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Market Reaction to Seasoned Equity Offerings by European Banks during the Recent Financial Crisis

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Abstract

This thesis attempts to assess the short-term costs of raising new equity for European banks during the recent crisis. We analyze the effect of seasoned equity offerings (SEOs) on stock prices and CDS spreads, using an event study methodology. We find evidence that on average it was costly for European banks to raise new equity during the crisis, as stock prices reacted negatively to SEO announcements while CDS spreads did not show any significant aggregate movement. We observe that stock price reactions were more negative for issuing banks in distressed countries. In addition, our analysis shows that the credit rating of the issuing institution is an important determinant of stock market and CDS spread reaction; overall we detect that SEOs announced by sub-investment grade banks caused the sharpest declines in stock values and larger reductions in CDS spreads. This provides empirical evidence for the prevalence of a debt overhang problem for highly leveraged banks, theorized by earlier research. Our research is motivated by the recent debate regarding new regulatory capital requirements for banks and the role of financial institutions in the latest financial crisis. In this context, funding costs for banks are highly relevant since they directly impact credit supply to the real economy. If banks see raising equity as too costly, they may consider to instead improve their capital ratios by downsizing their balance sheet and this in turn can lead to a credit crunch, with a severe negative impact on economic growth.

Keywords: European banks, capital ratio, crisis, seasoned equity offerings
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Table of Contents

List of Figures

List of Tables

List of Abbreviations

ABS	Asset Backed Securities
CAR	Cumulative Abnormal Return
CAS	Cumulative Abnormal Spread
CDS	Credit Default Swap
CPP	Capital Purchase Program
ECB	European Central Bank
EU	European Union
GDP	Gross Domestic Product
GIIPS	Greece, Ireland, Italy, Portugal and Spain
LTRO	Long-Term Refinancing Operation
M&A	Mergers and Acquisitions
N/A	Not Available
OLS	Ordinary Least Squares
SEO	Seasoned Equity Offering
TARP	Troubled Asset Relief Program
UK	United Kingdom
US	United States of America
USD	US Dollar

1. Introduction

This study is an assessment of the short-term effects of banks' recapitalizations on their cost of capital. We consider European commercial banks over the crisis period between 2007 and 2013 and analyze the effect of seasoned equity offerings (SEOs) on stock prices and CDS spreads, using an event study methodology. Our research is motivated by the recent debate on the increase in regulatory capital requirements for banks and the ongoing economic and political discussion regarding the role of financial institutions in the latest crisis. In fact, the banking sector has been at the core of the crisis that recently hit Europe, first as an international financial crisis and then as a sovereign debt crisis. Several measures have been adopted in order to improve the resilience of the financial system, many of them still ongoing and debated. In this context, the funding costs of banks are highly relevant since they directly impact the availability of loans and lending conditions to the private sector. If the private costs of raising capital are too high, banks may opt to downsize their balance sheets or choose to shift investments into less risky assets in order to avoid a costly capital increase. This in turn can lead to a credit crunch, severely affecting economic growth.

Academic scholars such as Baker and Wurgler (2013) argue that increasing capital requirements could substantially increase the cost of bank lending. We aim to contribute to the existing literature by providing an empirical analysis of the cost of bank recapitalizations – both voluntary and in response to increasing regulatory requirements[1] – with respect to cost of equity and cost of debt, the latter approximated by changes in CDS spreads. To our knowledge, the impact of seasoned equity offerings by banks on their funding costs has not been extensively covered by empirical literature. Marinova et al. (2014) provide some evidence on the topic with regards to European banks. In addition, Cornett et al. (2014) analyze the impact on US financial institutions. Overall, we find that SEOs by banks in Europe, over the covered period, had a large and significant negative short-term impact on their cost of capital. On average we detect a large drop in stock prices and a non-significant reaction in the CDS market around the SEO announcements. Our results deviate from Marinova et al. (2014) who find a significant average decrease in CDS spreads, but are supported by the existing literature on European banks' CDS spreads during the crisis which documents a detachment of banks' credit risk from firm specific characteristics and an increasing dependence of CDS spread movements on external systemic factors. Moreover, our results provide some evidence that the average drop in equity value was more pronounced in distressed countries and over the years 2010 – 2013, i.e. during the European sovereign debt crisis. We also investigate whether the creditworthiness of the issuing

[1] Basel II, implemented in 2008, and Basel III, approved in 2011, contain new rules that require banks to hold larger capital buffers, and of better quality (Liikanen report, 2012).

institution has a significant impact on the detected reactions; we observe that equity offerings by sub-investment grade banks are associated with larger drops in stock prices, but have a positive impact on CDS spreads that decrease around the announcement date. These findings provide evidence for the wealth-transfer mechanism from incumbent stockholders to debtholders in relation to banks' SEOs, described by Admati et al. (2012).

We conclude that during the crisis it has been costly for commercial banks to raise new equity capital on an aggregated basis. This suggests that the introduction of increased capital requirement for banks, in a period of relatively distressed market conditions, may have pressured some financial institutions to improve their capital ratios by shrinking their balance sheets instead of issuing new shares. This in turn may have impacted lending to enterprises and households as a consequence of the decrease in the size of the financial sector's assets.[2]

It is likely that our results are strongly affected by the severe financial and sovereign debt crisis that hit Europe in the period of our analysis. In addition, the large negative reactions over the second stage of the crisis suggest that the measures initially adopted by the European Central Bank and the other European national authorities in response to the international financial crisis were not successful in re-establishing a sound banking sector.

Comparing our results to Cornett et al. (2014), who find a relatively moderate negative average stock market reaction and a significant drop in CDS spreads around SEO announcements for US financial firms during the crisis, we hypothesize that diverging crisis response measures between the US and Europe may have played a significant role in explaining the different stock market and CDS spread reactions we detected for European banks. In the US, the TARP CPP program, which provided cheap equity injections to healthy US financial firms, was successful in recapitalizing the banking sector during the financial crisis. In contrast to that, some European countries, especially the peripheral ones, found themselves in weak financial positions, with distressed banks that were not only "too big to fail", but also "too big to save".

This thesis is structured as follows: Section 2 commences with providing background about the international financial crisis and the European sovereign debt crisis and describes the policy responses, both in the US and Europe. It closes with a section on empirical literature about the effect of those measures on stock and credit markets. Section 3 contains a review of the literature concerning seasoned equity offerings, with a particular focus on the effect of SEOs

[2] According to Kaya and Meyer (DB research, 2014) European bank lending has contracted by EUR 600bn since the collapse of Lehman Brothers. Besides a change in risk perception they see tighter regulatory measures as key reason for the contraction in lending. They argue that usually capital ratios are boosted via SEOs or retained earnings, but given the low profitability of banks post crisis and the dilution effect of SEOs many banks opted to "cut their assets", leading to tighter lending standards across Europe.

by financial firms. The first sections serve as the basis for our research hypotheses, outlined in Section 4. In Section 5 we briefly describe our sample and the data selection process. In Section 6 we elaborate on the event study methodology used in this paper. In Section 7 the results are presented and analyzed. Finally, in Section 8 we present our final thoughts and remarks.

2. The Banking Sector during the Financial and European Crisis

2.1 The Financial Crisis between 2007 and 2009

In June 2007, with the collapse of two hedge funds that were heavily invested in subprime asset-backed securities (ABSs) and managed by Bear Stearns, the collapse of the US housing market that had started in late 2006 began to have a major impact on the global financial markets. In the aftermath investors started to liquidate their financial positions, causing heavy losses to major hedge funds, making the crisis truly systemic. Given the increasing market uncertainty, banks with large exposure to the ABS market experienced a dramatic outflow of capital and there was an increasing concern over counterparty risk. This eventually led to two key events: First, the acquisition of the troubled investment bank Bear Stearns by JP Morgan in March 2008. This was made possible only with a USD 29bn US government guarantee on underlying subprime ABS held by Bear Sterns, in order to prevent a collapse of the Bank. Following the acquisition of Bear Stearns, financial markets and the market for credit default insurance for financial firms calmed temporarily. However, that changed dramatically on Monday, September 15th 2008 when Lehman Brothers filed for bankruptcy. Following the announcement, prices of credit default swaps for major international banks soared to unprecedented highs, reflecting a change in market sentiment that even large, systemically relevant banks would be allowed to fail (Acharya et al., 2009).

