HOW THE SOVEREIGN DEBT CRISIS AFFECTED THE CAPITAL STRUCTURE OF EURO ZONE BANKS

Selase Kanda[1] and Tabassum Iqbal[2]

[1]University of Manchester, School of Social Sciences,
Oxford Road, P.O. Box M13 9PL, Manchester, United Kingdom

[2]COMSAT Institute of Information Technology, Park Road,
Chak Shahzad, 44000, Islamabad, Pakistan

ABSTRACT: In this article, we try to identify the link between the capital structure dynamics of banks and the European sovereign debt crisis, looking at the drivers of leverage and how their interactions with leverage changed between the periods before and during the crisis. We review the existing literature on the links between the sovereign debt crisis and banks, as well as literature discussing the changes in bank funding patterns with the view to understanding how leverage dynamics changed during the debt crisis period.

We found out that although most of the variables of interest were relevant in explaining leverage over the period under study as a whole, the variables that captured macroeconomic interactions with leverage were more relevant to leverage during the crisis period than variables capturing bank specific information. Meanwhile this study showed a significant reduction of leverage during the crisis period in line with a risky environment and regulation pressures, with much of this reduction being explained by factors other than bank-specific determinants of leverage.

KEYWORDS: Sovereign Debt; Leverage; Capital Structure; Bank-specific Determinants.

1 INTRODUCTION

Considering the fact that it is still an on-going problem concentrated in the euro area, the sovereign debt crisis has gained a lot of attention from researchers. With traces of the crisis originating back in late 2009, a lot of work has been done into understanding how it unfolded and its widespread effects.

The euro area was an attempt towards promoting the common interests of its member countries through a more robust currency supported by the economies of a group of countries. Efforts towards an Economic and Monetary Union in Europe have been in the works since the 1970s. The Maastricht Treaty was signed in 1992 as part of the efforts towards achieving this, with a timeline for integration as well as conditions for joining the union set out therein. Part of the criteria for membership was that, countries were expected to meet certain thresholds including a budget deficit not exceeding 3% of GDP as well as public debt no more than 60% of GDP. There have however been numerous expressions of skepticism with regards to the implementation of a monetary union without the institution of banking and fiscal union alongside.

Most researchers believe that the crisis began when Greece announced its budget situation and confessed to reporting less than accurate figures. This led to questions about how many other countries were tampering with figures to present a better picture. The intensity of the situation increased Greece was not able to meet debt payments, with impending default lurking.

The sovereign debt crisis had far reaching consequences on the euro area and beyond, with its effects on the banking sector attracting a good share of attention. The link between sovereigns and the banking sector cannot be overemphasized,

noting the fact that, the banking sector drives economic activity through its intermediation activities of channelling money from lenders especially households, to firms to aid productive activity. In some countries, sovereigns depend a lot on the banking sector as a source of private funding, whilst the efforts by the sovereign to promote economic growth and stability go a long way to boost bank performance and health.

In relation to this interaction between banks and sovereigns though, our focus lies in exploring how the sovereign debt crisis situation affected the capital structure of banks. Since funding is needed for any business to survive and run, capital decisions and its structure is a key area for banks as well. A number of funding sources are open to banks including equity, debt funding, deposits from customers and Central bank lending. Funding decisions whether through equity or through external financing are made in light of several considerations: the business environment, economic situation, availability, bank characteristics and costs. It is no doubt that the sovereign debt crisis introduced a change in dynamics in capital structure decisions, in terms of costs of funding choices and availability. Banks as operating entities take various levels and types of decisions in running their businesses.

As mentioned earlier, the sovereign debt crisis continues to receive a lot of research attention, with a number of papers recently exploring the link between the sovereign debt crisis and the banks. To mention a few, Gennaioli, Martin and Rossi (2012), Bolton and Jeanne (2011) as well as Sosa-Padilla (2012) demonstrate through models how sovereign defaults would affect banks. With the interests of this research geared towards exploring bank capital structure in the midst of the crisis, Gropp and Heider (2010) and Giordana and Schumacher (2012) present papers that are of interest; explore the general drivers of capital structure in banks, albeit without a particular focus on the sovereign debt crisis.

What this study attempts to do is to therefore establish a link between the sovereign debt crisis and bank capital structure with the goal of understanding how capital structure patterns changed in light of the crisis. We explore the some relevant drivers of leverage in an attempt to explore how relevant they were to determining capital structure during the crisis period. Since the data at hand is of the panel type, we employ a fixed effects model to examine the links between various factors influencing leverage and to assess how the sovereign debt crisis changed the interaction of these factors with leverage choices. Findings showed that macroeconomic variables which capture market, lending risk and the spread increases were very significant in explaining leverage during the crisis period, as compared to bank-specific variables.

2 LITERATURE REVIEW

2.1 THE SOVEREIGN DEBT CRISIS

A lot of work has been done in studying the sovereign debt crisis, which turns out to be one of the major crises in history to hit most parts of Europe. The sovereign debt crisis, which followed after the financial crisis of the United States, began sometime in 2009.

Mody and Sandri (2012) consider signs of the euro zone crisis to have started from the impact of the global financial crisis on banks in European countries which then affected sovereign spreads in respective countries. They also point to the bailout of Bear Stearns and the Lehman Brothers bankruptcy as a second phase of events leading to the crisis, with the January 2009 nationalisation of Anglo-Irish in Ireland as the starting point of the crisis in its full-blown form. The figure below shows the transition of sovereign spreads into their rocket high trends during the crisis.
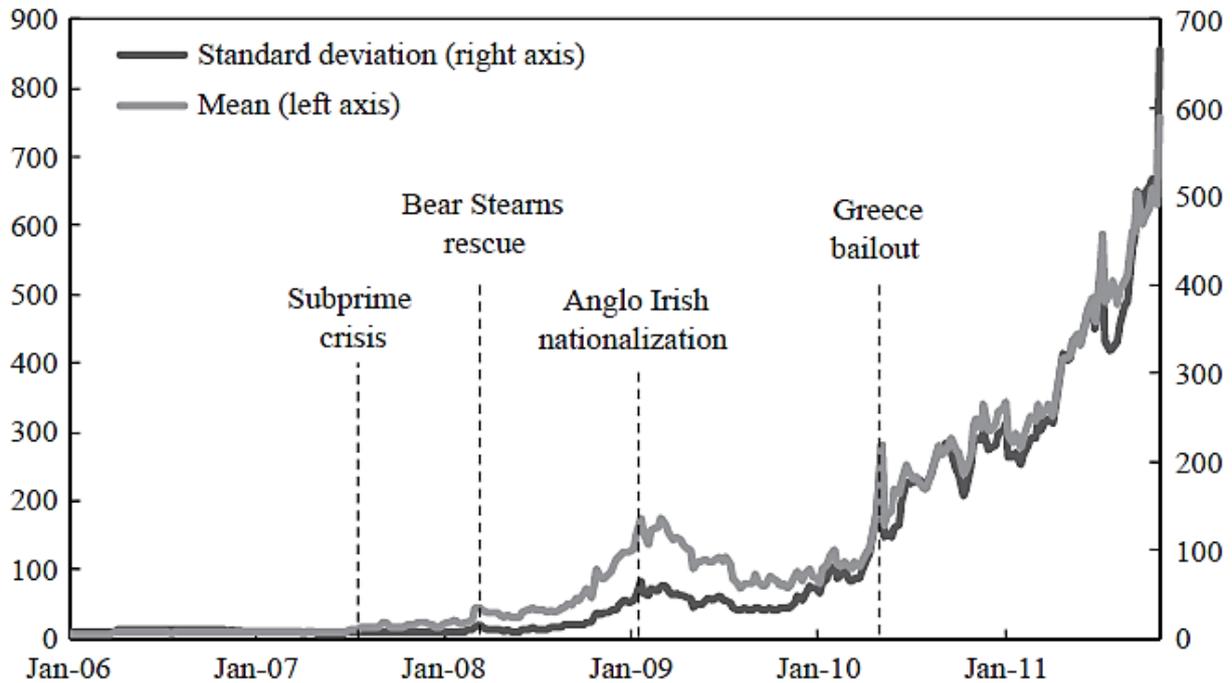
Fig. 1. *Increase and dispersion of euro zone sovereign spreads (basis points)*

