Discussion Paper

Equity returns in the banking sector in the wake of the great recession and the European sovereign debt crisis

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The views expressed in the paper are those of the authors and do not necessarily reflect those of the Deutsche Bundesbank.

Thursday, 17 January 2013

8:45 – 9:00	Registration
9:00 – 9:10	**Opening Remarks** by **Alexander Karmann** (TU Dresden) and **Thilo Liebig** (Deutsche Bundesbank)
9:10 – 9:25	**Welcome Address** by **Hans Müller-Steinhagen** (Rector, TU Dresden)

Session 1	**Business Models and Risk-Taking of Banks I**
	Chair: Iftekhar Hasan (Fordham University)

9:25 – 10:15	**Which banks are more risky? The impact of loan growth and business model on bank risk-taking**
	Matthias Köhler (Deutsche Bundesbank)
	Discussant: Michel Dietsch (Université de Strasbourg and Banque de France)
10:15 – 10:25	Coffee Break
10:25 – 11:15	**Modelling and measuring business risk and the resiliency of retail banks**
	Mohamed Chaffai (Université de Sfax) and *Michel Dietsch* (Université de Strasbourg and Banque de France)
	Discussant: Matthias Köhler (Deutsche Bundesbank)
11:15 – 12:00	**Invited Talk**
	Capital Levels and Risk-Taking Propensity in Financial Institutions
	Giovanni Barone-Adesi (University of Lugano and Swiss Finance Institute)
12:00 – 13:30	Lunch Break

Session 2	**Business Models and Risk-Taking of Banks II**
	Chair: Thilo Liebig (Deutsche Bundesbank)
13:30 – 14:20	**The Common Drivers of Default Risk**
	Christoph Memmel (Deutsche Bundesbank), Yalin Gündüz (Deutsche Bundesbank) and Peter Raupach (Deutsche Bundesbank)
	Discussant: Wolfgang Bessler (Justus-Liebig University Giessen)
14:20 – 15:10	**Bank Risk Factors and Changing Risk Exposures of Banks: Capital Market Evidence Before and During the Financial Crisis**
	Wolfgang Bessler (Justus-Liebig University Giessen) and Philipp Kurmann (Justus-Liebig University Giessen)
	Discussant: Christoph Memmel (Deutsche Bundesbank)
15:10 – 15:25	Coffee Break
Key Note Speech 15:25 – 16:10	**Why is the 'euro crisis' so difficult to deal with?** **Martin Hellwig** (Max Planck Institute for Research on Collective Goods)
Session 3	**The Financial Crisis and the Real Economy**
	Chair: Stefan Eichler (TU Dresden)
16:10 – 17:00	**Catharsis - Tracing the Real Effects of Bank Insolvency and Resolution**
	Josef Korte (Goethe University Frankfurt)
	Discussant: Camelia Minoiu (International Monetary Fund)
17:00 – 17:10	Coffee Break
17:10 – 18:00	**Liquidity Shocks, Bank Balance Sheets, and International Lending During the 2007-08 Crisis**
	Camelia Minoiu (International Monetary Fund) and Tümer Kapan (Fannie Mae)
	Discussant: Josef Korte (Goethe University Frankfurt)
19:00 – 22:00	**Reception and Conference Dinner** **Dinner Speech: Andreas Dombret** (Member of the Executive Board, Deutsche Bundesbank)

Session 4   **Regulatory Issues**

                       Chair: Olivier De Bandt (L'Autorité de Contrôle Prudentiel France)

9:00 – 9:50   **A Model of Mortgage Losses and its Applications for Macroprudential Instruments**

                       Christian Hott (Zurich Insurance Group)

                       Discussant: Clemens Bonner (De Nederlandsche Bank)

9:50 – 10:00   Coffee Break

10:00 – 10:50   **Steering the LCR with the Interbank Money Market**

                       Clemens Bonner (De Nederlandsche Bank) and Sylvester Eijffinger (CentER, Tilburg University)

                       Discussant: Roman Horvath   (Institute of Economic Studies, Charles University Prague and IOS Regensburg)

10:50 – 11:00   Coffee Break

11:00 – 11:50   **Central Bank Transparency and Financial Stability: Measurement, Determinants and Effects**

                       Roman Horvath   (Institute of Economic Studies, Charles University Prague and IOS Regensburg) and Dan Vaško (Institute of Economic Studies, Charles University Prague)

                       Discussant: Christian Hott (Zurich Insurance Group)

11:50 – 12:35   **Invited Talk**

                       Financial Contract: Bank versus Bank

                       Iftekhar Hasan (Fordham University)

12:35 – 13:40   Lunch Break

Session 5	**Sovereign Risk**
	Chair: Alexander Karmann (TU Dresden)

13:40 – 14:30	**Fiscal Spillovers in the Euro Area**

Guglielmo Maria Caporale (Brunel University London, CESifo and DIW Berlin) and Alessandro Girardi (Istat, Rome)

Discussant: Giovanni Calice (University of Southampton)

14:30 – 15:20	**Liquidity Spillovers in Sovereign Bond and CDS Markets: An Analysis of The Eurozone Sovereign Debt Crisis**

Giovanni Calice (University of Southampton), Jing Chen (Swansea University, School of Business and Economics Swansea) and Julian Williams (University of Aberdeen)

Discussant: Jorge Antonio Chan-Lau (International Monetary Fund)

15:20 – 15:35	Coffee Break

15:35 – 16:25	**Equity Returns in the Banking Sector in the Wake of the Great Recession and the European Sovereign Debt Crisis**

Jorge Antonio Chan-Lau (International Monetary Fund), Estelle X. Liu (International Monetary Fund) and Jochen M. Schmittmann (International Monetary Fund)

Discussant: Guglielmo Maria Caporale (Brunel University London, CESifo and DIW Berlin)

16:25 – 16:40	**Concluding remarks** by **Alexander Karmann** (TU Dresden) and **Thilo Liebig** (Deutsche Bundesbank)

End of Conference

Non-technical summary

The Great Recession of 2008 and the ongoing Euro area sovereign debt crisis, which started in early 2010, have led to elevated strains in financial markets. Despite massive support programs conducted by central banks in advanced economies, banks still face a challenging operating environment, which has been reflected in repeated ratings downgrades, widening funding spreads, and declining equity prices.

Unsurprisingly, equity price declines have been the most pronounced for European banks, which are far more exposed to peripheral European government securities, and are most impacted by the recession in several Euro area countries. Indeed, banks domiciled in peripheral European countries have performed the worst since 2007.

This study focuses on the drivers of equity returns in the banking sector of advanced economies. The drivers analyzed include sovereign risk, economic growth prospects, funding conditions, and investor sentiment or risk aversion. This study finds that, after 2008, equity returns have reacted mainly to changes in the growth outlook and in sovereign risk. The finding is consistent with the existence of strong linkages between sovereigns and banks giving rise to a feedback loop.