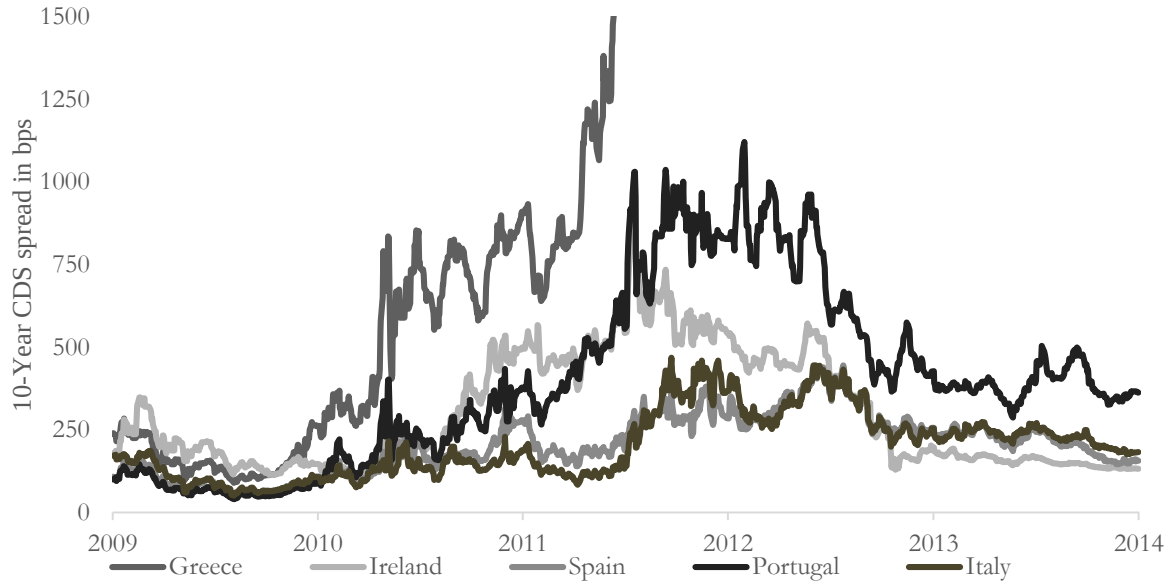
Over the following month, the US government and several other European countries announced comprehensive rescue packages aimed at improving the financial positions of systemically important banks, in order to prevent a worsening of the crisis. While the support programs in the US were successful in reassuring financial markets in the US, the picture in Europe was much more mixed (Pill and Reichlin, 2014).

2.2 The European Sovereign Debt Crisis between 2010 and 2013

There is some debate regarding the point at which the global financial crisis turned into a European debt crisis. Mody and Sandri (2012) view the nationalization of Anglo Irish bank in January 2009 as the start of a wider spread European sovereign debt crisis. While the bailout, with a fiscal cost amounting to around 20% of Irish GDP, led to a substantial increase in CDS spread for Irish sovereign debt, European debt markets remained relatively calm. In late 2009, revelations of a sharp decrease in fiscal revenues by Ireland and Spain, mainly resulting from a decline in construction activity and falling house prices, created unease in the sovereign debt market. This was followed by more troubling news from Greece. In October 2009, the newly elected government was forced to revise the 2009 deficit forecast to 12.7 percent of GDP, doubling the previous estimate. In addition, Greece had to revise accounts of prior years to reflect previously undisclosed deficits (Lane, 2012). But funding costs of Greece, Ireland, Italy,

Portugal and Spain, collectively referred to as "GIIPS", truly escalated in 2010, with Greece cut off from international markets and requiring a bailout in May 2010. That was followed by Ireland in November 2010 and Portugal in May 2011. In June 2012 Spain accepted a bailout package of up to EUR 125bn specifically aimed at recapitalizing the Spanish banking sector.[3]

Figure 1 – Sovereign CDS Spreads of Distressed European Countries



The European sovereign debt crisis affected European banks through several channels. First, there was an increasing exposure to GIIPS government bonds. Acharya and Steffen (2015) find that GIIPS banks and European banks with low Tier 1 capital were heavily investing in GIIPS bonds between March to December 2010 and January to June 2012 using cheap long-term refinancing options from the ECB. They compare the behaviour to a massive carry trade.[4] In addition, Becker and Ivashina (2014) link an increase in sovereign debt holdings by local banks between 2010 and 2013 to a decrease of lending to the private sector and see "financial repression"[5] by the respective governments as an important reason for explaining this.

Increased exposure to risky sovereign debt can impact a bank through direct losses but also, given that it is used as collateral, limit its money market funding capabilities. The contagion effect between banks and peripheral countries developed in both directions, as in addition to

[3] The Spanish prime minister insisted that it was not a bailout given the rescue package was specifically targeted at the banking sector (New York Times, June 9, 2012).
[4] Carry trade is an investment strategy in which money is borrowed at low interest rates and then invested in assets that are likely to yield higher returns.
[5] In this context financial repression refers to domestic governments pressuring domestic banks into buying government debt, a practice especially prevalent in GIIPS countries, according to Becker and Ivashina (2014).

the banks' exposure to GIIPS bonds the general market perception was that large, systemically important banks would have been bailed out or received credit support in case of bankruptcy, and both implicit and explicit guarantees for banks from peripheral countries were in fact in place. However, many distressed European countries had over-sized financial institutions in comparison to their GDP,[6] and may have lacked the financial strength to rescue troubled banks, hence the strong documented relation between sovereign and bank default risk documented in Europe over the period, especially in the GIIPS countries (Pill and Reichlin, 2014, Liikanen, 2012).

This is supported by De Bruyckere et al. (2013) who find an excessively strong correlation between the CDS spread of large banks and their respective home countries, increasing for banks in countries with high debt-to-GDP ratios during the European sovereign debt crisis.

2.3 Rescue Packages and Policy Response

After the Leman Brothers collapse and in particular between September 2008 and June 2009, countries around the globe announced comprehensive rescue packages in order to restore confidence in the solvency of systemically important banks. The measures were primarily implemented by the respective governments and central banks, falling in three categories: debt guarantees, recapitalisations and asset repurchases/insurances (Panetta et al., 2009). As the research focus of this paper is on capital increases by European banks, we will primarily focus on measures in Europe, but we will also provide an overview over US measures as they may explain divergences between European and US banks.

2.3.1 US Measures

From December 2007 the US Fed started to provide long-term liquidity options for certain financial institutions. The number of institutions with access to the facilities was eventually increased following the Bear Stearns collapse in March 2008. In addition, several other programs were added, with the aim of providing liquidity against collateral which had become illiquid at the time but had a sufficient rating above certain thresholds.

In October 2008, the US government announced the USD 700bn Troubled Asset Relief Program (TARP). The program included the USD 250bn Capital Purchase Program (CPP) that was designed to provide equity injections to financially sound institutions under the supervision of the US Treasury. Roughly half of the CPP funding was assigned to the eight largest US banks with each receiving injection equal to 3% of their risk weighted assets, with the other half made

[6] Liikanen (2012) reports that in 2011 the ten largest European banks had assets over €1 trillion each, eight of them exceeding their domestic GDP in size. The largest European bank was Deutsche Bank, with total assets amounting to 17% of EU GDP.

available to roughly a thousand remaining US banks (Swagel, 2015). The criteria for approval of funding were seen as strict. The Treasury only approved funding for financial institutions with low capital ratios, if they had healthy loan portfolios, essentially picking winners (Carow and Salotti, 2014). In addition, the capital injections were structured as nonvoting, senior preferred stock that would qualify as Tier 1 capital. The cost to banks was seen as low, at a flat cumulative dividend of 5% for the first five years and 9% thereafter, regardless of credit rating. Carow and Salotti (2014) find that participating banks with low credit rating performed especially well, outperforming their peers in the long-term. Overall, the TARP program was successful in reassuring financial markets in the US and substantially improved the capital ratios and lowered the CDS spread for US financial institutions.

2.3.2 European Measures

In Europe, the crisis persisted over a longer time frame and shifted from a banking crisis (2007-2009) into a sovereign debt crisis (2010-2013). Similar to the US, the ECB started to inject liquidity into financial markets by introducing long-term refinancing operations (LTROs). The program was substantially increased after the Lehman Brothers collapse, with longer maturities of up to 6 month. In mid-2009 the ECB increased the maturities of LTROs to up to one year and also introduced a EUR 60bn covered bond purchase program, substantially increasing the size of its balance sheet (Pill and Reichlin, 2014).

In addition to central bank action, several countries provided loan guarantees and recapitalization options to banks. Given the high costs associated with the support measures and the declining financial position of peripheral countries, programs were mainly implemented in wealthy European countries. The programs were comprised of recapitalization programs, loan guarantees and asset repurchases. The costs for participating banks were orientated at market rates plus additional fees and step ups, making them much less attractive than the US programs (Panetta et al., 2009). Most of the recapitalization programs were in the form of non-dilutive preferred shares with the notable exception of UK programs.[7] Besides general capitalization programs, countries also injected capital or outright bought distressed banks on a stand-alone basis. However, there was no bailout program on a European level that was comparable to the US TARP program (Table 13 in the Appendix provides a comprehensive overview of the different support schemes employed in Europe).

Reichlin (2014) argues that the failure to commit to a solution on the European level left weaker European countries, with relatively oversized financial sectors, unable to find

[7] Programs in the UK involved the purchase of common shares at an 8.5% discount to the closing price on October 2008. In addition, ordinary shares with annual dividends of 12% could be issued to the UK government, making them highly unattractive to UK banks (Panetta et al., 2009).

adequate solutions to sufficiently stabilize their banking sector. One effect of this was that weaker capitalized banks that viewed raising additional capital as too costly relied heavily on ECB funding from the LTRO program.