Source: Mody and Sandri (2012)

A main consensus however is that the Greece government's announcement sometime in October 2009 about its previous government reporting wrong budget deficit and public debt figures set the stage for the sovereign debt crisis. A report published in the 12th November, 2011 edition of *The Economist* lends credence to this view: it states that in the German point of view, what set the ball rolling for the crisis was Greece misrepresenting it's national account situation as well as its budgetary mismanagement. This led to agitation in markets and raised concerns about the how deep the deficit and debt situation was in Greece and other countries, especially the periphery (Van Rixtel and Gasperini, 2013). These events led up to a shoot of sovereign spreads to high levels which further aggravated the crisis situation, with spill overs from Greece to other countries, again with peripheral countries most hurt.

In retrospect, certain flaws can be pointed out in the fabric of the plans to establish an Economic and Monetary Union. One of the key observations was that not all countries were able to meet the budget deficit and public debt threshold provisions outlined in the Stability and Growth Pact (SGP) prior to the crisis, with even Germany falling short of its provisions at some point (The Economist, 2011). The provisions of the SGP therefore seemed quite ambitious to start with.

There is also the concern by many researchers about the fact that establishing a monetary union without a backing banking and fiscal union is not feasible, with most researchers pointing to the US example where such mechanisms are in place. Lane (2010) buttresses this point when he contends that the inherent design of the European Union was flawed due to a lack of a total comprehension of the inherent weaknesses of a monetary union, especially without an established banking union.

Greece was the hardest hit country, and probably the main 'centre of attraction' during the crisis, with several arrangements made to curb the severity of the situation. With many European countries holding Greek debt, the need to curb a default situation by Greece was pertinent. As shown in the insert from *The Economist* below, about 70% of Greek government debt amounting to close to EUR 80 billion was held by euro area banks as at the fourth quarter of 2009.

Country	% of total	Government bonds, €bn	Total, €bn
France	32	34	52
Germany	19	20	31
Netherlands	5	5	8
Rest of euro area	16	17	26
Total euro area	72	76	117
Britain	6	7	10
US	7	8	12
Rest of world	15	16	25
Total	100	106	164

Fig. 2.   Foreign bank holdings of Greek assets, Q4 2009

Sources: Bank for International Settlements; Bank of Greece; The Economist

The crisis situation was further exacerbated by a series of ratings downgrades from rating agencies. The Economist (2010) points out, Standard and Poor's (S&P) downgraded Greek debt to BB+, followed by a downgrade of Portugal and then Spain to A- and AA respectively. Hence, there was a spill over of the Greece debt problem to other Eurozone countries, with the peripheral countries being most affected. The yield spreads of Portugal and Spain in particular also started to rise amidst growing concerns about the state of the periphery along with the rating downgrades. With these countries tied to a single currency along with sluggish economic prospects, their plight became more burdensome as a somewhat offsetting mechanism like currency devaluation was no longer an available measure under the euro regime.

With Greece having no hope of meeting debt payment deadlines, other remedies had to be sought. Other peripheral countries were also in dire need of funding to bailout their ailing banks. In order to curb the crisis situation, bailouts were arranged initially for Greece, followed by Ireland and Portugal (Lane, 2010). The magnitude of the situation is captured by the joint bailout programmes put together by the European Union (EU) and International Monetary Fund (IMF). Greece was bailed out through the joint programme on March 2010, Ireland on November 2011 and Portugal on May 2011 (Van Rixtel and Gasperini, 2013).   Greece however required further assistance and a second bailout was arranged in March 2012. As Lane (2010) points out, this second bailout came with certain provisions with adverse effects on lenders by way of huge haircuts on Greek sovereign debt held; hence lenders were made to accept a reduction of about 50% of the original amount of debt that was due them from their holdings of Greek debt in order to prevent a default on payment by Greece.

With on-going measures to fully arrest the sovereign debt crisis, or the Greek debt crisis as it is sometimes known, the situation is likely to see a prolonged manifestation in the coming years as attempts are made to cure the ailing countries and their financial systems from the impact.

2.2   INTERCONNECTION BETWEEN THE SOVEREIGN DEBT CRISIS AND THE BANKING CRISIS

The banking crisis of the euro area is said to have started before the European Sovereign debt crisis, with the debt crisis leading to an intensification of the banking crisis.

According to Van Rixtel and Gasperini (2013), a banking crisis often occurs as a result of a decline in economic asset values. They refer to the case of the 2007-2009 financial crises, where banks built large exposures to mortgage assets which plunged in value and affected the financial strength of those banks. In line the above assertion, the banking crisis in Europe began to emerge during the global financial crisis, after the bailout of Bear Stearns (Mody and Sandri, 2012).

In addition to the exposures to US mortgage assets, there was an observed trend as Caruana and van Rixtel (2012) point out, where preceding the global financial crisis as well as the sovereign debt crisis, banks had eased on raising funds through deposits and increasingly depended on the global financial markets for funding with the US being an important source of funding. Additionally, during the 2007-2009 financial crisis, most money market funds transferred their investments from US

banks to European banks, increasing their share of investments in the euro area. This could be attributed to the relative safe haven the euro area provided at the time. Hence, Europe was enjoying a healthy patronage from money market investors as well as hedge funds from the US.

What this resulted into was that in light of the financial crisis and the sovereign debt crisis, euro area banks started scrambling for more stable sources of funds which they had focused less on because of the US markets they easily accessed prior to the two crises.

In light of the above developments, some researchers are of the view that there was a strong link between the global financial crisis and the banking problems that followed in Europe. In line with this, Van Rixtel and Gasperini (2013) establish the fact that the global financial crisis and banking funding are interconnected by reason that the financial crises affected the quality of assets on the balance sheets of banks, which led to massive selloffs of these bad assets and a worsening of the balance sheet positions of these banks as asset prices plunged during selloff. They also mention that this deterioration in the liquidity position of banks led them to increase their debt exposures as a means of funding and hence into more risky business areas. This situation further worsened the quality of their assets and eventually led to a limited access of banks to funding markets.