Another result of this study is that higher capitalization and lower leverage make banks' equity returns more resilient to adverse economic and sovereign risk shocks. The measure of bank capital matters: the equity to asset ratio has a positive effect on equity returns but the more commonly used Tier-1 capital to risk-weighted assets has an insignificant effect, partly owing to the fact that risk-weighted assets may fail to reflect risks adequately. This finding suggests that while official efforts to increase bank capital are well directed and should be commended, careful thought should be exercised on the choice of the right bank capitalization metric.

We also find that the equity returns of banks less reliant on wholesale funding, as approximated by the loan to deposit ratio, tend to outperform after controlling for other variables. Higher reliance on wholesale funding, which is generally short-term, makes banks more vulnerable to funding shortages during periods of extreme market uncertainty. In contrast, deposits tend to be a more stable funding source.

Nicht-technische Zusammenfassung

Die sogenannte große Rezession des Jahres 2008 und die andauernde Staatsschuldenkrise in der Eurozone, welche 2010 begann, sind mit erheblichen Verwerfungen in den globalen Finanzmärkten verbunden. Trotz massiver Zentralbank Interventionen bleibt das Geschäftsumfeld für Banken schwierig. Dies hat sich in Herabstufungen ihrer Kreditwürdigkeit durch Rating-Agenturen, höheren Finanzierungskosten und fallenenden Aktienpreisen widergespiegelt.

Am stärksten sind die Aktienkurse europäischer Banken gefallen. Dies ist nicht überraschend, da europäische Banken mehr Risiken in Verbindung mit Staatsanleihen von Ländern der Eurozonen-Peripherie in ihren Bilanzen haben als Banken in anderen Regionen. Desweiteren sind europäische Banken auch besonders von der schwierigen wirtschaftlichen Lage in vielen Ländern der Eurozone betroffen. Die Aktienkurse von Banken aus der Peripherie der Eurozone haben dabei die größten Einbußen registriert.

Die vorliegende Studie identifiziert und analysiert welche Haupteinflussfaktoren die Aktienkurse von Banken in den Industrieländern bestimmen. Dabei fokussieren wir uns auf Risiken in Verbindung mit der Bonität von Staaten, Aussichten für das Wirtschaftswachstum, Bedingungen an den Finanzierungsmärkten, sowie die Stimmung und Risiko Aversion in den Finanzmärkten. Unsere Studie zeigt, dass die Aktienkurse von Banken ab 2008 hauptsächlich von Staatsbonitätsrisiken und Wirtschaftswachstumsaussichten bestimmt wurden. Dies steht im Einklang mit ausgeprägten Verflechtungen zwischen Staaten und Banken und daraus resultierenden Rückkopplungsschleifen.

Ein weiteres Ergebnis unserer Studie ist, dass die Aktienkurse von Banken mit höherer Kapitalisierung weniger anfällig für negative Wirtschaftswachstums- und Staatsbonitätsschocks sind. Es ist allerdings entscheidend, wie die Kapitalisierung von Banken gemessen wird. Während eine höhere Eigenkapitalquote einen positiven Einfluss auf die Aktienrendite von Banken hat, lässt sich kein statistisch signifikanter Zusammenhang zwischen Aktienrenditen und dem Quotienten von Tier-1 Kapital zu Risiko-gewichteten Aktiva nachweisen. Ein Grund hierfür könnte sein, dass die Risiko-gewichteten Aktiva Risiken nicht adäquat widerspiegeln. Vor diesem Hintergrund erscheinen Anstrengungen zur Erhöhung der Kapitalisierung von Banken lobenswert, allerdings sollte das richtige Kapitalisierungsmaß mit Bedacht gewählt werden.

Wir zeigen außerdem, dass die Aktienrendite von Banken mit geringerer Abhängigkeit von Kapitalmarktfinanzierung, gemessen als Quotient von Krediten zu Einlagen, ceteris paribus besser ist. Der Grund hierfür ist, dass Kapitalmarktfinanzierung meist kurzfristig ist und Banken daher verwundbarer macht, wenn extreme Marktunsicherheit zum Einfrieren der Finanzierungsmärkte führt. Spareinlagen hingegen sind eine stabilere Form der Bankenfinanzierung.

Equity Returns in the Banking Sector in the Wake of the Great Recession and the European Sovereign Debt Crisis[*]

Jorge A. Chan-Lau[†], Estelle X. Liu[‡], and Jochen M. Schmittmann[§]

Abstract

This study finds that equity returns in the banking sector in the wake of the Great Recession and the European sovereign debt crisis have been driven mainly by weak growth prospects and heightened sovereign risk and to a lesser extent, by deteriorating funding conditions and investor sentiment. While the equity return performance in the banking sector has been dismal in general, better capitalized and less leveraged banks have outperformed their peers, a finding that supports policymakers' efforts to strengthen bank capitalization.

JEL Classification: G01, G14, G21

Keywords: Banks, equity returns, financial crisis, sovereign risk, sovereign debt crisis, economic growth, regulatory capital, panel data econometrics


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1   Bank Equity Performance During the Recent Crisis

The Great Recession of 2008 and the ongoing Euro area sovereign debt crisis, which started in early 2010, have led to elevated strains in financial markets. Despite massive support programs conducted by central banks in advanced economies, banks still face a challenging operating environment, which has been reflected in repeated ratings downgrades, widening funding spreads, and declining equity prices (Figure 1).[1]

Figure 1. U.S. and European Bank Equity Price Indices
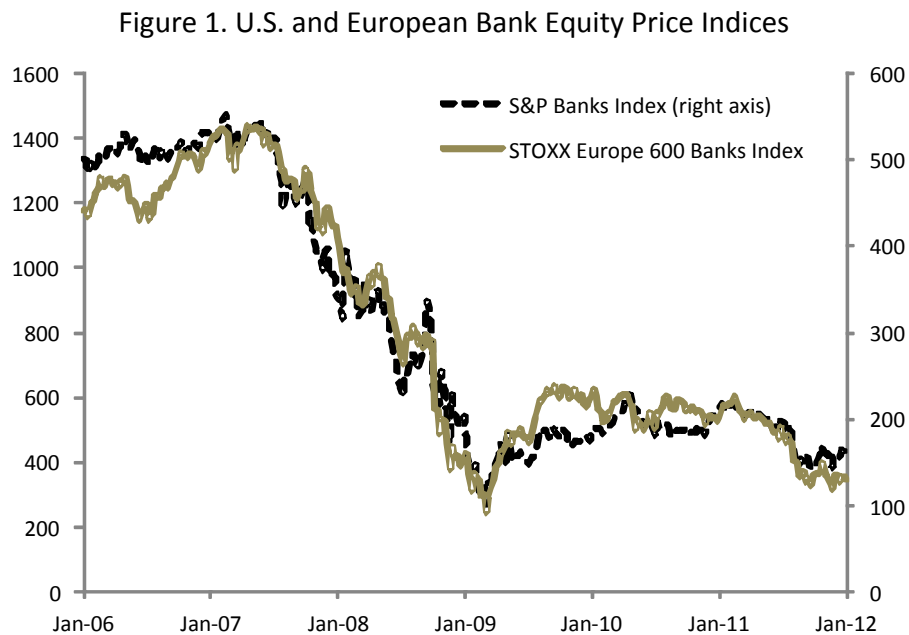
Source: Bloomberg.