From 2010 onwards, the focus shifted from a banking crisis to a sovereign debt crisis, with the solvency of GIIPS countries being increasingly questioned. European banks were vulnerable to this, given their growing exposure to domestic government bonds and their failure to build sufficient capital buffers. Reichlin (2014) links this to the LTROs program. By design, banks had to put up collateral in order to receive funds. Government bonds were accepted at a much smaller haircut compared to traditional lending portfolios and were therefore more attractive to financial institutions, especially in GIIPS countries were banks had limited access to other financing options. The interconnection between sovereigns' and banks' balance sheets was exacerbated by an increasing fragmentation of the Euro financial markets, partially due to the risk of some of the peripheral countries abandoning the monetary union; as argued by Pill and Reichlin (2014), the financial weakness of the GIIPS countries made their exit from the Euro a concrete possibility. This contributed to a cross-border financial market dry-up, as assets from peripheral banks incorporated a 'redenomination' risk premium, due to the fear of depreciation in case of an exit from the Euro, and is one of the reasons behind the large investments made by peripheral banks into their home countries' government bonds. Given that cross border lending did not recover and banks had become increasingly dependent on ECB funding, the ECB was pressured to expand the LTRO program in 2011 and increase its time horizon.

Overall, the liquidity support measures adopted by the ECB were successful in preventing the collapse of the European financial system during the international financial crisis but, together with a substantial lack of public bailout schemes on an individual country basis, dampened the incentives for banks to start a deleveraging process similar to the one ongoing in the US after the introduction of the TARP program (Pill and Reichlin 2014). The effect was to 'artificially' support over-sized balance sheets which contained assets of questionable quality, and to provide an incentive for banks to invest heavily in peripheral countries' bonds.

As a final remark, it should be noted that UK banks did not face the same problems as banks in the Eurozone. The UK stabilized their banking sector with a massive support package in the period after the Lehman Brothers collapse, with the relative size of the bailout surpassing the US and the highest participation rate in the programs among major countries (Panetta et al., 2009).

2.4 Impact of Rescue Packages on Banks

King (2009) assessed the announcement effects of several bank rescue packages, including loan guarantees, equity injections and other liquidity measures on average bank CDS spreads and stock market prices in the US and six European countries, between October 2008 and January 2009. He finds a moderate negative stock market reaction with an average cumulative abnormal return (CAR) of -2.1% for US banks, compared to a strong negative reaction for EU banks with average CARs of -21.9% to -44.3%, depending on the country for the 50-day period past announcement of the measures. In addition, he finds that CARs for banks that received financial support (-22.1%) were significantly lower than CARs of those that did not (-8.2%). King argues that this is mainly due to the relatively strict provisions attached to bank rescue packages in European countries compared to the TARP program in the US. In addition, he also assessed the impact of the announcement on average bank CDS spreads. Over the observed period CDS spreads for all banks went down by around 30%. However, he did not find a significant difference in spread reduction between banks that participated in the rescue packages and those that did not, suggesting that there is a significant correlation between the default risk of international banks and that the implicit assurance of a bailout in case of looming insolvency is sufficient to calm banks' debtholders. The reduction in bank CDS spreads is supported by Rauning (2015) who finds that credit risk premia for large global banks relative to corporates increased from summer 2007 but sharply fell in October 2008, after the bailout of Northern Rock. He argues that the pricing of credit risk for large banks benefits from an implicit "bailout discount" on their credit risk premia.

2.5 Determinants of Banking Sector Credit Risk during the Crisis

Given the importance of a healthy banking sector to the real economy and the significant costs associated with rescuing failing banks, determinants of their credit risk have become an increasingly important focus of research. Credit risk is particularly relevant for banks given their heavy reliance on debt for financing their lending business.

Alexopoulou et al. (2009) analyzed the determinants of CDS spreads during the financial crisis and found that from mid-2007 systematic risk factors for banks played a more important role than bank-specific idiosyncratic factors. That stands in sharp contrast to non-financial corporate bonds where idiosyncratic risk factors and liquidity were the key determinants for CDS spreads.

Chiaramonte and Casu (2013) on the other hand find that for their sample of large international banks Tier 1 capital ratio and leverage do not appear to be significant factors in explaining CDS spreads. They find that liquidity measures become significant for explaining CDS spreads only from the start of the crisis.

De Bruyckere et al. (2013) investigate risk spillovers during the European crisis by analyzing the relationship between CDS spreads of banks and their respective sovereign countries. They find three contagion channels transmitting sovereign distress in the banking sector and vice versa: a guarantee channel, an asset channel and a collateral channel. The correlation between the respective CDS spreads ranged from 65% to 73% in 2009 for the whole sample and between 82% and 100% when only considering GIIPS countries. However, they also find that the relationship significantly decreases with higher Tier 1 capital ratios, indicating that an increase in Tier 1 capital ratio should make a bank less dependent on the solvency of its domestic country.

3. Literature Overview

3.1 Abnormal Returns around SEO Announcements

Seasoned equity offerings are issuances of capital by firms that are already publicly traded. Primary SEOs consist of offers of new equity to current or new shareholders, and imply an increase in the company's amount of shares outstanding. Secondary SEOs occur when one or more shareholders decide to sell a large block of shares on the market. Public firms generally decide to raise new capital through primary seasoned equity offerings for different reasons; the most common purposes are reducing the amount of debt, financing an acquisition, or need for liquidity, as described by Hull et al. (2009).

The effect of SEO announcements on stock prices has been researched extensively, with the vast majority of studies discovering a negative abnormal stock return around the announcement date.[8] The reasons for the negative stock price reaction are debated, and for non-financial firms researchers find several different explanations for it.

Myers and Majluf (1984) relate the negative stock market reaction to asymmetric information between managers and investors about the underlying value of a firm. SEOs can be seen as negative signals, as it is difficult for managers to convince investors that their shares are not overvalued, essentially relating it to the lemon problem described by Akerlof (1970). In addition, if the market reacts slowly to the issuance announcement, managers can time the SEO in a period where the stock is overvalued and hence transfer wealth from new shareholders to existing ones, as suggested by Loughran and Ritter (1995).

Jung et al. (1996) go in a similar direction, relating the negative stock price reaction to agency theory. They argue that some firms issue equity despite low investment potential in order to invest in unprofitable projects and the stock market recognizes that.

Asquith and Mullins (1986) argue that as long as the demand function for a firm's shares is downward sloping, an increase in supply following a new equity offering has the effect of lowering the stock price. In relation to that they find that the negative stock market reaction around SEOs increases with offer size.

In addition to the arguments above, Admati et al. (2012) see debt overhang as another reason why in particular highly leveraged banks are reluctant to issue new equity as shareholders would react negatively, even if it would imply an increase in the value of the firm. They argue that new equity would make a firm less likely to default, and that would benefit mainly existing debt holders at the expense of shareholders. Their arguments are supported by Eberhart and

[8] For example Asquith and Mullins (1986) find CARs of -3% for industrial companies around the announcement date.

Siddique (2002). By examining the long-term performance of corporate bond and stock returns following an SEO announcement, they find that bond returns outperform stock returns relative to non-issuing firms, reflecting a wealth transfer from shareholders to bondholders.

3.2 SEOs in the Financial Sector

Research on the effect of SEOs by banks is fairly limited. Cornett et al. (1998) analyzed 120 SEO announcements by US banks over the period 1983-1991. By distinguishing between voluntary announcements and equity issuances that were required by regulators, they found that in the long-run voluntary announcements led to worse quarterly results which in turn led to significant negative stock market reactions. At the same time, capital increases that were required by regulators had no significant effect on a bank's performance. These results confirm the theory that the general negative stock price effect of SEO announcements is primarily due to asymmetric information problems; in case the recapitalization is required by the regulators, investors are not concerned about stock overvaluation and unprofitable growth issues.

To our knowledge there are only two papers that cover empirically SEOs by financial institutions and consider both stock market reaction and the implication on cost of debt. Both use CDS spreads reactions to proxy the effect on cost of debt.

In our analysis of the impact of banks' SEOs on their cost of capital we also chose to use to use CDS spreads instead of bond prices. Blanco et al. (2005) find that CDS spreads lead the bond market in terms of discovering new price relevant information. In addition, they find that CDS spreads are close to bond yield spreads. Hence they are useful for measuring the impact on cost of debt in short horizon event studies. Moreover, King (2009) argues that CDS contracts are more liquid and require less capital than the underlying bonds, and are not sensitive to the choice of free-risk benchmark or tax related issues.

Cornett et al. (2014) study 129 SEOs by US financial firms in the period 2002-2013. They find insignificant stock market reactions for the period prior to the crisis, but a significant negative average CAR of -2.02% for the period following the start of the financial crisis.[9] By comparing their results to a control group of industrial firms during the crisis, they find that the stock market reacted more positively to SEOs from financial firms. They argue that this could be related to a certification effect and favorable conditions of equity injections under the TARP program, which was only available to healthy US financial firms.[10] With regards to debt markets, they find a significant cumulative drop in CDS spreads by -10.12 bps in relation to a SEO announcement over the whole sample period. However, the drop in CDS spreads is almost

[9] Cornett et al. (2014) denote the acquisition of Bear Stearns by J.P. Morgan on 24th of March 2008 as the start of the financial crisis. They also test by using the start of the TARP announcement on 14th of October 2008 to mark the start of the financial crisis but find insignificant negative CARs.