When the sovereign tensions began, euro area banks underwent the major phase of a banking crisis. In the words of Van Rixtel and Gasperini (2013), "... Sovereign tensions morphed into a banking crisis". Although most European banks were affected by the Global financial crisis (with some banks in countries like Ireland severely affected), the sovereign debt crisis that emerged afterwards further worsened the financial health of banks extensively. Caruana and van Rixtel (2012) point out that the sovereign tensions that emerged came at a time when banks were recovering from the global crisis and trying to purge their balance sheets from the bad assets that they had acquired from its aftermath. With most banks holding large amounts of sovereign debt on their balance sheets, banks mainly in peripheral countries, suffered severely as a result of the rise in sovereign spreads. The nature of holdings were such that most euro area banks held the sovereign debt of other euro area countries, with banks in countries like Germany heavily exposed to debt from the peripheral countries. Figure 3 below from Bolton and Jeanne (2011) shows the proportions of sovereign debt held by both local and foreign banks, with over 50% of Spanish sovereign debt held by banks. Domestic banks in Spain, Germany and Greece were the most exposed to sovereign debt, with domestic banks holding around 42%, 34% and 19% of sovereign debt in these countries respectively.
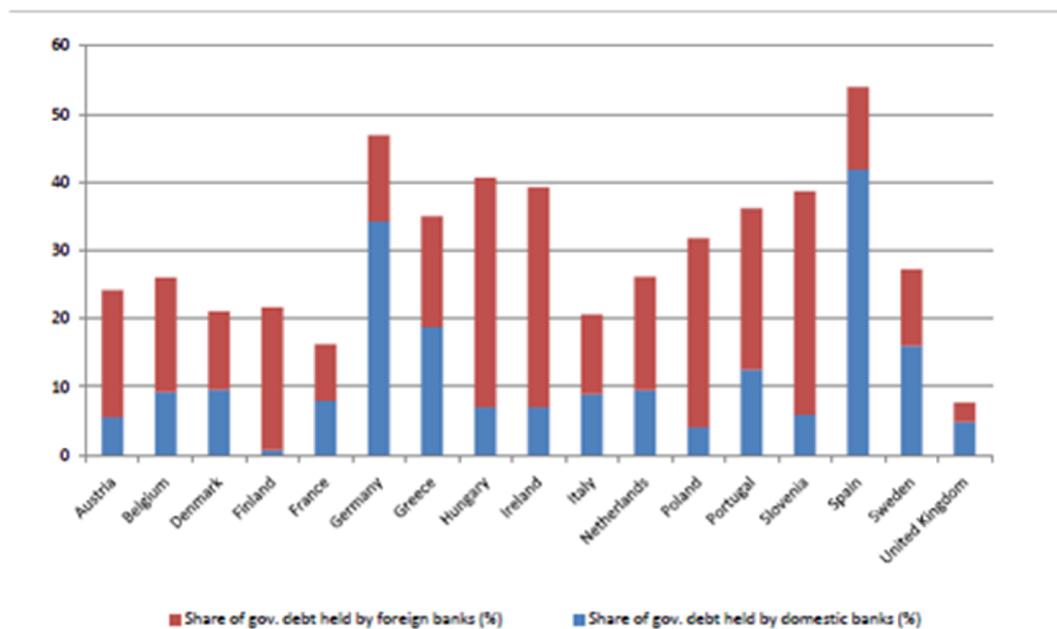

Fig. 3.   Proportion of Sovereign Debt held by Domestic and Foreign Banks

Source: Bolton and Jeanne (2011)

With perspective on how exposed banks in the euro area were to sovereign debt, there were a number of ways or channels through which the sovereign debt crisis affected the health of banks:

- First of all, the rise in sovereign spreads—a sign of rising sovereign credit risk—reduced the value of debt and hence directly affected the health of banks' balance sheets through a reduced value of sovereign debt held by these banks as assets. Panetta et al (2011) point to the fact that the amount of damage sustained by banks through holding sovereign debt depended on the accounting treatment used by banks to record such holdings: whether investments in sovereign assets are recorded as held at market value or at amortised cost on their balance sheet. The paper notes that in the case of holding debt at market value, any changes in the value of sovereign debt directly reflect on the income statements of such banks and hence directly affect their profit positions. Additionally, due to looming defaults on some sovereign debt, agreements had to be reached with creditors to accept haircuts to their debt holdings; this was the case for Greek debt. The banks holding Greek debt hence likely lost substantial values of their investments, considering that haircuts were about 50% of the value of debt.

- As part of their lending activities, most banks have to put up collateral for repo transactions, lending from Central bank and other secured forms of borrowing. An important composition of bank collateral for lending is sovereign debt, due to its relatively credit risk-free status—at least prior to the sovereign debt crisis, which rendered some sovereign debt like that of Greece highly risky. During the height of the debt crisis, the falling values of sovereign debt effectively made it difficult for banks to obtain funding as a result of the shrinking value and pool of bank collateral (Van Rixtel and Gasperini, 2013). The crisis also made sovereign debt use as collateral difficult due to its falling eligibility for use in funding transactions (Panetta et al, 2011).

- Another channel through which banks are affected by sovereign debt is through sovereign downgrades. Panetta et al (2011) argue that sovereign ratings serve as a cap for the ratings of banks due to the strong link between sovereigns and banks. Hence, what that means is that banks are limited as to the ratings they can attract on their debt issues and their ratings depend much on the ratings of the sovereign in which they are located. A complexity arises in this situation as a result of possible spillovers between parent and subsidiary banks in different countries, with a likely adverse effect on a subsidiary's ratings arising from the ratings of the sovereign in which its parent bank is based.

- Additionally, as pointed out by ECB (2012), with the sovereign debt crisis and reducing sovereign credibility followed a decline in the value of government guarantees. These guarantees were of potentially great importance to banks in obtaining funding, considering that governments were able and more credit-worthy and hence guarantees were weighty in circumstances where banks had to issue securities. The crisis however has diminished the credit position of many sovereigns and the value of their guarantees, mainly in peripheral countries.

- A final transmission channel worth mentioning is the case where the debt crisis affected household wealth and firm profits. Lane (2010) points out in relation to the efforts to curb the European debt crisis through fiscal consolidation, that those measures could further weaken the banking system through reducing household disposable incomes and private sector profits, hence making default on bank lending more likely.

Apart from the effects holding sovereign debt had on bank health, the sovereign debt crisis affected the banking system through other ways.

Van Rixtel and Gasperini (2013) mention the fact that these sovereign tensions were followed by a rise in interbank funding costs, both in euro and other currencies, hence limiting the funding sources available to banks.

Additionally, US money market funds which supplied huge amounts of funding to the euro area banks began to withdraw their investments from the euro area banks as the sovereign tensions soared. As these money market funds were an important provider of dollars to the euro area, European banks especially the peripheral countries suffered from limited supply of dollars in the region.

The effects of the debt crisis were actually quite pervasive; the sovereign crisis not only affected euro zone countries, but stock prices of banks in the UK and US fell along with stock price declines in the euro zone banks (Van Rixtel and Gasperini, 2013).

2.3 CHANGES IN FUNDING SOURCES OF BANKS AS A RESULT OF THE DEBT CRISIS

The Sovereign debt crisis saw banks in both core and peripheral countries experience difficulties in accessing funding from a number of sources. The main sources of funding for banks include customer deposits; long-term debt such as debentures;

short-term funding from interbank markets and money markets; raising equity from shareholders and potential shareholders; and funding from Central Banks which are normally lenders of last resort.

The sovereign debt crisis led to structural changes in funding choices by banks as certain funding sources were more difficult to access and other means of funding had to be sought. The following main changes in bank funding occurred during the euro area crisis period:

- **Deposit funding**: The crisis period saw banks increasingly move towards more stable sources of funding, prime of which was funding from deposits. Within the euro area however, Van Rixtel and Gasperini (2013) record that there was a gradual movement of deposit funding from some peripheral countries like Greece to core countries like Germany and France which were more of a safe haven for funds; peripheral countries, in order to attract some deposits, had to offer much higher deposit rates than what was being offered by core countries. This points to the selective provision of funding provision based on country, where euro zone countries considered more stable and less affected by the sovereign crisis had more funding opportunities open to them, whilst those countries, precisely the peripheral countries, most hit by the crisis suffered limitations to accessing funding markets.

- **Short-term wholesale funding**: Van Rixtel and Gasperini (2013) define this to include secured and unsecured borrowing from money markets as well as other short-term borrowing like commercial paper. They point out that the debt crisis led to limitations in raising unsecured debt, leading to a greater dependence on interbank borrowing. The situation might be attributed to uncertainties in the short-term funding markets about the intensity of the crisis situation and how it would affect bank balance sheets and their ability to pay off their obligations. The authors also point out the fact that interbank lending in the form of repo financing saw a lot of scrutiny regarding the form of collateral provided and the choice of counterparties. This arose as the value of sovereign debt, which before was an eligible form of collateral, experienced falls especially in the case of peripheral countries, with debts of the likes of Greece undergoing cuts to prevent a default. Hence, banks in most peripheral countries were unable to obtain secured funding as a result of the deterioration in the value of their collateral.