Since late 2007, pressure has been building up on both sides of banks' balance sheets. Asset values and earnings expectations have been impaired as the weakening of economic conditions in the Euro area offset hopes for a sustained recovery hinted by improved economic data in the United States and major emerging market countries. Non-performing loans will likely remain a problem given the sluggish growth outlook, further eroding profitability in the banking sector.

In particular, banks' holdings of peripheral European government bonds, long regarded as risk-free assets, have experienced large declines in value as markets recently priced in increased sovereign default risk on debt sustainability concerns. Even banks without substantial exposures to peripheral European government securities have been affected, as they are major counterparties in derivatives markets referencing these securities, stand on the other side of large interest rate swaps with sovereigns, and/or have claims on banks highly

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[1] Examples of such support programs include central bank liquidity swap agreements in 2008 and 2011, the Troubled Assets Relief Program (TARP) in the United States, and several refinancing option programs in the Euro area.

exposed to peripheral sovereigns. To further compound problems, the restructuring of Greek sovereign debt, which yielded a 70 percent net present value loss for bondholders, has resulted in increased market uncertainty on the effectiveness of hedging instruments and strategies such as credit default swaps (CDS) and short-selling, impacting the investor base negatively and driving sovereign bond prices downwards. Unsurprisingly, equity price declines have been the most pronounced for European banks, which are far more exposed to peripheral European government securities, and could be the most impacted by a potential recession in the Euro area. Indeed, banks domiciled in peripheral European countries have performed the worst since 2007 (Figure 2).

Figure 2. European Banking Sector Equity Price Indices, January 2006=100
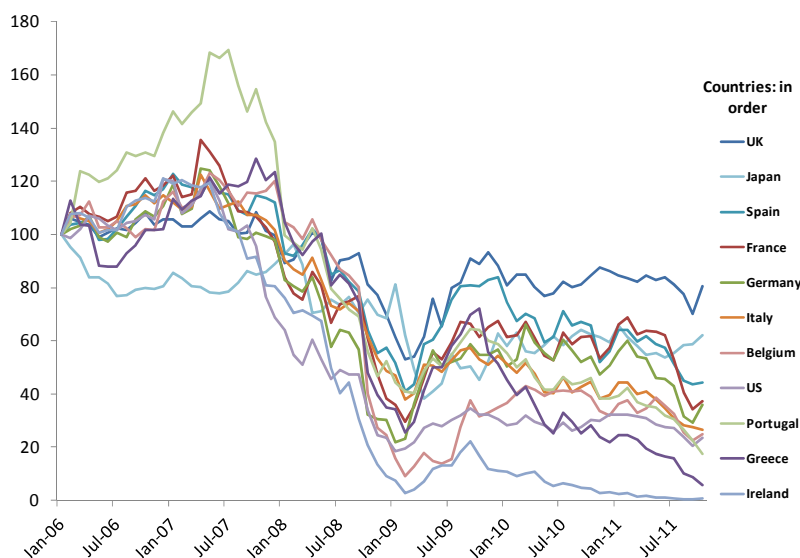
Source: Bloomberg and authors' calculations.

Increased investor attention on the exposure to peripheral European countries has led to a tightening of funding conditions for banks, especially those in Europe and those perceived strongly connected to the latter. Funding tenors have shortened significantly and some financial institutions have been able to access term funding market only by pledging prime assets as guarantees. In particular, European banks have faced U.S. dollar funding shortages, forcing them to retreat from global operations such as trade finance in Asia and municipal finance in the United States. In response to a drying up of liquidity conditions, the European Central Bank (ECB) provided banks with about €1 trillion in extraordinary, long-term financing in two allotments conducted on December 2011 and February 2012, with resulted in a net injection of about € 521 billion. Against this background, more stringent bank regulations and, in the case of European banks, the need to improve capital ratios to withstand potential sovereign debt losses may further accelerate the deleveraging process which started in 2008, contributing to further depress earnings in the banking sector (IMF, 2012).

This study focuses on the drivers of equity returns in the banking sector of advanced economies. The drivers analyzed include sovereign risk, economic growth prospects, funding

conditions, and investor sentiment or risk aversion. This study finds that, after 2008, equity returns have reacted mainly to changes in the growth outlook and in sovereign risk. The finding is consistent with the existence of strong linkages between sovereigns and banks giving rise to a feedback loop. Banks have been a cornerstone of the European sovereign bond investor base, holding sizable bond portfolios. A deterioration of the economic outlook hurts a country's repayment capacity raising its sovereign risk. Losses in bond holdings decrease banks' ability to provide credit, further damaging the growth outlook, and to continue buying sovereign debt, leading to higher sovereign spreads that affect the country's ability to serve its debt.

Another result of this study is that higher capitalization and lower leverage make banks' equity returns more resilient to adverse economic and sovereign risk shocks. The measure of bank capital matters: the equity to asset ratio has a positive effect on equity returns but the more commonly used Tier-1 capital to risk-weighted assets has an insignificant effect, partly owing to the fact that risk-weighted assets may fail to reflect risks adequately. For instance, despite several sovereign downgrades, domestic government debt still carries a zero-weight for regulatory purposes in European countries. This finding suggests that while official efforts to increase bank capital are well directed and should be commended, careful thought should be exercised on the choice of the right bank capitalization metric.

We also find that the equity returns of banks less reliant on wholesale funding, as approximated by the loan to deposit ratio, tend to outperform after controlling for other variables. Higher reliance on wholesale funding, which is generally short-term, makes banks more vulnerable to funding shortages during periods of extreme market uncertainty, as pointed by Duffie (2010) and Gorton and Metrick (2010) among others. In contrast, deposits tend to be a more stable funding source.

The structure of the remainder of this paper is as follows. Section 2 reviews the literature, and is followed by a description of the data in Section 3. Section 4 presents the panel data analysis relating banks' equity returns to macro factors and Section 5 examines how different bank characteristics affect equity returns. Section 6 concludes.

2   Literature Review

There is a vast literature on banks' performance and profitability. A number of studies have focused on the factors affecting the supply of banking services, relating bank profitability and performance to the degree of economy of scale, mergers and acquisitions, efficacy of management and the impact of market structure. Some examples are Berger and Humphrey (1994), which focus on the US financial market; Molyneux and Thornton (1992), Altunbas et al (2007) and Bos and Schmiedel (2007) on European banks, and more recently, Said & Tumin (2011) on emerging market banks.