[10] It should be noted that they do not explicitly state how many SEOs were made under the US TARP program.

entirely attributed to SEOs that occurred after the announcement of the TARP program, from October 2008 onwards. After the announcement of TARP, SEO announcements by financial firms led to an average reduction in CDS spreads of -18.84 bps, compared to -2.54 bps for the pre-crisis period. In their cross-sectional analysis they find strong negative coefficients related to high yield issuances prior to the crisis, suggesting that financial firms with low credit ratings benefit from a strong and significant reduction in CDS spreads. However this does not hold for the crisis period; after the TARP announcement, the risk profile of the firm loses relevance for both equity and CDS. Furthermore, they find that relative issuance size has only a small and insignificant impact on CDS spread movements, arguing that there is a strong certification effect associated with equity injections under the US TARP program.

Marinova et al. (2014) briefly cover the subject in a background discussion document on the cost of bank recapitalizations. They analyze the market reactions to 74 European and 111 US equity issuances by banks over the period 2007-2013. Their analysis reveals that the stock market reaction to issuance announcements over a three-day event window was more negative in Europe (-2.61%) than in the US (-0.82%).[11] Furthermore, they find that SEOs lead to a significant fall in CDS spreads, both in the US (-3.03%) and in Europe (-1.88%), indicating that unlike shareholders, bank creditors perceived announced capital injections positively. Overall they argue that the relatively more positive reaction to SEO announcements in the US might be due to better capitalization levels of US banks relative to their European peers.

[11] Marinova et al.'s (2014) methodology differs from ours since they define cumulative abnormal spreads as the average abnormal spreads over the event window, while in this study the abnormal returns are added up.

4. Development of Hypotheses

4.1 Hypothesis I – Effects of SEOs on Stock Prices

Previous research has found significant drops in equity prices in relation to the announcement of SEOs. Following Myers and Majluf (1984) reasoning, asymmetric information about the intrinsic value of a firm should lead to negative stock price reactions around the SEO announcement date. Given the opaque risk exposure of banks during the financial crisis, investors might expect firms which conduct an SEO to have potentially high, currently undisclosed losses in the future and hence consider it favorable to issue new equity. Therefore, we will test the following null-hypothesis:

H0a: Seasoned equity offerings have no impact on stock prices.

In line with Admati et al. (2012) we argue that there are potential issues related to debt overhang in the banking sector, given the high leverage in the industry. Their line of reasoning is that injecting new equity mainly benefits creditors at the expense of incumbent shareholders. The risk of financial distress will be lowered, mainly benefiting debtholders. But it is not possible to get compensation from incumbent debtholders in the form of lower interest payments and hence shareholders bear the majority of the costs. This issue should be particularly severe for banks with solvency issues, indicated by a low credit rating. Hence we expect stronger negative stock price reactions for them, and we test null-hypothesis *H0b:*

H0b: The impact of seasoned equity offerings on stock price movements is invariant to the issuing bank's creditworthiness.

Given the documented fragmentation of the European financial markets during the sovereign debt crisis and the general reluctance to invest abroad over the period, we expect there to be weak investor demand for new share issuances, especially with regards to the peripheral countries, for which the sovereign and bank risks were highly interrelated and the risk of an exit from the Euro was a concrete possibility. Following Asquith and Mullins (1986) we expect the increase in the supply of shares related to SEOs, combined with a weak demand, to lead to substantial reductions in share value. The effect should be particularly profound for GIIPS countries with weakened financial markets. In addition to that, we expect most of the issuances to be made by banks in countries affected by the sovereign debt crisis, given their exposure to the depressed local economy and large government debt.

H0c: The impact of seasoned equity offerings on stock price movements is invariant to the period considered and the credit quality of the issuing bank's home country.

4.2 Hypothesis II – Effects of SEOs on CDS Spreads

In line with the findings of Cornett et al. (2014) for US financial firms, we expect creditors of European banks to react positively to SEO announcements. The new capital buffer should reduce the probability of financial distress. This should lower the risk profile of bank debt and hence lead to a reduction in CDS spreads. The first hypothesis we intend to reject regarding CDS spreads is:

H0d: Seasoned equity offerings have no impact on CDS spreads.

Furthermore, the effect should be more profound for banks with a weaker financial position as the reduction in default risk should disproportionally benefit creditors. Following Admati et al. (2012), we expect debtholders of highly leveraged banks to benefit from a higher wealth transfer from incumbent shareholders in relation to the SEO.

Based on findings by Chiaramonte and Casu (2013), simple leverage ratios should have low explanatory power in explaining a bank's credit risk. Credit ratings should serve as a more complete measure of risk and are hence better able to quantify the prevalence of debt overhang problems. Therefore, we expect SEOs by banks with low credit ratings to lead to higher reductions in CDS spreads and hence lower the firms' financing costs.

H0e: The impact of seasoned equity offerings on CDS spread movements is invariant to the issuing bank's creditworthiness.

Consistent with our reasoning regarding the reactions in the stock market, we expect the majority of seasoned equity offerings in the years 2010-2013 to occur in distressed countries. Banks in peripheral countries experienced a period of acute distress during the European debt crisis and there was a strong contagion effect between sovereign risk and bank risk. The reasons for this were investigated by De Bruyckere et al. (2013) who, among other factors, argued that an implicit guarantee channel between governments and their domestic bank debt existed. For weak banks in GIIPS countries the effect was especially profound, as there was increasing doubt whether governments could finance the huge costs of a potential bailout. That in turn affected the value of the domestic sovereign debt that banks held and led to a downward spiral. De Bruyckere et al. (2013) find that this relation breaks for banks with a stronger Tier 1 capital ratio in distressed countries. Hence we expect to see larger magnitudes in the CDS spreads reductions in relation to SEO announcements for banks in peripheral countries. A capital increase would in fact make them less dependent on guarantees from their distressed home country.

H0f: The impact of seasoned equity offerings on CDS spread movements is invariant to the period considered and the credit quality of the issuing bank's home country.

5. Data

5.1 SEO Announcements

We study the stock price and credit default swap spread reactions to 64 seasoned equity offerings announcements for 37 commercial banks in Europe over the period 2007-2013. The event dates have originally been extracted from Thomson Reuters' SDC Platinum database.[12] The dates have been compared with the SEO announcements published on Thomson Reuters, Dow Jones News Wire and the respective institutions' corporate investor relations websites. In case of discrepancies we took the earliest date available. Information about the issuance purpose has been extracted from the same sources. Secondary offerings have been excluded from our sample, as they do not imply an increase in equity capital. Private placements and closely-held banks have also been disregarded.[13] This study does not include equity offerings with total proceeds below USD 25mn. All public bailouts have been excluded from our event list.[14]

The sample of commercial banks first considered has then been restricted to the institutions that have liquid CDS 5-year contracts outstanding on senior unsecured debt. Our final sample comprehends 64 seasoned equity offerings by 37 different institutions, ranging between USD 83mn and USD 24.35bn. The average SEO size in our sample is USD 4.42bn.

Table 1 – Distribution of SEOs over the Sample Period

SEO announcement dates are extracted from Thomson Reuters' SDC Platinum. The minimum size considered is USD 25mn. Secondary offerings, private placements and public bailouts have been excluded from our events. The total amount issued has been extracted from SDC Platinum for each event, in mn USD.

Year	N	Amount Issued ($mil)	Average ($mil)
2007	2	624	312
2008	17	111418	6554
2009	15	96937	6462
2010	4	9882	2470
2011	9	19667	2185
2012	7	15015	2145
2013	10	29304	2930
Total	**64**	**282847**	**4419**

[12] SDC Platinum provides access to seasoned equity offerings filing dates. We cross-checked the filing dates provided by SDC Platinum in the press and replaced them with official corporate announcement dates in case they differed.

[13] All the banks in our sample had at least 30% of their market value in free float at the time of the announcement, in line with King (2009) that uses a 20% lower bound. A firm's free float is given by all its shares outstanding that can be traded publicly.

[14] See Table 12 in the Appendix for a list of public bailouts in Europe. We only report bailouts for the banks we include in our sample. SEOs by Royal Bank of Scotland Group (October 13th 2008 and January 19th 2009), HBOS PLC and Lloyds TSB Group (both on October 13th 2008) have been deleted from the original sample extracted from SDC Platinum, as they were part of a public recapitalization scheme implemented by the UK government.

Table 1 shows the distribution of seasoned equity offering per year; half of the SEOs in our sample are concentrated in the years 2008-2009, and in those same years the average equity offering amount is significantly larger than in the remaining period.