  Additionally, US money markets, which were important providers of short-term funding, reduced their investments drastically during the crisis and moved to other foreign countries as a drive to safety. Even the core countries experienced reductions in money market investments, a case in point being France, which saw a cut in US money market funding due to the heavy exposure of its banks to the sovereign debt of peripheral countries (Van Rixtel and Gasperini, 2013).

- **Long-term wholesale funding**: The euro area debt crisis had a severe impact on access to long-term funding, with some peripheral countries almost entirely cut out of these funding markets. National segmentation was again prominent in this case where selective access was available only to some countries mainly the core European countries.

  Van Rixtel and Gasperini (2013) reiterate the fact that only some peripheral countries were able to access these markets mainly Italy and Spain, albeit a very limited access; the others were literally shut out of the long-term debt market. Core countries were not without difficulty in accessing funding, as spillovers from peripheral countries made it difficult for them as well.

  Covered bond issuance (a secured form of issuance) and other forms of secured funding increased generally in the euro region as other means of funding, which meant that more assets were tied as collateral in this form of issuance. ECB (2012) lends further credence to the point by emphasizing that secured lending led to an over-collaterised position for the banks, further shrinking the availability of unsecured funding as most assets of banks were tied in secured funding transactions.

  Government-guaranteed issuance also increased momentarily as they were reintroduced with programmes in Spain and Italy in the second quarter of 2012, an indication that government guarantees still had some value during the euro area crisis period (Van Rixtel and Gasperini, 2013).

  Retained issuance, where banks retained securities instead of issuing them, was also a major activity for banks in peripheral countries as they had limited markets to sell bonds to; German, French and Dutch banks still had a market for their bond issues though. Retained issuance mainly involved covered bonds and government-guaranteed bonds, and was an important form of collateral in obtaining funding from the ECB—the ECB being lenient in its defining qualifying collateral (Caruana and van Rixtel, 2012).

- **ECB Liquidity Provision**: With ever-rising tensions in the funding markets, most peripheral countries resorted to the ECB for funding. The ECB's full-allotment policy made it possible for banks to access ECB lending in place of interbank funds amidst the tensions, especially in 2011 when the crisis situation worsened (ECB, 2012). The critical nature of the sovereign debt crisis led to the ECB undertaking various assistance programmes. As a result, the ECB made various liquidity

provisions to salvage the situation and curb the damage sustained by banks on their balance sheets. These provisions include the Long-Term Refinancing Operations and Main Refinancing Operations, through which the ECB provided liquidity to struggling banks. European central banks also provided emergency finance under the Emergency Liquidity Assistance Programme.

- **Bank Capital**: As a result of the weakening access to funding sources and the deteriorating value of sovereign debt assets, banks in the euro area made frantic efforts to deleverage by raising equity capital. Van Rixtel and Gasperini (2013) make mention of the fact that banks' ratio of capital plus reserves to total assets did not change much in pre-crisis period, but started increasing at the end of 2008 as a move to more stable funding; they record that there were increases in equity issues, with an issue amount of EUR 88 billion in September 2012.

ECB (2012) also lends corroborating evidence of the fact that the capital plus reserves to assets ratio was on the incline, driven mainly by the fact that capital growth exceeded the growth in assets. The deleveraging efforts were believed to be driven mainly by the need to increase safety capital levels in response to the funding difficulties in the markets as well as in anticipation of the new provisions the Basel III framework may bring along in response to the global and sovereign debt crises (Van Rixtel and Gasperini, 2013).

2.4 DETERMINANTS OF BANK CAPITAL STRUCTURE/ FUNDING CHOICES

Banks as businesses make decisions about various aspects of operation, an important part of which is how operations are funded. From classical corporate finance literature, Modiglianni and Miller (1958) proposed a theory of capital structure which put forward the view that the method of financing used by a firm, whether through equity or debt, does not matter. Their first proposition, as it was referred to, stated that the market value of a firm does not depend on its capital structure. In the ideal world however, there may be various relative benefits to financing from one method over another, hence the first Modigliani and Miller proposition does not hold in real life situations.

Other capital structure theories therefore emerged to explain capital structure with more realistic assumptions in mind. Two famous theories emerged. Fama and French (2005) describe the trade-off theory as follows:

"In the trade-off model, firms identify optimal leverage by weighing the costs and benefits of an additional dollar of debt. The benefits of debt include, for example, the tax deductibility of interest and the reduction of free-cash-flow agency problems. The costs of debt include potential bankruptcy costs and agency conflicts between stockholders and bondholders. At the leverage optimum, the benefit of the last dollar of debt just offsets the cost."

Myers (1984) argues in favour of an alternate theory: the pecking order theory. According to the pecking order theory, internal financing is preferable to debt financing—with safe debt preferred to risky debt—which is also preferable to equity financing; the idea being that information asymmetry increases the cost of raising finance. Hence under this theory, equity is most expensive because of management hold superior information about the company creating a larger information asymmetry problem (Fama and French, 2005).

Despite the many theories that have been developed to explain firm capital structure, a lot is still yet to be understood about it. Myers (1984) makes this clear when he openly states in his paper the fact that very little is known about how firms choose between equity, debt and hybrid securities. With this in mind, many researchers have undertaken practical work using econometric techniques to understand how capital structure interacts with various bank-specific as well as external macroeconomic factors, in an attempt to gain further insight into firm choices between self-funding and funding from outside sources.

The case of banks is quite unique as are heavily regulated in relation to their capital management practices. Capital regulations require banks to hold a certain minimum amount of capital and reserves in order to meet capital adequacy requirements; hence there is some regulatory input into the capital decisions of banks to start with. We explore a number of factors that drive capital structure decisions of banks.

2.4.1 CAPITAL REGULATION

Despite the fact that capital regulation is not a focal point of study of this research, it is worth mentioning its role in banks' capital structure decisions, a role which was quite emphasized after the global financial crisis. Capital regulation has to do with setting minimum capital requirements for banks in an attempt to ensure the safety and health of capital. In light of the recent crises both in the United States and the on-going sovereign debt crisis, there have been a series of modifications

made to capital regulation to safeguard against the devastating effect that the past and on-going crises have had on bank health.

The global financial crisis was an eye-opener for regulators who came to the realisation of the insufficiency of previous Basel provisions to deal with crises situations. As Demirgüç-Kunt et al (2010) note, the US financial crisis revealed the inadequacies of capital regulation pointing to the fact that most of the banks in the crisis period were within capital regulation requirements, but still needed bailouts.

In September 2010, the Basel Committee agreed on new reforms to the capital regulations banks were required to meet. The Basel III was a response to the need for a more robust capital and liquidity base of banks in order to better handle economic and financial stress. It hence has a number of more stringent provisions that attempt to improve on the requirements set out in the previous agreement.

Härle et al (2010) point out that fact that the Basel III framework focuses on improving two main weaknesses in the banking system that came to light during the global financial crisis: improving on the quality of capital and making provisions for liquidity and funding management.

In relation to the main capital requirements, the figure below outlines the capital provisions under Basel III.

