireland</td>
<td>-32.913</td>
<td>-38.970</td>
<td>-33.548</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dummy</td>
<td>(15.370)**</td>
<td>(12.636)***</td>
<td>(15.729)***</td>
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</tr>
<tr>
<td>R²</td>
<td>0.75742</td>
<td>0.79142</td>
<td>0.7069</td>
<td>0.78866</td>
<td>0.74533</td>
<td>0.78371</td>
<td></td>
</tr>
</tbody>
</table>

Note: Dependent variable in the top panel is the percent change in return on equity from 2008-2009. ***,*** denote significance at 10, 5 and 1 percent levels respectively. OLS estimation, with standard errors in parenthesis. GDP growth is the growth in real GDP in from 2008-2009. House Prices is the percent change in house prices from 2008-2009. Value Added Construction/GDP is the change in the amount of construction added or subtracted each year divided by GDP. Private Sector Credit/GDP, 2004-08 is the change in the ratio of GDP to credit by deposit money banks between 2004 and 2008. Net Foreign Assets/GDP is the ratio of net assets to GDP in 2008. Baltic/Ireland is a dummy variable taking the value of 1 if the EU country is Estonia, Latvia, Lithuania or Ireland.
Table 3: 2010 Change in Return on Equity
Sample: All EU countries except Romania and Luxembourg

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<thead>
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<th>Explanatory Variable</th>
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<th>25</th>
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<th>25</th>
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<td>Intercept</td>
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<td>1.630</td>
<td>-12.535</td>
<td>-13.005</td>
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<tr>
<td>(4.716)</td>
<td>(4.876)</td>
<td>(9.387)</td>
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<tr>
<td>GDP Growth</td>
<td>1.824</td>
<td>1.621</td>
<td>3.394</td>
<td>3.193</td>
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<td>(1.852)</td>
<td>(1.916)</td>
<td>(1.988)</td>
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<td>House Prices</td>
<td>-0.389</td>
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<td>0.04835</td>
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<td>(0.542)</td>
<td>(0.589)</td>
<td>(0.632)</td>
<td>(0.675)</td>
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<tr>
<td>Value Added Construction/GDP</td>
<td>-0.900</td>
<td>-0.894</td>
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<tr>
<td>(0.645)</td>
<td>(0.657)</td>
<td></td>
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<tr>
<td>Private Sector Credit/GDP</td>
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<td>-7.190</td>
<td></td>
<td></td>
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<tr>
<td>(3.917)</td>
<td>(4.143)</td>
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<tr>
<td>Net Foreign Assets/GDP&lt;sub&gt;1&lt;/sub&gt;</td>
<td>-11.761</td>
<td>-11.095</td>
<td>0.579</td>
<td>0.581</td>
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<tr>
<td>(3.398)**</td>
<td>(3.648)**</td>
<td>(0.606)*</td>
<td>(0.617)*</td>
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<tr>
<td>Baltic/Ireland Dummy</td>
<td>5.920</td>
<td>5.758</td>
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<tr>
<td>(10.421)</td>
<td>(10.103)</td>
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<tr>
<td>R²</td>
<td>0.31082</td>
<td>0.28785</td>
<td>0.35461</td>
<td>0.331</td>
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<tr>
<td>F</td>
<td>4.60804***</td>
<td>3.42525**</td>
<td>3.63738**</td>
<td>2.97756**</td>
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</tbody>
</table>

Note: Dependent variable in the top panel is the percent change in return on equity from 2009-2010. *,**,*** denote significance at 10, 5 and 1 percent levels respectively. OLS estimation, with standard errors in parenthesis. GDP growth is the growth in real GDP in from 2009-2010. House Prices is the percent change in house prices from 2009-2010 Value Added Construction/GDP is change in the amount of construction added or subtracted each year divided by GDP. Private Sector Credit/GDP, 2004-08 is the change in the ratio of GDP to credit by deposit money banks between 2004 and 2008. Net Foreign Assets/GDP is the ratio of net assets to GDP in 2009. Baltic/Ireland is a dummy variable taking the value of 1 if the EU country is Estonia, Latvia, Lithuania or Ireland.
Table 4: 2009 and 2010 Change in the Non-Performing Loan Ratio
Sample: All EU countries except Romania and Luxembourg in 2009 and Czech Republic, France, Finland, Ireland, Luxembourg, Sweden and Slovenia in 2010.