Figure 2 – Purpose and Volume of SEO by Year

Figure 2 shows the total equity issued per year in mn USD, divided into SEOs aimed at strengthening the balance sheet and SEOs motivated by mergers or acquisitions. Information about the purpose of the issuance has been retrieved from the announcements published on Thomson Reuters, Dow Jones News Wire and the respective institutions' corporate investor relations websites

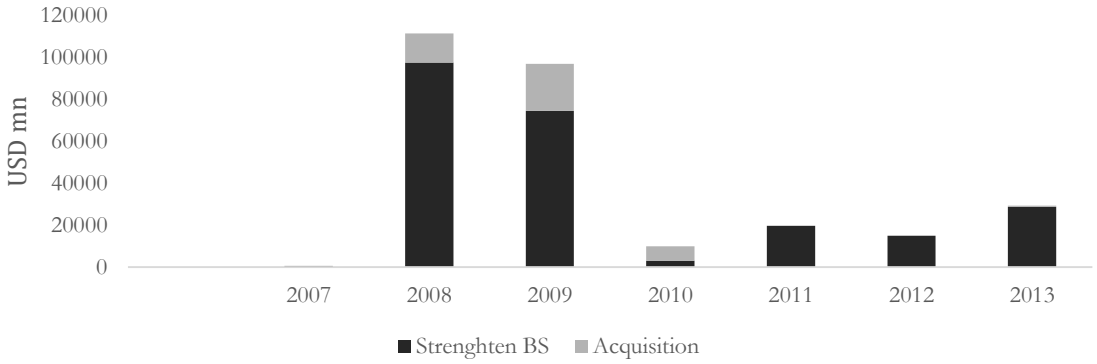


Figure 2 shows the sample split between equity offerings motivated by a merger or an acquisition and the SEOs whose purpose was strengthening the banks' balance sheet. As displayed by the graph, 82% of the SEOs motivated by M&A occurred over the period 2008-2009.

Figure 3 – SEO Volume by Country and Purpose

Figure 3 displays the total amount of equity issued per country, in mn USD, divided into SEOs motivated by mergers or acquisitions opportunities and SEOs whose purpose was strengthening the balance sheet.

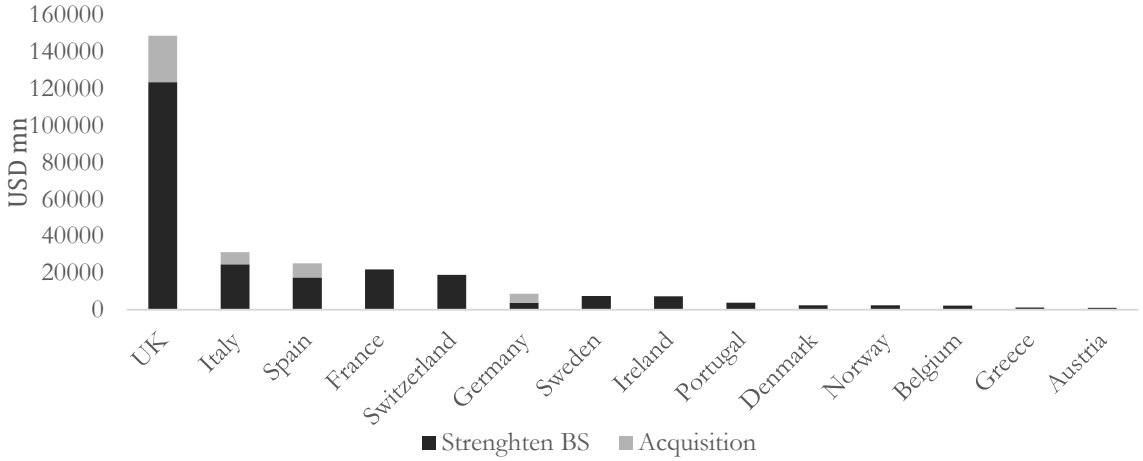


Table 2 and Figure 3 show the sample distribution per issuing institution's country. The UK accounts for 52% of the total amount of equity issued, while Switzerland has the highest average

issue size. 57% of the seasoned equity offerings motivated by a merger or an acquisition occurred in the UK. Table 2 also displays the sample distribution of SEOs per country and sub-period, showing that Spain, Italy, Portugal and Greece alone account for 2/3 of the seasoned equity issuances over the European sovereign debt crisis and provides partial evidence against *hypotheses H0c and H0f,* as *SEOs during the European debt crisis were predominantly done by banks in distressed countries*

Table 2 – Geographical Distribution of SEOs by Period

Country	N (2007-2009)	Amount Issued 2007-2009($mil)	N (2010-2013)	Amount Issued 2010-2013($mil)
UK	15	128384	3	20043
Italy	3	7003	5	24274
Spain	1	9276	9	15866
France	3	21848	0	0
Switzerland	2	18922	0	0
Germany	2	4825	1	3899
Sweden	3	7504	0	0
Ireland	1	4651	2	2776
Portugal	1	1592	3	2348
Denmark	0	0	2	2497
Norway	1	2448	0	0
Belgium	1	2369	0	0
Greece	1	156	3	1137
Austria	0	0	2	1029
Total	**34**	**208979**	**30**	**73868**

Figure 4 and Table 3 below show the sample split across distressed and non-distressed countries. 86% of the SEOs and 95% of the amount issued in distressed countries was during the European sovereign debt crisis, i.e. between 2010 and 2013. 73% of the SEOs and 85% of the amount issued in non-distressed countries was during the first part of the crisis, i.e. the international financial crisis that hit Europe in the years 2007-2009.

Figure 4 – Number of SEOs by Distressed and Non-Distressed Countries

Figure 4 shows the number of SEOs per year across distressed and non-distressed countries. We classify a country as distressed if at the time of the issuance the firm's home country Fitch rating was below AA+.

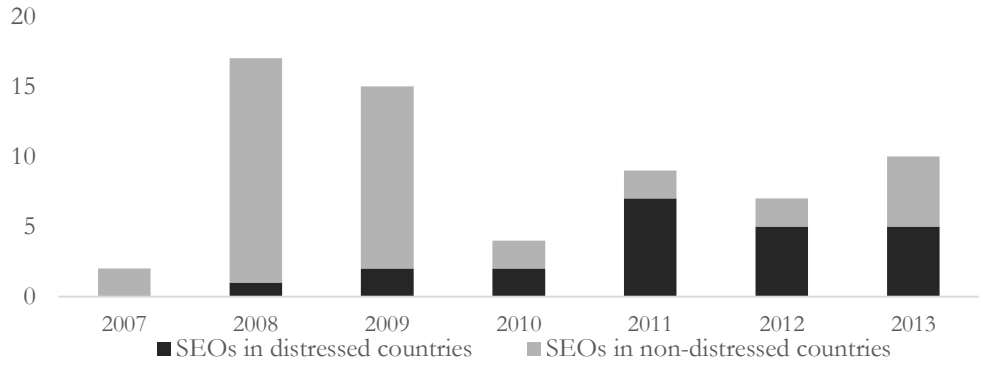


Table 3 – Distribution of SEOs between Distressed and Non-distressed Countries

Table 3 displays the number of SEOs and total equity issued in mn USD per year across distressed and non-distressed countries. We classify a country as distressed if at the time of the issuance the firm's home country Fitch rating was below AA+. Fitch ratings for the countries have been downloaded from Bloomberg, and refer to the time of the SEO announcement. Over our sample, only Greece, Ireland, Italy, Portugal and Spain fall into this category at least in one event case.

Year	SEOs in distressed countries	SEOs in Distressed Countries($mil)	SEOs in non-distressed countries	SEOs in Non-Distressed Countries($mil)
2007	0	0	2	624
2008	1	258	16	111160
2009	2	1748	13	95189
2010	2	2776	2	7106
2011	7	17845	2	1822
2012	5	13503	2	1512
2013	5	4603	5	24701
Total	**22**	**40734**	**42**	**242113**

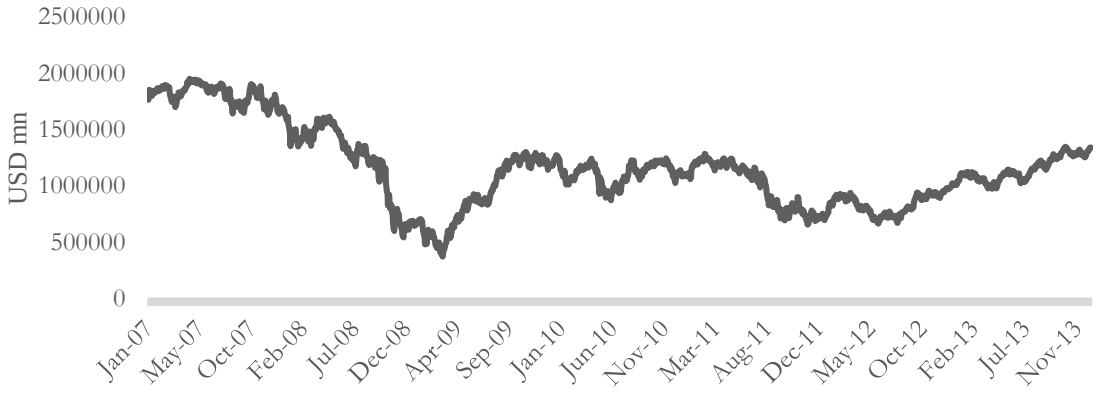
5.2 Stock Returns

Daily percentage changes in price have been extracted from Datastream. Figure 5 shows the aggregate market capitalization of the 37 firms in our sample over the period of analysis. The market capitalization is computed as the firm's daily stock price times the number of common shares outstanding. The average daily stock return in our sample is -0.022% over the whole sample and -0.056% and 0.003% respectively in the periods 2007-2009 and 2010-2013.