Calibration of the Capital Framework
Capital requirements and buffers (all numbers in percent)

	Common Equity Tier 1	Tier 1 Capital	Total Capital
Minimum	4.5	6.0	8.0
Conservation buffer	2.5		
Minimum plus conservation buffer	7.0	8.5	10.5
Countercyclical buffer range*	0 – 2.5		

Fig. 4.   Basel III Capital Requirements

Source: Bank for International Settlements

As can be seen from the table, there has been an increase in the amount of equity capital banks are required to hold to 4.5%, more than twice the previous provisions of 2%. The minimum total capital of 8% remains the same as in previous Basel provisions. One of the main changes though is the introduction of the capital buffer of 2.5%, which effectively increases the total capital requirement to 10.5%. There is also the new countercyclical buffer, which is expected to be a means for banks to build up additional capital buffer in times of excess credit growth (Basel Committee, 2010). The Basel III provisions therefore provide for a more robust capital base for banks against risk.

The provisions made under liquidity and funding, as described by Härle et al (2010b), are made up of two indicators:

- The liquidity coverage ratio (LCR) which is supposed to prevent banks from suffering from shortages of short-term funds; and

- The net stable funding ratio (NSFR) supposed to set out requirements in terms of long-term funding by banks. The purpose of the NSFR is to mitigate against refinancing risk by providing for amounts of long-term funds banks must raise; these funds must be equivalent to the value of their long-term assets.

Other provisions made by the committee, as outlined in The Economist (2010b), include another 1.5% of capital in addition to the mentioned equity requirements; this component of capital is not expected to be of the same quality as equity. The authors also mention a total leverage provision, which is to ensure that equity value is at least 3% of total assets.

Despite the fact that the capital and liquidity requirements of Basel III are quite robust, they are also quite substantial to satisfy and the lengthy implementation period of up to 2019 for certain provisions does not make it any less daunting a task. The statistics estimated by Härle et al (2010b), though higher than other authors' estimates, emphasize the point of how high a shortfall banks may have to meet: capital provisions in Basel III are expected to leave banks with the need to raise an additional €700 billion, which would amount to a shortfall of about 40% of the core Tier 1 capital of the banking system; the funding and liquidity provisions would additionally require banks to raise between €3.5 trillion and €5.5 trillion in long-term funding, and a further €2 trillion in liquid assets.

There has also been a fair amount of concern about certain tools being considered by regulators as part of the means to curb risk contagion in the banking system. An interesting one worth mentioning is the concept of bail-in. As Pengelly (2012) explains, a bail-in is supposed to be an arrangement where bank creditors bear part of the damage of bank losses. Hence, in addition to equity holders taking losses, bondholders will be next in line to shoulder losses from banks by having an appropriate amount of their bond holdings converted to equity in order to cover such losses. Despite the fact that certain regulators—such as the Financial Stability Board—deem the concept worthy of implementation, the author expresses concern for the defeating purpose it may have on banks: with banks expected under the NSFR to raise extra long-term funds, the bail-in concept would push potential lenders away, who would not want to shoulder such responsibilities for bank losses. The bail-in idea, if implemented could also shoot long-term spreads very high to compensate for the high risks involved for bondholders.

In response to the implementation of Basel III, most banks started putting in place measures to meet its requirements, which led to a steady increase in capital and reserves by the banking system. The figure below shows the increase in capital and reserves by Monetary Financial Institutions (MFI) in the European Union, of which banks make up the majority.
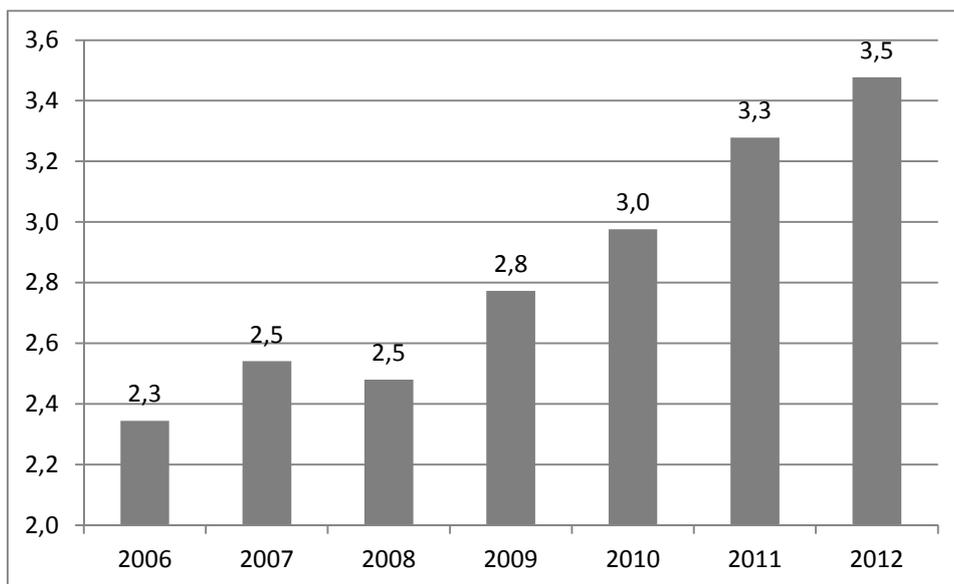
Fig. 5.   MFI capital & reserves in EU (€ trln)

Source: ECB

As figure shows, a significant increase in capital is seen in the year preceding the Basel III agreement, most likely in preparation for the more stringent capital requirements that was being expected, and rightly so. It is hoped that the new provisions will somewhat contribute to ensuring a banking system that is more robust to market risks.

2.4.2   BANK-SPECIFIC AND MACROECONOMIC DETERMINANTS OF CAPITAL STRUCTURE

Gropp and Heider (2010) believe based on their research that in relation to variables affecting leverage, capital regulation is only of second-order importance in explaining leverage dynamics; this therefore provides a background for exploring the more relevant factors that are related to bank capital structure.

A considerable amount of research has been done in the corporate finance literature on the effects bank-specific characteristics have on leverage. A number of researchers find that most variables that are related to the leverage of non-financial firms are also able to explain the dynamics in the leverage of banks; the paper by Gropp and Heider (2010) provides evidence to buttress that there may be similarities between the capital structure of banks and non-financial firms. Amongst the variables found relevant to explaining capital structure of banks, Gropp and Heider (2010) make use of size, collateral, profits, market-to-book ratio and dividends; they find all these variables significant to leverage for their period of study. Another paper of reference, Giordana and Schumacher (2012): they model leverage of Luxemburgish banks with variables including loans-to-deposits ratio, the liquid-assets-to-assets ratio and the off-balance-to-assets ratio. Evidence from these papers indicates that bank-specific variables under normally circumstances hold high significance to explaining leverage movements.

Macroeconomic factors tend to affect leverage in many ways. Conditions in the funding Market, which are determined to a large extent by the macroeconomic environment, are also important in affecting the capital structure of banks. As mentioned earlier, during the debt crisis, most banks especially in the peripheral countries were shut out of debt markets, causing a shift to other sources of funding. It cannot be overemphasized how important macroeconomic factors are to explaining capital structure changes; as Brewer et al (2008) point out, recession situations could lead to increases in bad loans due to more defaults, and hence more losses which reduce bank profitability.

Some macroeconomic factors found in Gropp and Heider (2010) as well as in Giordana and Schumacher (2012) to be relevant to explaining leverage behaviour include GDP growth, the spread of the EURIBOR rate over the overnight 'risk free' swap rate and the term structure of interest rates.

3 METHODOLOGY

3.1 INTRODUCTION

We intend to go about conducting the data analysis part of the research which will include a discussion on the type of data we make use of, the data collection techniques used, the methods used for the analysis as well as any limitations of the study. What Intend to explore by way of hypothesis is whether bank-specific variables became less relevant during the sovereign debt crisis compared to the significance of the macro-economic factors, as we believe should be the case.