In the past decade the focus has shifted to reflect the rapid globalization of financial markets such as the impact and importance of international divergences on banking performance (Berger, 2007), and interactions between domestic and foreign banks (Claessens, Demirgüç-Kunt, and Huizinga, 2001; Carbó et al, 2009; Hannan, and Prager, 2009). Other studies have

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examined bank profitability from a risk perspective and can be grouped into three different categories. The first category includes traditional asset and liability management studies. For example, Staikouras (2003) studies the sensitivity of bank value to changes in market interest rates. The second category comprises studies on how financial regulation such as asset and capital adequacy requirements affect profitability (Altunbas et al, 2007). The third category studies the causes and consequences of financial crises, for example Berger and Bouwman (2010), focusing on the importance of liquidity risk exposures and the capital adequacy of banks for the stability of financial systems.

There has been a heated debate about how bank capital affects banks' stock performance. Some studies argue that banks should hold more capital, especially during financial crises, as more capital will help banks to raise cheaper financing, to signal credit worthiness and to borrow less in order to support a given level of assets (Demirgüç-Kunt and Huizinga, 1998; and García-Herrero et al, 2009). However, other studies argue that forcing banks to hold more capital would jeopardize their return on assets (Molyneux and Thornton, 1992) and thus increase their exposure to asset risks (see Jensen, 1986, and Ross, 1977). Moreover, regulatory capital ratios could be misleading, giving a false sense of security. For instance, one month before the bailout of Dexia, a Belgian-French bank, regulatory capital ratios were well above the minimum regulatory standards (De Groen, 2011). A recent study by (Demirgüç-Kunt, Detragiache, and Merrouche (2012) finds that a stronger capital position is associated with better stock market performance, most markedly for larger banks, and that the relationship is stronger when capital is measured by the leverage ratio rather than the risk-adjusted capital ratio, results which are consistent with our results.

Aside from the above-mentioned studies on banks' capital structure, various studies since the Great Recession have focused on the feedback loop between the banking sector and sovereign risks. Though most of these studies focus on how banks' performance affects sovereign risks, some other studies find negative spillovers from euro area sovereign stresses on the banking sector. BIS (2011) argues that increases in sovereign risk adversely affect banks' funding costs. Ejsing and Lemke (2009) find that the rescue packages announced by several euro area governments in October 2008 lowered the spreads of financial firms. Demirgüç-Kunt and Huizinga (2010) find that during the financial crisis the increase in bank CDS premia is significantly related to the deterioration of public finance conditions. Goldman Sachs (2010) documents that during the euro area debt crisis, bank CDS premia were significantly positively correlated with the CDS premia of the respective sovereigns.

Finally, a large body of literature analyzes the impact of macroeconomic factors on stock market returns. For example, Chen, Roll, and Ross (1986) find that default and term premia along with industrial production are priced factors, while the evidence for inflation is weak. Cutler, Poterba, and Summers (1989) confirm a significant positive correlation of industrial production with stock returns, but only for certain periods. Similarly, McQueen and Roley (1993) show that models with time-varying coefficients are better able to detect the impact of macro variables on returns than constant coefficient models. A link between stock market volatility and macro factors is documented by a number of studies including Flannery and Protopapadakis (2002). An additional strand of literature links long-run economic growth to stock market performance (Levine and Zervos (1998), Mohtadi and Agarwal (2001)).

3 Data and Variable Definitions

This study uses a data sample comprising 68 banks headquartered in Belgium, France, Germany, Greece, Ireland, Italy, Japan, Portugal, Spain, the United Kingdom and the United States. Only banks with assets equal or above 500 million of local currency units (50 billion yen for Japanese banks) were included in the sample (for a complete list of banks, see Appendix I). The sample does not include banks that were delisted during the period 2006 – 11, which may introduce survivorship bias. The results, hence, could be biased towards banks with strong capital bases, banks deemed too-important-to-fail that benefitted from the perception of an implied government guarantee, and regional banks that were less affected by the ongoing financial crisis due to their limited international exposures.

For each bank, data on bank-specific characteristics were collected from Bloomberg, including the tier-1 capital ratio, the ratio of short-term to long-term liabilities, leverage (equity to assets), and the loans to deposit ratio, which indicates how much a bank relies on wholesale funding. The inclusion of the latter variable was justified, as the 2008 crisis showed that banks were vulnerable to a run on wholesale funding (Duffie, 2010; Gorton and Metrick, 2010).

Monthly equity return series for the period January 2006 – October 2011 were constructed from mid-price quotes obtained from Bloomberg, from which a risk-free rate proxy was subtracted to calculate the excess equity return series. The risk-free proxy was the 1-month euro overnight index average swap rate (EONIA). EONIA swaps are the most liquid instrument in the euro money markets and since they are mark-to-market on a daily basis and do not involve exchange of principal, the rates are less affected by counterparty risk.[2] This is not the case for Libor rates, as rising default risk in the banking sector has increased unsecured borrowing costs in the interbank market. Risk-free rates could also have been approximated with German bond yields, but they could reflect market concerns that the need to bail out peripheral European countries would have worsened Germany's fiscal position. In addition, only little trade in Bunds with one month to maturity takes place, which makes EONIA better for such maturities.

Figure 3 illustrates the behavior of equity returns during the sample period. Excess equity returns entered negative territory starting from the beginning of 2008. Despite a rebound in early 2009, which coincided with a rebound in economic growth, excess returns rapidly became negligible before turning negative once more in 2011.

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[2] We acknowledge that EONIA rates could have been significantly distorted by the introduction of the fixed rate allotment tender procedure by the ECB in October 2008. Excess liquidity from this allotment could have put downward pressure on EONIA.

Figure 3. Excess Equity Returns in the Banking Sector
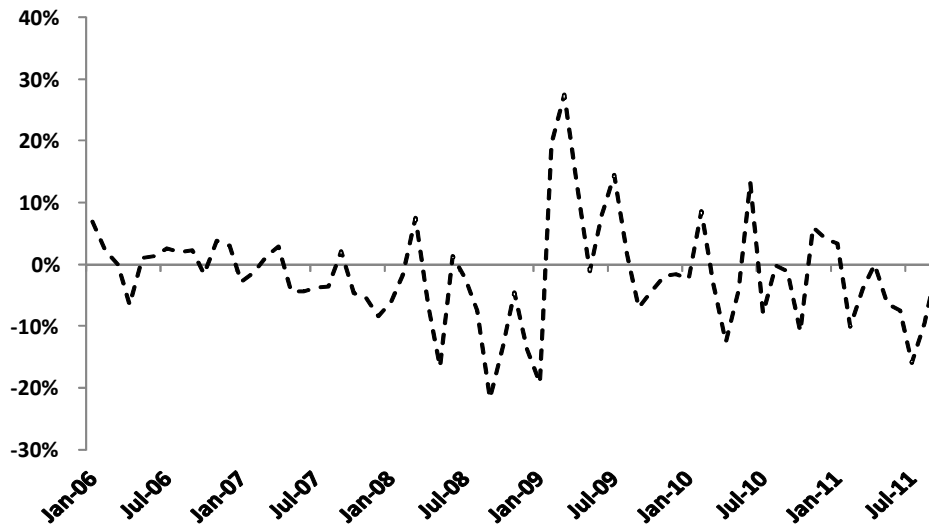
Source: Bloomberg; and authors' calculations.