In the market model, for the calculation of abnormal returns, the *Stoxx Europe 600 Banks* stock index and the *Stoxx Europe 600* general market index are used, both extracted from Datastream.

Figure 5 – Aggregated Market Cap of Sample Banks during the Crisis Period

Figure 5 shows the aggregated market capitalization of the banks in our sample over the period 2007-2013 in mn USD. The market capitalization is computed as the firm's daily stock price times the number of common shares outstanding.



5.3 CDS Spreads

Daily CDS spread changes are extracted from Datastream. 5-year contracts on senior unsecured debt denominated in the bank's home currency are considered in this study, as Blanco et al. (2005) report that five-year contracts are by far the most liquid in the CDS market. The index utilized in the market model is the *DS Europe Banks 5 Year Credit Default Swap Index*[15], also downloaded from Datastream. In our analysis we use both the daily percentage changes and the daily absolute changes in CDS spreads[16], the latter calculated as:

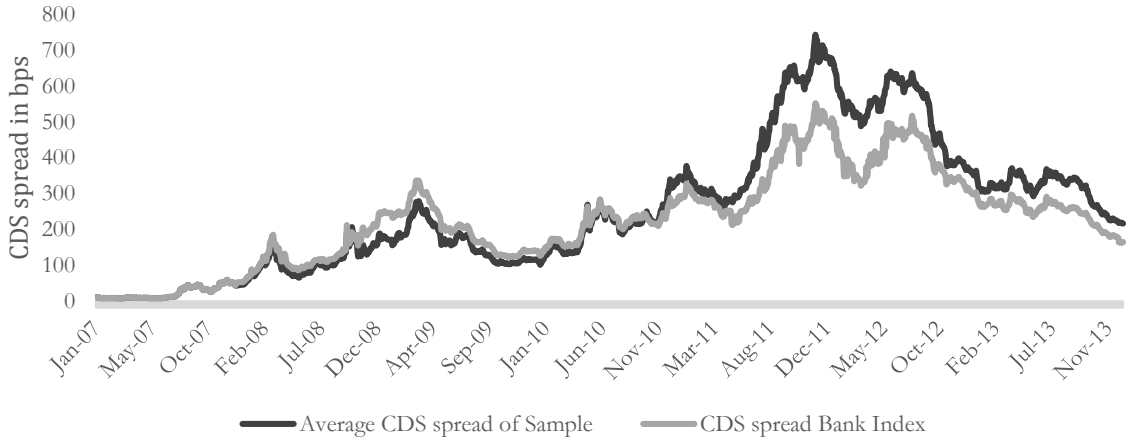
$$\Delta S_{it} = S_{i,t} - S_{i,t-1}$$

where $S_{i,t}$ is the CDS spread for firm *i* in day *t*.

The average daily change in CDS spread is 0.116 basis points over both the periods considered in the analysis.

Figure 6 – Average CDS Spread of Sample Banks vs European Banking Index

Figure 6 shows the average CDS spread of the banks in our sample vs the European banking index. 5-year CDS contracts on senior unsecured debt denominated in the bank's home currency and the DS Europe Banks 5 Year Credit Default Swap Index are extracted from Datastream. The spreads are displayed in basis points



5.4 Controls

After having measured the average CARs and CASs over our sample, cross sectional analysis is used to investigate the determinants of the results. We consider firm and issue characteristics, and we control for period and country.[17] Table 4 displays the summary statistics for our sample.

[15] The index is available only back to December 17th 2007 on Datastream. For the remaining part of the sample the market index is built as the average daily CDS spread change for the firms in our sample. This however has an impact only on the $\overline{CAS}$calculations for two events.

[16] Our reported results will refer primarily to the analysis of daily changes computed in basis points, in line with Cornett et al. (2014). We utilize the daily percentage changes when controlling for robustness.

[17] In order not to include an excessive number of independent variables in our analysis, we control for time and country by means of two dummy variables: *Crisis*, taking the value of 1 in the years 2007-2009 and *Distressed Country*, described below.

Table 4 – Summary Statistics of Control Variables

Table 4 displays the controls used and their summary statistics. The Marginal Expected Shortfall has been extracted from NYU Stern – The Volatility Institute website, and the month-end value before the event date is considered. Issue size has been extracted for each event in USD mn from SDC platinum. Market cap, Market to Book and Total Debt have been retrieved from Datastream, in USD mn, 10 days before announcement. Leverage is computed as the ratio between total debt and the sum of total debt and market cap. Volatility has been extracted from Datastream and is calculated as the standard deviation of a stock in the three months prior to the event date. The dummy variable Acquisition Purpose takes the value of one if the SEO was motivated by a merger or an acquisition. Information about the motivation of an equity issue has been retrieved from Thomson Reuters, Dow Jones Industry Wire and the corporate investor relations websites of the banks in our sample. Distressed country takes the value of 1 if the issuing firm's country Fitch rating was below AA+ at the time of the announcement. High Yield takes the values of one if the issuing firm's S&P credit rating at the time of the announcement was below BBB-. S&P and Fitch ratings have been extracted from Bloomberg.

Variable		N	Mean	Median	Std Dev	Min	Max
MES (%)		61	4,23	3,98	1,36	2,03	9,53
Market cap (USD mn)		64	26382	16238	25547	260	99189
Issue size as % of Market cap (%)		64	0,91	0,17	4,11	0,01	31,81
Market to Book		64	0,84	0,70	0,77	-0,22	4,69
Leverage (%)		63	90,10	91,96	9,47	35,81	99,96
Volatility (%)		64	18,94	1,72	47,09	0,002	234,55
Variable		**N**		**2007-2009**		**2010-2013**	
Acquisition Purpose	1	10		8		2	
	0	54		26		28	
Distressed Country	1	22		3		19	
	0	42		31		11	
High Yield	1	9		0		9	
	0	55		34		21	

The *Marginal Expected Shortfall* (*MES)* indicates the expected fall in an institution's stock value in case of a crisis event, namely if the market overall declines beyond a certain threshold over a determined time period. It is therefore a proxy for financial fragility and for the exposure of an institution to the financial market and systemic risk factors. The first approach for the MES calculation has been developed by Brownlees and Engle (2012) and Engle, Jondeau and Rockinger (2014) provide an extension of the model for the European markets. This variable has been extracted from NYU Stern – The Volatility Institute website, and the month-end value before the event date is considered.[18] Specifically, the measure considered in our study is the expected one-day loss per dollar invested in a firm's equity in case of a 2% daily world market decline:

$$MES_{i,t} = -E_t\left(R_{i,t+1} \middle| R_{M,t+1} \leq -2\%\right) \quad (1)$$

The reasoning behind the development of this risk measure is that for each firm systemic risk is determined by the propensity of the firm to be under-capitalized whenever the financial system as a whole is under-capitalized. This model captures the expected loss for each financial

[18] Systemic risk measures for European firms are calculated by the Center for Risk Management at HEC Lausanne

institution conditional on the weak economy; in our analysis it will be used as a proxy for exposure to systemic risk factors

The firms' *market capitalization* has been extracted from Datastream and is computed as the firm's stock price times the number of common shares outstanding (in mn USD), ten days before the event date. It is used as a proxy for company size. The market capitalization of the banks in our sample ranges from USD 260mn to USD 99.2bn, with a sample average of USD 16.2bn.

Issue size has been downloaded from SDC platinum for each event, and is measured in mn USD. Issue size has been then divided by the respective firm's market capitalization in order to have a comparable measure across different institutions.

Market to Book has been extracted from Datastream, ten days before the event. It is computed as the ratio between the market capitalization and the book value of equity of a firm. High market-to-book values could signal either positive growth prospects or overvaluation. The literature generally associates overvaluation to more negative stock price reactions around equity issuance announcements, as it is more likely that managers time the market when deciding upon a SEO.

Leverage is calculated as the ratio between a firm's total debt and the total value of the firm (total debt plus the market value of equity). Total debt has been downloaded from Datastream, ten days prior to the event, and is defined as all the interest bearing and capitalized lease obligations, i.e. long plus short term debt (in USD mn).

Volatility has been extracted from Datastream and is calculated as the standard deviation of a stock in the three months prior to the event date.

The *acquisition purpose* dummy variable assumes the value of one if the purpose of the SEO is financing a merger or an acquisition. Information about the motivation of an equity issue has been retrieved from Thomson Reuters, Dow Jones Industry Wire and the corporate investor relations websites of the banks in our sample. A value of zero is associated to SEOs aimed at improving the banks' capital ratios.