3.2 RESEARCH DESIGN

We make use of a quantitative approach to analysis. The period of time under study for this research is the period from 2005 to 2012, which is broken down into a pre-sovereign debt crisis period (2005-2008) and the period during the crisis (2009-2012). The data consists of panel data on 1521 banks from 7 countries, namely Germany, France, Italy, Spain, Ireland, Portugal and Greece. Our use of panel data has many advantages over a conventional cross sectional data approach, as panel data captures time varying information in the variables of interest. Panel data also makes it possible to model how data for each observation changes from one period to another. It therefore tends to be more informative especially in our case where we study the significance of variables from one period to another, and make use of 8 years of data.

For the purposes of exploring the effects of the sovereign debt crisis on capital structure, we make use of a number of variables which drive leverage with the hope to study their dynamics on leverage before and during the debt crisis era. Our main variables of choice include: Bank-specific variables that capture bank characteristics like size, profitability, collateral availability and off-balance sheet items; and Macroeconomic variables which include GDP Growth, the yield curve spread and the EURIBOR-OIS spread.

Choice of variables is informed by previous research literature which has found these variables significant in various levels to explaining changes in capital structure. Our main papers of reference that are informative to my choice of variables are Giordana and Schumacher (2012) as well as Gropp and Heider (2010). Although these papers make use of more variables than we have specified above for our study, we find some of the other variables econometrically insignificant for our study—based on t-statistics. We do not expect our selection of variables to be a problem as they are the variables that hold the most significance from the aforementioned papers; hence we do not expect the variables we fail to capture as controls to pose too much of an endogeneity problem, albeit not to ignore its existence.

3.3 SOURCE OF DATA AND DATA COLLECTION TECHNIQUE

Much of our data is gathered from the Bankscope - Bureau van Dijk database, which is a well-known source of bank balance sheet data. We also make use of GDP data from the World Bank database, yield curve data from the macro-economic database (AMECO) of the European Commission and the EURIBOR-OIS rate from the EURIBOR website (http://www.euribor-rates.eu). In relation to data collection, we do not make use of any screening techniques in particular; we simply make use of banks for which we have the data we need, available. In this sense, data in terms of sampling is not entirely random as we have excluded banks for which data to calculate certain key model variables is woefully unavailable.

3.4 TECHNIQUE OF ANALYSIS

There are a number of techniques available to estimate panel data. Wooldridge (2012) identifies some of the main tools, namely random effects estimation, fixed effects estimation as well as the correlated random effects approach. We will be making use of a fixed effects method for panel data analysis for a simple reason: for the purposes of this research, this method eliminates any time-invariant bank and country effects on leverage, hence dealing to some extent with endogeneity in the model. This elimination of time-invariant variables hence helps us to focus on variables of interest in the model, without having to worry about how much of leverage is explained by unobserved time invariant variables in the model. Another well-known method which is gaining a lot of use recently is the generalized method of moments. Most studies that are done with panel data in this area favour the use of System GMM method of estimation rather than the fixed effects model, with Giordana and Schumacher (2012) asserting as the System GMM method is supposed to give more reliable estimates by way of dealing more effectively with endogeneity, heteroskedasticity and serial correlation. For the purposes of our study however, we make use of the fixed effects method as we find that for our purposes, the fixed effects model is more pliable. Additionally, due to the complexity of finding a suitable moment condition as a starting point for the System GMM method, we find the fixed effects method more suitable overall.

In order to deal with any issues of heteroskedasticity and serial correlation in the fixed effects model, we employ Stata's clustered robust standard error correction, which takes care of the aforementioned problems. The issue of endogeneity is also partially dealt with by the fixed effects model, as it irons out specifically any unobserved time-invariant affects in the data through differencing.

4 DATA ANALYSIS AND FINDINGS

4.1 DESCRIPTION OF DATA AND MODEL

Our dependent variable, leverage, is defined as total assets-to-equity. The control variables are made up of bank-specific variables as well as macroeconomic variables: loan-to-deposits, the log of profitability, the log of size, off-balance sheet items-to-assets, collateral-to-assets, EURIBOR-OIS spread, GDP growth and the yield curve spread. All the explanatory variables are lagged by one year, with the exception of GDP growth which is lagged by two years. A brief description of variables follows, with additional definitions provided in the appendix.

The loans-to-deposits ratio is composed of bank loans issued to customer deposits. Changes in this ratio indicate a banks source of funding; whether it is being funded increasingly by customer deposits or by other sources of funding, say by either debt or equity other than deposits (Giordana and Schumacher, 2012).

Profitability is one very important variable in determining capital structure, the reason being that the more profitable a bank, the more reserves and hence self-funding it is able to provide; an increase in bank profitability will therefore in this case lower leverage. Additionally, a profitable bank is more likely to be considered by the capital markets for long-term borrowing than a less-profitable bank, although profitability is not the main consideration in testing a bank's creditworthiness. Most research findings validate the former argument, that profitability is negatively correlated with leverage.

Size is probably the most significant driver of leverage, with the larger and more established banks being more able to increase their leverage due to the fact that they are well known and have significant assets. On the other hand, it is possible that the larger banks may also have more capital and reserves, and hence be in a better position to fund their activities internally, hence resulting in relatively lower leverage. We would expect in general though that size will be positively correlated with leverage, as found by Gropp and Heider (2010).

Off-balance sheet items give information on the number of future commitments banks may need to meet in future, depending on a uncertain events yet to occur; these future commitments go to contribute to leverage in future as they materialize and make their way onto the balance sheet of banks. Hence holding all else constant, a high amount of off-balance sheet items reported in footnotes is a signal to the high probability of an increase in leverage in future.

Collateral is normally needed by banks in securing debt; it therefore normally has a positive contribution to the leverage of banks as banks with more collateral are more likely to be considered if they want to fund their activities through borrowing. The availability of assets that can be used as collateral however does not ensure lending by banks, since a number of other factors may be considered before lending decisions are made.

The EURIBOR_OIS spread is the main indicator of risk in the interbank market, with higher spreads indicating more risk in lending activity. As a risk indicator, the higher these spreads, the more uncertain markets become in regards to lending and hence, the more restrained borrowing activity becomes.

The yield curve spread is the difference between the yields on long-term (including sovereign debt) and short-term instruments. Higher spreads indicate that markets attach a higher premium to lending for longer periods as a compensation for higher credit risks in times of higher market uncertainty. This spread hence directly affects banks' ability to borrow long-term. We use it as a proxy of the riskiness the markets perceive in long-term sovereign debt in relation to short-term instruments.

The last variable, GDP growth, is a well-known economic variable used here to indicate general economic growth; better economic conditions as indicated by higher GDP growth trickle down to market growth and hence more leverage buildup.

As mentioned earlier, the bank-specific and macroeconomic variables used have been found relevant in a number empirical studies in corporate finance as well as some studies on determinants of leverage in European banks. In relation to the macroeconomic variables, Giordana and Schumacher (2012) do find evidence of the procyclicality of leverage, with their evidence gathered from Luxemburgish banks; this should mean that leverage should increase in good times and fall in situations like the sovereign debt crisis, and we expect macroeconomic variables of choice to hold key insights into these dynamics of leverage.

4.2 SPECIFYING THE ECONOMETRIC MODEL

We shall proceed with carrying out a number of regressions. Our first regression comprises leverage on the relevant variables and a time dummy variable. Hence model takes the following form:

$$\text{Leverage}_{it} = \alpha + \beta X_{it-1} + \gamma d_t + u_i + e_{it-1}$$

Where X_{it-1} comprises the explanatory variables; d_t is the time dummy, which takes on the value one for the crisis period, and zero otherwise; The variable 'u_i' captures the unobservable time-invariant fixed effects (at both the bank level and country level) we eliminate from the model using a fixed effects transformation; and e_{it-1} is the time-variant error term. My second regression is specified as:

$$\text{Leverage}_{it} = \alpha + \beta X_{it-1} + \gamma d_t + \delta d_t X_{it-1} + u_i + e_{it-1}$$

The addition here is $d_t X_{it-1}$, a set of interactions of the time dummy variable with relevant explanatory variables to determine how those variables changed between the periods under study.