To analyze the impact of sovereign risk on equity returns, we approximate sovereign risk with the arithmetic average of the 5-year senior credit default swap (CDS) spreads of Belgium, Greece, Ireland, Italy, Portugal, and Spain, the six countries which have experienced the most severe CDS widening during the sample period.[3]

The choice of CDS spreads rather than bond spreads is justified for practical reasons. First, CDS are standardized contracts, with spreads over a given tenor equivalent to the spreads of a constant maturity contract. This is not necessarily the case with government bonds, as for any given tenor the spread is calculated from the bond with the nearest maturity. Second, empirical evidence shows that CDS spreads tend to lead bond spreads. While this does not necessarily imply economic causality, CDS spreads are likely to convey more information than bond spreads in a regression analysis.[4] For instance, following the long-term liquidity injections by the European Central Bank (ECB) in late December 2011 and February 2012, sovereign bond spreads in some peripheral countries narrowed on purchases by banks benefitting from cheap long-term funding. Nevertheless, the sovereign CDS spreads did not compress, as markets considered fundamentals were little changed.

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[3] The results did not differ substantially when a GDP-weighted CDS measure was used, and when sovereign CDS for countries other than European countries were included. While in practice CDSs are considered appropriate "clean" measures of default risk, they may also embed a liquidity premium or be thinly traded, (Longstaff et al, 2005; Chen et al, 2011). Thin-trading tends to occur when CDS spreads start trading at recovery values for highly-distressed issuers, as it was the case for Greece in the first quarter of 2012.

[4] Blanco et al (2005), Chan-Lau and Kim (2005), Hull and White (2004).

The economic growth outlook is also a driver of equity prices as it affects earnings expectations. We approximate monthly changes in the economic growth outlook, or the growth pace, with monthly changes of the purchasing managers' indices (PMIs) of Euro area countries and the United States.[5] Even if released with a one-month lag, changes in PMIs provide markets with new information on how fast the economy has grown, and large deviations from market consensus could prompt an earnings revision which would be ultimately reflected in equity prices. Stronger growth leads to higher earnings and higher equity returns, supports higher fiscal revenues, and helps reducing a country's debt to GDP ratio, reducing sovereign risk. Indeed, as observed in Figure 4, changes in sovereign risk exhibits a negative contemporaneous correlation with changes in PMIs.

Figure 4. Sovereign Risk vs PMI, monthly changes
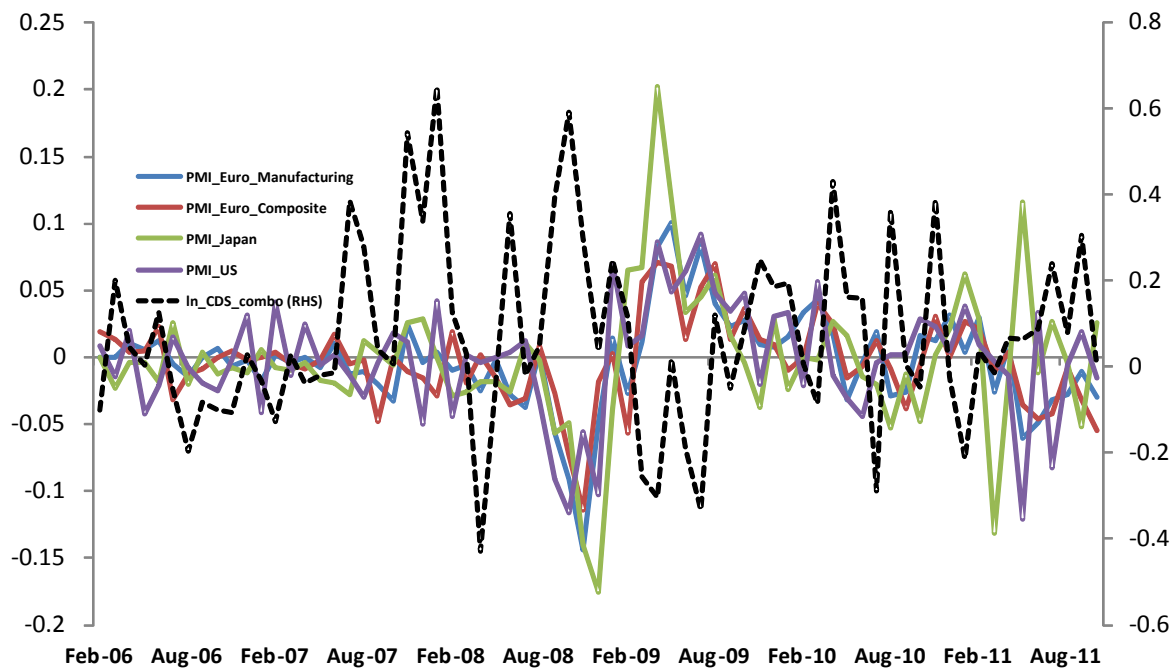
Source: Bloomberg, and authors' calculations.
Note: The CDS is an arithmetic average of Belgium, Greece, Ireland, Italy, Portugal and Spain.
PMI_Euro_Composite is a composite PMI index for both manufacturing and service sectors.

We also include other explanatory variables to account for funding conditions and investor sentiment. Funding conditions are approximated by two factors: the 3-month Euribor-EONIA spread (Euribor OIS spread) and the option adjusted spread (OAS) for eurobonds issued by

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[5] In addition to the change in the PMI, we also construct a *growth surprise* variable, the difference between the PMI forecast and its realized value. Inclusion of the variable does not materially affect our results and the variable is therefore omitted.

global banks.[6] The former is used as an indicator for short-term funding stress, while the latter measures long-term funding conditions over horizons of one-year and above. As it has become standard in the literature, investor sentiment is proxied by the Chicago Board Options Exchange Volatility Index, VIX.[7]

4   What Explains Equity Returns in the Banking Sector?

We use fixed-effect panel regressions to assess the impact of growth, sovereign risk, funding stress and investor sentiment on banks' equity returns, the dependent variable. Table 1 summarizes the three main model specifications estimated during the sample period January 2006-October 2011. Significance levels are indicated by the standard star notation and standard errors are included in parenthesis.