The dummy variable *distressed country* takes the value of one if at the time of the issuance the firm's home country Fitch rating was below AA+. Fitch ratings for the countries have been downloaded from Bloomberg, and refer to the time of the SEO announcement. Over our sample, only Greece, Ireland, Italy, Portugal and Spain fall into this category at least in one event case.

The *high yield* dummy equals one if the firm's S&P rating at the time of the SEO announcement was below BBB-, in line with Standard & Poor's definition of speculative grade. S&P ratings for banks have been downloaded from Bloomberg.

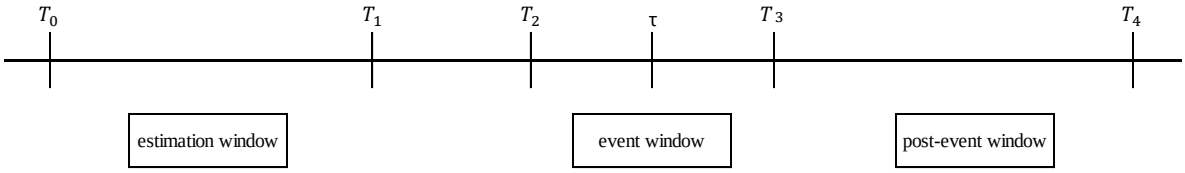
6. Methodology

6.1 Event Study Methodology

In our study we follow the methodology outlined by Campbell, Lo, MacKinlay (1997) and Kothari and Warner (2004).

Figure 7 – Overview of Event Study Windows

In the estimation window $L_1 = T_1 - T_0$ the parameters α, β and the error term ε of the market model are estimated with an OLS regression with the security returns as dependent variables and the market index as independent variable. The estimated parameters are then used for the calculation of the abnormal returns over the event window $L_0 = T_3 - T_2$. To avoid potential anticipation effects in the event window, six days separate T_2 from T_1.



To detect the effect of the event, first the normal security returns in case the event did not take place need to be estimated. An estimation window $L_1 = T_1 - T_0$ of 120 trading days is used, ending six days before the event window, to avoid including part of the price movements caused by the event in our predicted returns estimation. We then consider symmetrical three and five-day windows $L_0 = T_3 - T_2$ around the event to detect the abnormal returns on the market.[19]

6.2 The Market Model

The market model is used to estimate the expected returns over the event window. This model assumes a constant linear relationship between individual stock returns and the returns of a market index, according to the following specification:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \tag{2}$$

$$E(\varepsilon_{it} = 0) \qquad Var(\varepsilon_{it}) = \sigma_{\varepsilon_i}^2$$

where R_{it} is the return for security *i* on period *t* and R_{mt} is the market portfolio return for the same period. The intercept α_i represents the portion of security *i*'s return that is not affected by the market portfolio movements, while β_i reflects the sensitivity of the security's return to the movements of the market index. ε_{it} is the zero mean disturbance term, or error term.

As argued by Campbell, Lo and MacKinlay (1997), the market model removes the portion of the return that is related to the variation in the market index and therefore reduces the variance of the abnormal results. For this reason we chose the market model over the

[19] A three-day event window is used in the analysis of abnormal stock price movements, while a five-day window is adopted when assessing CDS spread reactions.

constant-mean-return model for our study. Furthermore, we chose not to use any factor model such as the Fama-French model, since more complex specifications reduce the variance of the abnormal returns only marginally, especially over short horizons (Campbell et al., 1997). To compute abnormal CDS spreads the same model is used and instead of stock returns we consider daily changes in CDS spreads computed as:

$$\Delta S_{it} = S_{i,t} - S_{i,t-1} \tag{3}$$

where $S_{i,t}$ is the credit default swap spread for firm *i* in period *t*, as in Cornett et al. (2014).

The parameters of the market model are estimated with an OLS regression according to the following formulas:

$$\hat{\beta}_i = \frac{\sum_{\tau=T_0+1}^{T_1}(R_{i\tau}-\hat{\mu}_i)(R_{m\tau}-\hat{\mu}_m)}{\sum_{\tau=T_0+1}^{T_1}(R_{m\tau}-\hat{\mu}_m)^2} \tag{4}$$

$$\hat{\alpha}_i = \hat{\mu}_i - \hat{\beta}_i\hat{\mu}_m \tag{5}$$

$$\hat{\sigma}_{\varepsilon_i}^2 = \frac{1}{L_1 - 2}\sum_{\tau=T_0+1}^{T_1}(R_{i\tau} - \hat{\alpha}_i - \beta_i R_{m\tau})^2 \tag{6}$$

The mean return of the market portfolio and security *i* over the estimation window are calculated as:

$$\hat{\mu}_i = \frac{1}{L_1}\sum_{\tau=T_0+1}^{T_1} R_{i\tau} \tag{7}$$

$$\hat{\mu}_m = \frac{1}{L_1}\sum_{\tau=T_0+1}^{T_1} R_{m\tau} \tag{8}$$

In our model we consider the *Stoxx Europe 600 Banks* as market index for equity. To check for robustness, we also repeat our study using the *Stoxx Europe 600* general market index. For CDS spreads we use the *DS Europe Banks 5 Year Credit Default Swap Index*.

6.3 Abnormal Return Calculation

The parameters estimated with the market model over the estimation window are then used to predict the security price movements over the event window. Abnormal returns are computed as the difference between actual returns and predicted returns, and correspond to the disturbance terms of the market model:

$$\widehat{AR}_{i\tau} = R_{i\tau} - \hat{\alpha}_i - \hat{\beta}_i R_{m\tau} \tag{9}$$

According to the null hypothesis and conditional on the market returns in the event window, abnormal returns will be jointly normally distributed with a zero conditional mean and variance:

$$\sigma^2\left(\widehat{AR}_{i\tau}\right) = \sigma_{\varepsilon_i}^2 + \frac{1}{L_1}\left[1 + \frac{(R_{m\tau} - \hat{\mu}_m)^2}{\hat{\sigma}_m^2}\right] \tag{10}$$

The abnormal returns are then aggregated across time and different securities, to detect any average effect following the event. Aggregation across time is due to the fact that it might take several periods for the information to be incorporated into prices, and because the specific event dates τ=0 may be imprecise, i.e. the information might reach the markets before the official announcement date.

The cumulative abnormal return over each event window is simply computed as the sum of the daily abnormal returns for a security:

$$\widehat{CAR}_i(\tau_2, \tau_3) = \sum_{\tau=\tau_2}^{\tau_3} (\widehat{AR}_{i\tau}) \tag{11}$$

With a large enough estimation window the errors in the estimation of the market model's parameters can be approximated to zero and the variance of each event's CAR becomes:

$$\sigma^2{}_{\widehat{CAR}_i}(\tau_2, \tau_3) = (\tau_3 - \tau_2 + 1)\sigma^2_{\varepsilon_i} \tag{12}$$

meaning that larger event windows reduce statistical power.

Then the average cumulative abnormal return is computed over the whole sample of N events

$$\overline{CAR}(\tau_2, \tau_3) = \frac{1}{N}\sum_{i=1}^{N} \widehat{CAR}_i(\tau_2, \tau_3) \tag{13}$$

with its variance defined as:

$$\sigma^2{}_{\overline{CAR}}(\tau_2, \tau_3) = \frac{1}{N^2}\sum_{i=1}^{N} \sigma^2{}_{\widehat{CAR}_i}(\tau_2, \tau_3) \tag{14}$$

6.4 Significance Testing

First, a t-test is applied to our results to assess the significance level of the cumulative abnormal returns detected. Therefore the null hypothesis that the average CARs equal zero is tested:

$$H_0: \overline{CAR}(\tau_2, \tau_3) = 0 \tag{15}$$

With a large enough number of events, the average CAR's variance can be reformulated as:

$$\sigma^2{}_{\overline{CAR}}(\tau_2, \tau_3) = \frac{1}{N^2}\sigma^2{}_{\widehat{CAR}_i}(\tau_2, \tau_3) \tag{16}$$

And a traditional two-tailed t-test can be performed (Campbell et al., 1997):

$$J_1 = \frac{\overline{CAR}(\tau_2, \tau_3)}{\sqrt{\sigma^2{}_{\overline{CAR}}(\tau_2, \tau_3)}} \sim N(0,1) \tag{17}$$

6.4.1 Welch's T-Test

To test if the average cumulative abnormal returns differ significantly across the two periods of our analysis - i.e. the financial crisis and the European sovereign debt crisis - and across countries that were or were not in distress, we use Welch's adaptation of the unpaired samples t-test. The underlying assumption is that the sample is normally distributed within the two subgroups. The null hypothesis is that the average CAR does not differ across the two subsamples:

$$H_0: \overline{CAR}(\tau_2, \tau_3)_1 = \overline{CAR}(\tau_2, \tau_3)_2 \tag{18}$$

The t-statistic of the Welch test is:

$$t = \frac{\overline{\mu_1} - \overline{\mu_2}}{\sqrt{\frac{\sigma_1^2}{N_1} + \frac{\sigma_2^2}{N_2}}} \tag{19}$$

where $\bar{\mu}$, $\sigma^2$and N are respectively the mean, variance and size of a subsample (Welch 1947).