4.3 FINDINGS

With the predicted effects of the various variables in mind as well as the hypothesis of finding that the relevant macroeconomic variables should be more significant than the bank-specific variables, the results show the following trends.

The first regression of the log of leverage on the relevant bank-specific as well as macroeconomic variables reveals that the loans-to-deposits ratio, the collateral-to-assets ratio, profitability, the Euribos_OIS spread and the yield curve spread have a negative effect on leverage whilst the log of size, off balance sheet-to-assets ratio, GDP growth have a positive effect on leverage. This is shown in Table 1 in the appendix.

The most significant bank-specific variable explaining leverage dynamics is bank size as measured by the log of assets. The results indicate that for a 10% increase in size, firms increase leverage by 3.4% controlling for the known variables in the model and fixed effects. Profitability is also very significant to leverage, with a 0.5% fall in leverage for a 10% increase in profits. The macroeconomic variables are all significant at a 1% level. The only variable with little significance is the collateral-

to-assets ratio, which is significant only between 10%-15%. The signs on all variables are also as expected except for the collateral-to-assets ratio, which is the only less significant variable here as well; collateral availability should normally affect leverage positively. We will examine the sign on the collateral variable later.

We also include a time dummy variable to determine how leverage changed between the two periods involved in the study. Also very significant, it shows that leverage fell about 11.4% ($\exp(-.121148) - 1$) from the pre-crisis period to the period of the sovereign crisis period.

4.3.1   COMPARISON BETWEEN PERIOD BEFORE AND DURING THE SOVEREIGN DEBT CRISIS

We now proceed with examining the results of analyzing changes in variables between the pre and during crisis periods, as captured in the second regression equation.

Table 2 and 3 (in appendices) give results of the said regressions. Running a regression with all the macroeconomic variables drastically affects the coefficients of the other control variables in the regression model. Wooldridge (2012) points out the reason for such changes, asserting the issue of multicollinearity between the explanatory variables and the dummy-explanatory variable interaction. Hence, whilst we can draw inferences from the dummy-explanatory variable interactions, the coefficients on the control variables in the second regression are not estimated properly. We however run separate regressions for the dummy interactions with the relevant macroeconomic variables, in order to be able to better interpret the results.

Table 2 (in appendices) shows the results of running a regression with all controls and dummy interactions with bank-specific controls and another interaction for the EURIBOR_OIS spread; in Table 3 (in appendices), we replace the dummy on EURIBOR_OIS spread with a dummy on yield curve spread. In relation to the significance of variables, what we see in Table 2 (in appendices) compared to similar variables in Table 1 (in appendices) is that the time dummy is now insignificant; this arising from the introduction of the dummy interactions. Amongst the new variables introduced, all the dummy interactions with bank specific variables turn out insignificant, except for the interaction with the collateral variable. The dummy interacted with the collateral variable shows a significant negative slope in the crisis period, whilst the main collateral control variable becomes even more insignificant with the introduction of the interaction variable. As mentioned earlier, we expect generally that collateral should be positively related with leverage. This positive relationship is verified by ECB (2012) and other papers mentioned therein. A number of factors could account for this negative relationship with leverage during the period under study.

First of all, there was the global financial crisis, which pushed forward the need for banks to build more robust capital buffers to prevent bank insolvencies; then came the sovereign debt crisis to further buttress the need for a solid capital base for banks. During these two crises periods which were almost in succession of each other, markets were very turbulent and borrowing activities were tampered. In the euro area for instance, most banks experiences difficulties borrowing during the debt crisis and made frantic attempts to deleverage. Some of these could hence account for the negative relationship collateral had with leverage during the sovereign debt crisis period.

In relation to the dummy interation with EURIBOR_OIS spread, it can be seen that the relationship between the pre-crisis period and the crisis period strengthened, with the spread increasing by approximately 19% between periods. As an indicator of risk, this makes perfect economic sense as markets became increasingly turbulent during the crisis period.

A look at the dummy interaction with the yield curve spread in Result 3(in appendices) reveals a somewhat different picture: although the yield curve spread interaction term has an addition to the negative relation of yield curve spread to leverage, it is not significant. This means that the effect of the yield curve spread on leverage did not change much between the pre-crisis period and during the crisis period, albeit the spread as a whole reduced leverage. This goes to alter our expectations in relation to the yield curve spread in particular; having in mind that increasing spreads would reduce the value of sovereign debt holdings by banks, we expected a highly significant change in the spread during the crisis period compared to the base period. However, this result could be justified if short-term spreads rose with similar magnitude during the crisis period, in order to iron out a drastic increase in this spread measure.

5   CONCLUSION

This study attempts to provide evidence of the fact that the sovereign debt crisis made bank capital structure less reactive to bank-specific factors and characteristics, and macroeconomic factors became relatively more important in driving leverage decisions. Our periods of interest have been 2005-2009 and 2010-2012, in an attempt to capture how variables' interaction with leverage transitioned from the pre-debt crisis to the debt crisis period.

The effect of the sovereign debt crisis on the banking system has definitely been one that requires further research to continually monitor the linkages between sovereigns and banks, with the view to be able to arrest spill overs from sovereigns to banks.

As we have also established, the capital structure of banks become disentangled from bank-specific drivers and are driven by macroeconomic conditions in turbulent times as in the case of the sovereign debt crisis. This is not ideal as capital structure decisions by banks are normally made with long-term targets in mind, and hence crises situations disrupt the internal operations of banks and impede their drive towards their target mix of internal and external financing.

In line with the above, the sovereign debt crisis has also led to the realization of the need for a more robust banking system through providing for more capital cushion for banks. It is hoped that the reformed capital regulations under Basel III regime will assist banks to remain stable in crises situations like the on-going one.

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APPENDICES

Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Loglev	12183	2.712802	.595904	-.3221355	7.228635
loandeposits	12208	93.3676	89.07796	0	988.88
logprofit	11582	-5.359255	.9516662	-12.3	.6590991
sizelogass~s	12208	13.81693	1.679159	3.61092	21.3543
offbalshee~s	12208	.1347935	.7757048	-.0081	40.8264
collateral~s	12208	.2685811	.1630859	0	1
euriborois	12208	.4675	.3260766	.064	.953
gdpgrowth_l	12208	1.084959	2.702852	-5.49441	5.94338
yieldcurve	12208	1.117246	1.113481	-.65	14.36

Correlation Matrix

	Loglev	loande~s	logpro~t	sizelo~s	offbal~s	collat~s	euribo~s	gdpgro~l	yieldc~e
Loglev	1.0000								
loandeposits	-0.0262	1.0000							
logprofit	-0.5253	0.0482	1.0000						
sizelogass~s	0.3553	0.1595	-0.1726	1.0000					
offbalshee~s	-0.1713	-0.0438	0.0756	-0.0416	1.0000				
collateral~s	-0.0568	-0.2671	-0.0406	-0.0797	0.1187	1.0000			
euriborois	-0.0763	-0.0155	-0.0599	0.0394	0.0096	-0.0121	1.0000		
gdpgrowth_l	0.0351	-0.0030	-0.0544	0.0147	0.0038	-0.0470	0.3445	1.0000	
yieldcurve	-0.0471	0.0377	0.1198	0.0770	0.0053	0.0526	-0.3096	-0.5881	1.0000