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<th>Year</th>
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<td></td>
<td>Intercept</td>
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<td>1.291</td>
<td>0.411</td>
<td>-0.077</td>
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<td></td>
<td></td>
<td>(0.910)</td>
<td>(0.903)</td>
<td>(0.832)</td>
<td>(0.865)</td>
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<td>GDP Growth</td>
<td>-0.157</td>
<td>0.014</td>
<td>-0.203</td>
<td>-0.130</td>
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<td></td>
<td></td>
<td>(0.159)</td>
<td>(0.162)</td>
<td>(0.178)</td>
<td>(0.178)</td>
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<td></td>
<td>House Prices</td>
<td>-0.022</td>
<td>0.011</td>
<td>-0.003</td>
<td>-0.011</td>
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<tr>
<td></td>
<td></td>
<td>(0.073)</td>
<td>(0.068)</td>
<td>(0.059)</td>
<td>(0.057)</td>
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<td></td>
<td>Value Added Construction/GDP</td>
<td>-0.045</td>
<td>0.047</td>
<td>0.034</td>
<td>-0.027</td>
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<tr>
<td></td>
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<td>(0.057)</td>
<td>(0.065)</td>
<td>(0.063)</td>
<td>(0.073)</td>
</tr>
<tr>
<td></td>
<td>Private Sector Credit/GDP</td>
<td>0.378</td>
<td>0.380</td>
<td>0.116</td>
<td>0.134</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.098)**</td>
<td>(0.089)**</td>
<td>(0.053)**</td>
<td>(0.053)**</td>
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<tr>
<td></td>
<td>Net Foreign Assets/GDP</td>
<td>0.408</td>
<td>0.655</td>
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<td>0.013</td>
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<td>(0.553)</td>
<td>(0.511)</td>
<td>(0.326)</td>
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<td>R²</td>
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<td>12.62126***</td>
<td>13.76125***</td>
<td>3.05087**</td>
<td>3.11706**</td>
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Note: Dependent variable in the top panel is the percent change in the non-performing loan ratio. *,**,*** denote significance at 10, 5 and 1 percent levels respectively. OLS estimation, with standard errors in parenthesis.
Table 5: Determinants in the Changes in Return on Equity
Sample: All EU countries except Romania

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<td>(4.721)*</td>
<td>(3.058)</td>
<td>(3.776)**</td>
<td>(2.627)*</td>
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<tr>
<td>N</td>
<td>Net-Interest Income</td>
<td>46.571</td>
<td>13.826</td>
<td>-25.933</td>
<td>8.575</td>
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<td>(10.676)***</td>
<td>(8.067)</td>
<td>(18.200)</td>
<td>(13.818)</td>
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<tr>
<td>N</td>
<td>Non-Interest Income</td>
<td>3.854</td>
<td>6.614</td>
<td>26.610</td>
<td>34.774</td>
</tr>
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<td></td>
<td>(9.914)</td>
<td>(5.905)</td>
<td>(9.831)**</td>
<td>(6.782)***</td>
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<td>N</td>
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<td>39.172</td>
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<td>(8.159)***</td>
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<td>(7.289)***</td>
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<td>9.72207***</td>
<td>32.7467***</td>
<td>4.57494**</td>
<td>16.37526***</td>
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Note: Dependent variable in the top panel is the percent change in return on equity from, 2008-2009 and 2009-2010. *, **, *** denote significance at 10, 5 and 1 percent levels respectively. OLS estimation, with standard errors in parenthesis. Net-Interest Income is the revenue a bank generates on interest. It is the percent change from the previous year. Non-Interest Income is the revenue a bank generates from fees and commissions. It is the percent change from the previous year. Baltic/Ireland is a dummy variable taking the value of 1 if the EU country is Estonia, Latvia, Lithuania or Ireland.