Table 1. Banks' Equity Returns: Model Specifications

VARIABLES	(1)	(2)	(3)
Δ Sovereign stress	-0.212***	-0.175***	-0.164***
	(0.011)	(0.012)	(0.014)
Δ Euro PMI	1.180***	1.097***	1.072***
	(0.081)	(0.083)	(0.085)
Δ US PMI	-0.220***	-0.183***	-0.200***
	(0.069)	(0.071)	(0.075)
Δ VIX		-0.076***	-0.064***
		(0.013)	(0.014)
Δ Euribor-OIS spread			0.007
			(0.007)
Δ Euro bank bond spread			-0.055*
			(0.029)
Constant	-0.009***	-0.011***	-0.010***
	(0.002)	(0.002)	(0.002)
Observations	4,461	4,329	4,329
R-squared	0.183	0.187	0.188
Number of banks	68	68	68

Standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Column 1 includes only sovereign stress and economic conditions in the Euro area and the U.S., column 2 adds the VIX as a measure of uncertainty in financial markets, and column 3 adds measures of short- and long-term funding conditions for banks. In subsequent tables we

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[6] Another possible measure of funding stress is the 3-month euro dollar basis. This measure is highly correlated with the Euribor OIS spread, so the results would have been qualitatively similar.

[7] The results were very similar using other measures of investor sentiment, such as the VDAX. The choice of the VIX was guided by its wide acceptance among practitioners as a global investor sentiment.

only present the specification in column 3.[8] The simple model in column 1 explains about 18 percent of the variation in banks' stock returns. Adding the VIX and measures of funding conditions adds only marginally to explanatory power.

The results show a strong negative correlation between sovereign stress in the GIIPS plus Belgium and bank returns. Increases in the Euro area PMI, our measure of economic conditions, are positively correlated with the returns on bank equities in our sample. Funding pressures, when measured by the option adjusted swaps spread on Euro-denominated bank bonds, exhibit negative correlation with equity excess returns. Our measure of short-term funding conditions, the Euribor-OIS spread is insignificant. Possible explanations for this are the high collinearity with other variables, and that funding pressures, captured by the Euribor-OIS spread, may respond to changes in banks' balance sheets driven by changes in the value of sovereign bond holdings.

Surprisingly, the U.S. PMI is negatively related to returns. This finding can be rationalized by the observation that, while the 2008 Great Recession affected the banking system worldwide, partly owing to the run on repo (Duffie, 2010; Gorton, 2010), the U.S. economy somewhat has decoupled from the Euro area economy during the European sovereign debt crisis. The economic decoupling of the U.S. and the Euro area can be analyzed by splitting the sample into two periods, the earlier one corresponding to the 2008 Global Recession and the latter to the European sovereign debt crisis.

Roughly, the first period starts in 2007, when problems in the U.S. subprime market first emerged which led to wide-spread banking stresses that culminated in the collapse of Lehman Brothers in September 2008. The second period started in 2009 when doubts about Greece's fiscal position emerged that would ultimately snow balled into the ongoing European sovereign debt crisis.

In order to account for these two crises periods, Table 2 presents panel regression results for two time periods: 2006-08 and 2009-11 (October). Consistent with the latter period being a Euro area sovereign debt crisis, the Euro-periphery sovereign stress measure and the Euro PMI have a larger impact during 2009-11. The higher impact of sovereign stress may reflect the increased focus on sovereign exposures, which in the case for European banks, became evident with the stress tests conducted by the European Banking Authority (EBA) and the related bank data disclosure. As mentioned above, the U.S. PMI has a negative sign in the second period, suggesting that the U.S. has somewhat decoupled from developments in Europe. Market volatility (VIX) is only significant in the first period. This is consistent with the intuitive explanation that the 2008 Global Recession was more focused on the United States. In contrast, funding stress measures in Euros are significant and negative in the second half of the sample, reflecting the mounting difficulties faced by European banks.

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[8] The inclusion of a wide range of different variables such as lagged variables, PMI deviations from consensus forecast, the Citi economic surprise indicator, and various funding measures does not alter the qualitative findings in this paper fundamentally, as different funding measures are highly correlated. The correlation analysis is available from the authors upon request.

Table 2. Banks' Equity Returns: Different Sample Periods

VARIABLES	(1) 2006-2008	(2) 2009-2011
Δ Sovereign stress	-0.153***	-0.184***
	(0.017)	(0.023)
Δ Euro PMI	0.672***	1.656***
	(0.102)	(0.147)
Δ US PMI	0.411***	-0.837***
	(0.091)	(0.130)
Δ VIX	-0.091***	-0.008
	(0.016)	(0.025)
Δ Euribor-OIS spread	0.014**	-0.036**
	(0.007)	(0.015)
Δ Euro bank bond spread	0.036	-0.152***
	(0.038)	(0.046)
Constant	-0.004	-0.019***
	(0.003)	(0.004)
Observations	2,211	2,118
R-squared	0.205	0.217
Number of banks	66	68

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Tables 3 and 4 present results for the baseline panel regression by country. Among the non-Euro area countries in the sample, banks in the UK are most affected by Euro sovereign stress and economic conditions, while Japanese banks are least affected. Market volatility matters for banks in the US, UK, and Japan in line with the importance of investment banking in these countries. As one would expect, the explanatory power of the Euro-centric macro-variables in the US and Japan is much lower than for banks in the UK or Euro area.

Among Euro area countries, Euro sovereign stress is important for banks' returns in general, owing partly to its impact on the banks' sovereign bond holdings. The exception is Ireland, as Irish banks got into trouble in the first phase of the crisis before it became a sovereign debt crisis. In fact, very large loan losses of banks – whose impact on public debt was exacerbated by guarantees Ireland gave to its banking sector – precipitated the country's sovereign debt crisis. Market volatility is only significant for banks in France and Germany as both countries are home to institutions with sizeable investment banking activities. The longer-term, bond-based funding measure has the expected negative sign for almost all countries but is insignificant due to high correlation with the other variables.