Regression Results

Table 1

Dependent Variable	Log(Leverage)
loandeposits |	-.0001992
	(.0000873)
logprofit |	-.0501531
	(.0065572)
sizelogassets |	.3432565
	(0 .0428908)
offbalsheet~s |	.0224515
	(0.009072)
collaterala~s |	-.1112544
	(0.0693832)
euriborois |	-.1627364
	(0.0130548)
yieldcurve |	-.0251688
	(0.0042129)
gdpgrowth_l |	.0037444
	(0.0006008)
d_200912 |	-.121148
	(0.0066514)
Constant |	-2.085179
	(0.588514)
Number of observations	11569
R^2	0.1688

Result 1

```
 Fixed-effects (within) regression          Number of obs      =      11569
 Group variable: id                         Number of groups   =       1521

 R-sq:  within  = 0.2638                     Obs per group: min =          1
        between = 0.1884                                    avg =        7.6
        overall = 0.1688                                    max =          8

                                            F(9,1520)          =      82.22
 corr(u_i, Xb)  = -0.5631                    Prob > F           =     0.0000

                                 (Std. Err. adjusted for 1521 clusters in id)
```

Loglev	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf. Interval]	
loandeposits	-.0001992	.0000873	-2.28	0.023	-.0003704	-.000028
logprofit	-.0501531	.0065572	-7.65	0.000	-.0630153	-.037291
sizelogassets	.3432565	.0428908	8.00	0.000	.2591252	.4273878
collateralass~s	-.1112544	.0693832	-1.60	0.109	-.2473514	.0248426
offbalsheetit~s	.0224515	.009072	2.47	0.013	.0046565	.0402465
euriborois	-.1627364	.0130548	-12.47	0.000	-.1883437	-.1371292
gdpgrowth_l	.0037444	.0006008	6.23	0.000	.0025659	.0049229
yieldcurve	-.0251688	.0042129	-5.97	0.000	-.0334325	-.016905
d_200912	-.121148	.0066514	-18.21	0.000	-.1341948	-.1081012
_cons	-2.085179	.588514	-3.54	0.000	-3.239565	-.9307937
sigma_u	.6034705					
sigma_e	.17356844					
rho	.92359675	(fraction of variance due to u_i)				

Table 2

Dependent Variable	Log(Leverage)
sizelogassets |	-0.0002326
	(.0001089)
collateralass~s |	0.3433352
	(0.0432897)
offbalsheetit~s |	-0.0200322
	(0 .073011)
euriborois |	.0242716
	(0.0080681)
gdpgrowth_l |	0.0064234
	(0.0006326)
Logprofit |	-0.0405298
	(0.0068333)
d_200912 |	0.1170594
	(0.0743471)
d_loandeposits	.0000567
	(0.0001038)
d_logprofit	-0.013336
	(0.074548)
d_sizelogassets	-0.01131152
	(0.0044088)
d_offbalsheet~s	-0.0045371
	(0.0053285)
d_collaterala~s	-0.2054581
	(0.0517604)
d_euriborois	-0.192775
	(0.011985)
Constant	-2.086136
	(0.5973527)
No. of Obs	11569
R^2	0.1686

Result 2

```
Fixed-effects (within) regression              Number of obs      =      11569
Group variable: id                             Number of groups   =       1521

R-sq:  within  = 0.2876                         Obs per group: min =          1
       between = 0.1863                                        avg =        7.6
       overall = 0.1686                                        max =          8

                                                F(15,1520)         =      78.54
corr(u_i, Xb)  = -0.5543                         Prob > F           =     0.0000

                                     (Std. Err. adjusted for 1521 clusters in id)
```

Loglev	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf. Interval]
loandeposits	-.0002326	.0001089	-2.14	0.033	-.0004463 -.000019
sizelogassets	.3433352	.0432897	7.93	0.000	.2584213 .4282491
collateralass~s	-.0200322	.073011	-0.27	0.784	-.1632451 .1231808
offbalsheetit~s	.0242716	.0080681	3.01	0.003	.0084458 .0400974
euriborois	-.1039051	.0130478	-7.96	0.000	-.1294987 -.0783114
gdpgrowth_l	.0064234	.0006326	10.15	0.000	.0051825 .0076643
yieldcurve	-.0165766	.0040239	-4.12	0.000	-.0244696 -.0086836
logprofit	-.0405289	.0068333	-5.93	0.000	-.0539326 -.0271253
d_200912	.1170594	.0743471	1.57	0.116	-.0287744 .2628931
d_loandeposits	.0000567	.0001038	0.55	0.585	-.000147 .0002604
d_logprofit	-.0133336	.0074549	-1.79	0.074	-.0279565 .0012893
d_sizelogassets	-.0113152	.0044088	-2.57	0.010	-.0199631 -.0026673
d_offbalsheet~s	-.0045371	.0053285	-0.85	0.395	-.0149891 .005915
d_collaterala~s	-.2054581	.0517604	-3.97	0.000	-.3069876 -.1039286
d_euriborois	-.1927751	.0111985	-17.21	0.000	-.2147414 -.1708089
_cons	-2.086136	.5973527	-3.49	0.000	-3.257859 -.9144135
sigma_u	.60026843				
sigma_e	.17078285				
rho	.92511526	(fraction of variance due to u_i)			

Result 3

```
Fixed-effects (within) regression          Number of obs     =      11569
Group variable: id                         Number of groups  =       1521

R-sq:  within  = 0.2722                     Obs per group: min =          1
       between = 0.1884                                    avg =        7.6
       overall = 0.1693                                    max =          8

                                            F(15,1520)        =      65.21
corr(u_i, Xb)  = -0.5617                    Prob > F          =     0.0000
```

(Std. Err. adjusted for 1521 clusters in id)

Loglev	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf. Interval]	
loandeposits	-.0002408	.0001094	-2.20	0.028	-.0004554	-.0000263
sizelogassets	.3479477	.0443425	7.85	0.000	.2609688	.4349267
collateralass~s	-.0220525	.0732133	-0.30	0.763	-.1656622	.1215572
offbalsheetit~s	.024517	.0080851	3.03	0.002	.0086579	.0403762
euriborois	-.1485744	.0097991	-15.16	0.000	-.1677957	-.1293532
gdpgrowth_l	.003327	.0005672	5.87	0.000	.0022144	.0044395
yieldcurve	-.0172991	.0048051	-3.60	0.000	-.0267245	-.0078737
logprofit	-.0443063	.0068734	-6.45	0.000	-.0577886	-.030824
d_200912	.0212872	.0763033	0.28	0.780	-.1283836	.1709581
d_loandeposits	.000071	.0001036	0.69	0.493	-.0001322	.0002742
d_logprofit	-.0124371	.0075229	-1.65	0.098	-.0271934	.0023193
d_sizelogassets	-.0118837	.004408	-2.70	0.007	-.0205301	-.0032374
d_offbalsheet~s	-.0062442	.0051426	-1.21	0.225	-.0163315	.0038431
d_collaterala~s	-.187955	.051557	-3.65	0.000	-.2890854	-.0868245
d_yieldcurve	-.0062512	.0062911	-0.99	0.321	-.0185914	.0060889
_cons	-2.149412	.6157049	-3.49	0.000	-3.357133	-.9416908
sigma_u	.60292745					
sigma_e	.17262308					
rho	.924238	(fraction of variance due to u_i)				

Definition of terms

Leverage= Total Assets / Equity

Loan to Deposits = Loans / Customer Deposits

Profitability = Profit before tax / Total Assets

Size = Natural Log of Total Assets

EURIBOR-OIS Spread = 12 month EURIBOR – **E**uro **O**ver**n**ight **I**ndex **A**verage (Eonia)

Yield curve spread = Nominal long-term interest rates on Government bonds - Nominal short-term interest rates on short-term government bills or interbank lending (Source AMECO).