Table 3. Banks' Equity Returns: United Kingdom, United States, and Japan

VARIABLES	(1) UK	(2) US	(3) Japan
Δ Sovereign stress	-0.203***	-0.123***	-0.071***
	(0.041)	(0.046)	(0.022)
Δ Euro PMI	1.143***	1.080***	0.341***
	(0.254)	(0.284)	(0.132)
Δ US PMI	-0.074	-0.231	0.112
	(0.225)	(0.252)	(0.117)
Δ VIX	-0.102**	-0.120**	-0.082***
	(0.042)	(0.047)	(0.022)
Δ Euribor-OIS spread	-0.003	0.025	-0.008
	(0.020)	(0.022)	(0.010)
Δ Euro bank bond spread	0.005	-0.135	0.027
	(0.086)	(0.096)	(0.045)
Constant	-0.001	-0.005	-0.015***
	(0.007)	(0.008)	(0.004)
Observations	335	804	712
R-squared	0.317	0.119	0.132
Number of banks	5	12	11

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4. Banks' Equity Returns: Euro Area Countries

VARIABLES	(1) France	(2) Germany	(3) Spain	(4) Italy	(5) Ireland	(6) Greece	(7) Belgium	(8) Portugal
Δ Sovereign stress	-0.199***	-0.197***	-0.159***	-0.162***	-0.140	-0.281***	-0.349***	-0.202***
	(0.041)	(0.047)	(0.023)	(0.026)	(0.123)	(0.045)	(0.081)	(0.036)
Δ Euro PMI	0.925***	0.943***	0.702***	0.892***	4.340***	1.442***	2.052***	0.942***
	(0.256)	(0.290)	(0.138)	(0.157)	(0.756)	(0.276)	(0.502)	(0.225)
Δ US PMI	-0.012	-0.213	-0.337***	-0.161	-0.965	-0.094	-0.230	-0.564***
	(0.227)	(0.257)	(0.123)	(0.140)	(0.671)	(0.245)	(0.445)	(0.199)
Δ VIX	-0.095**	-0.123**	-0.004	-0.036	-0.066	-0.038	-0.030	0.017
	(0.042)	(0.048)	(0.023)	(0.026)	(0.125)	(0.046)	(0.083)	(0.037)
Δ Euribor-OIS spread	-0.000	0.012	-0.004	0.006	0.056	0.004	-0.019	0.007
	(0.020)	(0.023)	(0.011)	(0.012)	(0.060)	(0.022)	(0.040)	(0.018)
Δ Euro bank bond spread	-0.068	-0.107	-0.024	-0.048	-0.291	-0.038	0.184	-0.129*
	(0.087)	(0.099)	(0.047)	(0.054)	(0.257)	(0.093)	(0.171)	(0.076)
Constant	0.000	-0.000	-0.002	-0.010**	-0.048**	-0.024***	-0.012	-0.010
	(0.007)	(0.008)	(0.004)	(0.004)	(0.021)	(0.008)	(0.014)	(0.006)
Observations	201	201	625	451	201	397	134	268
R-squared	0.442	0.398	0.216	0.333	0.286	0.334	0.353	0.318
Number of banks	3	3	12	7	3	6	2	4

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

5   Do Bank Characteristics Matter for Explaining Equity Returns?

As the European debt crisis broadens and deepens, policy advice has strongly called for an adequate capitalization of banks (IMF, 2011). It is therefore natural to ask whether banks with better capital positions fared better than their peers during the crisis, and whether certain funding practices could better insulate them from liquidity shocks (BCBS, 2011). In this context, typical indicators used to assess and identify bank vulnerabilities include Tier-1 capital ratios, leverage ratios (equity to total assets), and dependence on wholesale funding (Brunnermeier et al, 2009).

To analyze whether bank specific characteristics matter for banks' vulnerability and which characteristics better identify banks' ability to weather adverse shocks, we take two approaches. First, we augment the panel regressions in the previous section with bank specific characteristics. Second, we split the sample into banks with above and below median values for a given characteristic such as capitalization.

Table 5 presents results of the first approach, bank fixed-effects panel regressions with bank specific characteristics as additional independent variables. Columns (1) and (2) show results for the full sample of banks, while columns (3) and (4) are limited to the sub-sample of Euro area banks. Coefficients on macroeconomic factors are little changed from the previous section. The following discussion therefore focuses on bank-specific variables.

In general, lower leverage (i.e. a high ratio of equity to assets) was associated with better equity performance. This result holds for both Euro area banks and the full sample. The beneficial effect of lower leverage is about twice as high in the period 2009-11 compared to the earlier period (2006-08). On the other hand, the tier 1 capital ratio is insignificant in all cases. The relative irrelevance of this measure could be due to issues with the definition of capital and conceptual flaws in the calculation of risk-weighted assets (Haldane, 2011; Le Leslé and Avramova, 2011; Das and Sy, 2012). For example, tier 1 capital may not adequately reflect the risk associated with European peripheral sovereign debt. In unreported results we find that a measure of potential losses on banks' sovereign exposure is highly significant and negative.[9] For the ratio of loans to deposits, the results show a negative significant effect for both the full sample and Euro area banks during 2009-11. Accordingly, deposits as a stable source of funding were beneficial for banks during the Euro area crisis episode. The ratio of short-term to long-term liabilities is insignificant in all cases.

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[9] For an estimate of potential losses on sovereign exposure see "Box 1.3. Quantifying Spillovers from High-Spread Euro Area Sovereigns to the European Union Banking Sector", September 2011 GFSR.

Table 5. Banks' Equity Returns and Bank Characteristics

VARIABLES	(1) Full Sample 2006-2008	(2) Full Sample 2009-2011	(3) Euro Area 2006-2008	(4) Euro Area 2009-2011
Δ Sovereign stress	-0.150***	-0.195***	-0.173***	-0.224***
	(0.019)	(0.025)	(0.017)	(0.030)
Δ Euro PMI	0.631***	1.638***	0.877***	1.652***
	(0.118)	(0.158)	(0.104)	(0.194)
Δ US PMI	0.434***	-0.759***	0.130	-0.594***
	(0.105)	(0.138)	(0.093)	(0.170)
Δ VIX	-0.085***	-0.007	-0.058***	0.006
	(0.018)	(0.026)	(0.016)	(0.032)
Δ Euribor-OIS spread	0.014*	-0.040***	0.021***	-0.049**
	(0.008)	(0.016)	(0.007)	(0.019)
Δ Euro bank bond spread	0.046	-0.164***	0.014	-0.210***
	(0.044)	(0.049)	(0.039)	(0.060)
Short-term liab./Total liab.	0.035	0.035	0.008	0.066
	(0.056)	(0.071)	(0.044)	(0.076)
Equity/Assets	0.181*	0.427***	0.209***	0.397***
	(0.095)	(0.131)	(0.067)	(0.129)
Loans/Deposits	-0.016	-0.066**	-0.010	-0.054*
	(0.027)	(0.028)	(0.020)	(0.028)
Tier 1 capital ratio	-0.151	0.463	-0.168	0.253
	(0.262)	(0.309)	(0.201)	(0.357)
Constant	0.008	-0.017	0.014	-0.018
	(0.044)	(0.049)	(0.036)	(0.055)
Observations	1,760	1,802	1,093	1,120
R-squared	0.189	0.240	0.346	0.313
Number of banks	55	57	35	35

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0

Table 6 presents results of the second approach, separate panel regressions of samples splitted by the sample medians for leverage (equity/assets), the tier 1 capital ratio, and the ratio of loans to deposits as of January 2007. Banks with lower leverage, higher capital and a lower loan to deposit ratio appear somewhat less vulnerable to sovereign stress. For Euro area economic conditions, there is very little difference between the sensitivity of banks split by leverage and tier 1 capital. Banks with a high ratio of loans to deposits appear more vulnerable to changes in Euro area economic conditions. Among bank-specific characteristics the positive significance of equity/assets for banks with high leverage, low capital and high loans to deposits stands out. This suggests that the positive effects of lower leverage are non-linear and are more prevalent for weaker or riskier banks.

Table 6: Banks' Equity Returns and Standard Vulnerability Indicators

VARIABLES	(1) Equity/Assets High (>5.8%)	(2) Low	(3) Tier 1 capital ratio High (>7.1%)	(4) Low	(5) Loans/Deposits High (>115%)	(6) Low
Δ Sovereign stress	-0.134***	-0.184***	-0.159***	-0.189***	-0.184***	-0.135***
	(0.027)	(0.018)	(0.020)	(0.018)	(0.019)	(0.025)
Δ Euro PMI	1.060***	1.011***	1.190***	1.021***	1.202***	0.840***
	(0.162)	(0.111)	(0.124)	(0.108)	(0.117)	(0.155)
Δ US PMI	-0.240*	-0.147	-0.194*	-0.252***	-0.327***	-0.044
	(0.144)	(0.098)	(0.110)	(0.096)	(0.104)	(0.137)
Δ VIX	-0.052*	-0.071***	-0.053**	-0.050***	-0.034*	-0.091***
	(0.027)	(0.018)	(0.021)	(0.018)	(0.019)	(0.026)
Δ Euribor-OIS spread	0.019	-0.004	0.008	0.001	0.007	0.006
	(0.013)	(0.009)	(0.010)	(0.009)	(0.009)	(0.012)
Δ Euro bank bond spread	-0.131**	-0.021	-0.023	-0.035	-0.085**	-0.063
	(0.056)	(0.038)	(0.043)	(0.037)	(0.040)	(0.053)
Short-term liab./Total liab.	-0.147**	-0.000	-0.082*	-0.060	-0.056	-0.015
	(0.068)	(0.042)	(0.049)	(0.044)	(0.041)	(0.077)
Equity/Assets	0.146	0.389***	0.242	0.330***	0.294***	0.901*
	(0.190)	(0.077)	(0.158)	(0.071)	(0.071)	(0.540)
Loans/Deposits	-0.015	-0.023	-0.031	-0.013	-0.012	-0.097**
	(0.036)	(0.016)	(0.021)	(0.018)	(0.015)	(0.050)
Tier 1 capital ratio	-0.548	-0.171	-0.171	-0.292*	-0.591***	-0.223
	(0.344)	(0.146)	(0.214)	(0.160)	(0.206)	(0.229)
Constant	0.074	0.017	0.044	0.033	0.056	0.041
	(0.063)	(0.029)	(0.035)	(0.035)	(0.036)	(0.063)
Observations	1,627	1,840	1,569	1,775	1,806	1,661
R-squared	0.139	0.266	0.221	0.263	0.255	0.143
Number of banks	27	28	24	27	28	27

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

6 Conclusions

The successive realization of two major crises since 2008 has eroded banks' earnings prospects owing partly to tight funding conditions and potential large losses from sovereign debt holdings of European countries undergoing significant duress. While it is difficult for banks to insulate completely from major shocks affecting global economic conditions, our analysis suggest that banks with a stronger capital base have been better able to cope with major stresses, a fact priced in their equity prices.

Increased reliance on deposits rather than short-term wholesale funding could help banks to withstand negative shocks better, as our results suggest that lower loan to deposit ratios are reflected in a better equity return performance.

Another important finding is that higher capitalization and lower leverage help banks' equity returns to cope better with negative economic shocks and deteriorating sovereign risk. The result, however, depends on what capital measure is used, as only the equity to asset ratio matters with the Tier-1 capital to risk-weighted asset being insignificant. This finding provides guidance on the ongoing discussion on how best to recapitalize banks, either in the context of the current sovereign debt crisis or proposals to reform the banking sector.

Policy makers would be ill-advised on relying on traditional capital measures relative to risk-weighted assets, as the latter fail to capture banks' balance sheet credit risk correctly. Rather, capital should be measured against realistic measures of potential losses such as those implied from market prices. Critiques correctly point out that market-based measures could overestimate losses, as they embed risk and liquidity premia, and they could induce procyclicality (Brunnermeier et al, 2009). During uncertain times, however, to err on the side of caution may prove to be the wiser choice, while work continues towards a better definition of risk-weighted assets and back-testing to ensure it captures risks in banks adequately.

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Appendix I: List of banks

Countries	Name	Countries	Name
US	JP Morgan	**Ireland**	Allied Irish Banks
	Bank of America		Governor * Co of the bank of Ireland
			Irish Life & Permanent Group Holdings
	Citigroup		PLC
	Wells Fargo	**Italy**	Intesa Sanpaolo SpA
	US Bancorp		Unicredit
	Washington Mutual		Mediobanca SpA
	PNC Financial Services Group Inc		Banca Monte dei Paschi di Siena SpA
	SunTrust Banks		Unione di Banche Italiane
	BB&T Corp		Banco Popolare
	Regional Financial Group		Banca Popolare dell'Emilia Romagna Scrl
	Morgan Stanley	**Spain**	Banco Santander
	Goldman Sachs		BBVA
Japan	Misubishi UFJ Financial Group		CaixaBank
	Mizuho Financial Group Inc.		Bank Civica Sa
	Sumitomo Mitsui Financial Group Inc		Banco Popular Espanol
	Resona Holdings Inc		Banco de Sabadell SA
	Shinkin Central Bank		Banco Espanol de Credito Sa
	Sumitomo Mitsui Trust Holdings Inc		Bankinter SA
	Fukuoka Financial Group Inc		Bankia SA
	Saitama Resona Bank Ltd		Banco Pastor SA
	Hokuhoku Financial Group Inc		Banco de Valencia
	Chiba Bank Ltd		Caja de Ahorros del Mediterraneo
	Nomura Holdings Inc		CaixaBank
Belgium	KBC Group	**UK**	HSBC
	Dexia		Barclay
France	BNP Paribas		Royal Bank of Scotland
	Societe Generale SA		Lloyds Banking Group PLC
	Credit Agricole SA		Standard Chartered
Germany	Deutsche Bank	**Portugal**	Banco Commercial Portugues
	Commerzbank AG		Banco Espirito Santo Sa
	Landesbank Berlin		Banco BPI SA
Greece	National Bank of Greece		Banif SGPS SA
	Alpha Bank		
	EFG Eurobank Ergasias SA		
	Agricultural Bank of Greece		
	Piraeus Bank SA		
	TT Hellenic Postbank SA		