6.4.2 Non-Parametric Tests

Parametric tests rely on assumptions regarding the sample distribution. In the specific case, the standard t-test assumes that the abnormal returns are jointly normally distributed. However, Fama (1976) observes that distributions of daily returns are generally fat-tailed, and Brown and Warner (1985) document that the same is true for daily excess returns.

In our analysis we include non-parametric tests as a robustness check, in addition to the standard t-test, as outlined by Campbell et al. (1997).We use the non-parametric *sign test* described by Campbell, Lo and MacKinley (1997) to assess the significance of the cumulative abnormal returns. The sign test tests the null hypothesis that the distribution of a variable has median zero and no further assumptions about the distribution are made. The test relies on the fact that under the null hypothesis it is equally likely that the CAR will be positive or negative.

The *Wilcoxon rank-sum (Mann-Whitney) test* is used as a non-parametric alternative to the two-sample t-test. This test is based on the order in which the observations from the two subsamples are distributed and relies on the assumption that the observations are independent across samples. The Wilcoxon rank-sum test tests the null hypothesis that the data in the two subsamples are from distributions with equal medians (Wilcoxon, 1945).

Literature provides mixed evidence about the effectiveness of non-parametric tests in event studies. Brown and Warner (1985) observe that for mean excess returns across a relatively large number of securities the standard parametric tests appear to be well specified, as mean abnormal returns in cross-sections of securities converge to normality. Moreover, Berry et al. (1990) argue that non-parametric tests should be used with extreme attention, and that the standard student t-test is generally well specified with OLS regression residuals.

6.4.3 Bootstrapped Standard Errors

A bootstrapping procedure is used for the computation of the standard errors of the mean CARs and CASs when the results are aggregated across a small cross-section of securities, i.e. when the number of events in the subsamples is not sufficiently high. Bootstrapping is a non-parametric method for evaluating the distribution of a statistics, and it uses random resampling. From a dataset of N observations, N observations are drawn with replacement, so that the random process selects some observations more than once and some other never. Each time the resampling is run, a random sample is created and the statistics of interest are recalculated. From the dataset of replicated statistics, the standard error can be computed using the standard formula for the sample standard deviation.

6.5 Clustering

When aggregating the results across time and firms, the tests rely on the assumption that the abnormal returns of different securities are independent. Campbell, Lo and MacKinlay (1997) argue that this is a reasonable assumption if there is no overlap in the event windows across the sample. In our sample we detect six cases of event window overlap, if the symmetrical three-day window is used. As robustness check, we use also a 1-day window that would restrict the clustering issue to only two events that occur on the same day.[20]

6.6 Cross Sectional Analysis

Ordinary Least Squared (OLS) regressions are utilized to study the determinants of the cumulative abnormal returns across our sample:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \cdots + \beta_K X_{Ki} + \varepsilon_i \tag{20}$$

where the controls are used as explanatory variables (X_{Ki}) to predict the CARs (Y_i), so that the estimated coefficients $\check{\beta}_1, \check{\beta}_2, \ldots, \check{\beta}_K$ minimize the sum of the squared residuals (Wooldridge, 2012).[21]

In our analysis we utilize *clustered standards errors*. OLS regressions assume that the residuals are independent. By clustering standard errors at bank level, we control for correlation among the residuals within institutions that issue equity multiple times across our sample.

[20] As a general remark, evidence shows that in event studies with short horizon the test statistics are not highly sensitive to the model used in the calculation of the predicted returns or to assumptions made about the cross-sectional or time-series correlation of abnormal returns. The model specification and clustering become more important issues when the horizon of the event study increases. (Kothari, Warner, 2004)

[21] The cross-sectional analysis might be subject to some selection bias if there is a relation between the firm's characteristics and the degree of anticipation of the event from the market. In fact, investors use companies' information to predict the likelihood of the event occurring. This would cause the assumption that the residuals are uncorrelated with the regressors to break. However, Prabhala (1995) argues that the OLS approach still remains valid for inference and that the t statistics can be taken as lower bounds for the actual significance of the explanatory variables

7. Results and Analysis

7.1 Reactions in the Equity Market

7.1.1 Cumulative Abnormal Return around the SEO Announcement

Null-hypothesis H0a: Seasoned equity offerings have no impact on stock prices.

We first investigate the effect of 64 seasoned equity offering announcements made by 37 commercial banks in Europe on stock returns, over the period from 2007 to 2013. We detect an average cumulative abnormal return of -4.76% over a symmetrical three-day event window, significant at the 1% level with both the t-test and the sign test. This result is consistent with previous literature and large in magnitude. Cornett et al. (2014) find an average CAR of 1.43% in the United States over the years 2002-2013, while Marinova et al. (2014) detect an average abnormal return of -2.61% in Europe over our same sample period (2007-2013).[22] We can reject the first *hypothesis H0a* as we find that *CARs for our sample of 64 SEOs by 37 European banks are negative and statistically significant,* likely due to a negative signalling effect, consistent with the theory that equity issuances are perceived as negative news by market participants.

Table 5 – Summary of Average Cumulative Abnormal Returns

Cumulative abnormal returns are computed as the sum of the abnormal returns over a symmetrical three-day event window for each security, and then mean CARs are considered over cross-sections of securities. 64 SEOs by 37 European commercial banks are considered in this study. Event dates have been extracted from SDC Platinum. The minimum size considered is USD 25mn. Secondary offerings, private placements and public bailouts have been excluded. The index used in the analysis is the European 600 Banks stock index. Stock returns and the market index have been extracted from Datastream. A SEO occurred in a country in distress if the issuing firm's country Fitch rating was below AA+ at the time of the announcement. Standard errors are robust and clustered at firm level.

	CAR (-1/+1)	std error	t-statistic	p-value	obs
Full sample	**-4.76%**	0.0093	-5.09	0.000	64
Period 1 (2007-2009)	**-3.78%**	0.0122	-3.09	0.005	34
Period 2 (2010-2013)	**-5.88%**	0.0135	-4.35	0.000	30
Distressed Country	**-6.40%**	0.0158	-4.05	0.001	22
Non-Distressed Country	**-3.91%**	0.0104	-3.76	0.001	42

Null-hypothesis H0c: The impact of seasoned equity offerings on stock price movements is invariant to the period considered and the credit quality of the issuing bank's home country

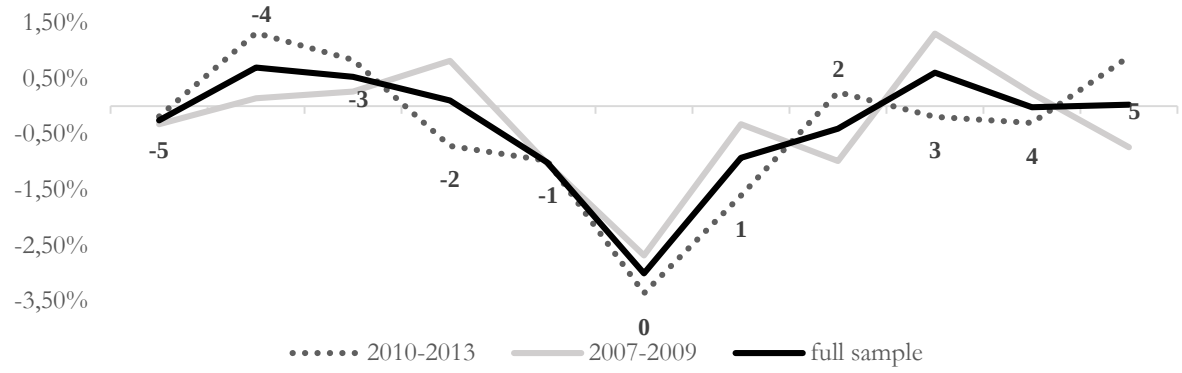
We then split the sample into two periods in order to detect if there was any difference between the stock market reaction to SEOs made by commercial banks during the international financial crisis (2007-2009) and during the European sovereign debt crisis (2010-2013). As

[22] Marinova et al.'s(2014) methodology differs from the one adopted in this paper as their CARs are computed as the average abnormal return over the event window.

shown in Section 5, in our sample Spain, Italy, Portugal and Greece account for two-thirds of the seasoned equity issuances over the European sovereign debt crisis. During the European debt crisis the average CAR amounts to -5.88%, substantially larger than the average CAR of -3.78% detected in the first period of our sample. Both abnormal effects are significant at 1% with both the t-test and the sign test, however the Welch's unequal variances t-test shows limited significance for the difference of the abnormal effects across the two subsamples (the results are different at a 12% significance level). Therefore we can provide only limited evidence that investors on average viewed a SEO more negatively during the period 2010-2013, the period of the European sovereign debt crisis.

Figure 8 – Average Abnormal Stock Returns around the Event Date

Figure 8 shows the average abnormal stock returns across all the events in our sample, in a window of eleven days around the event. Day zero is when the SEO announcement occurred. The Figure also displays the different average abnormal returns across the two periods in our sample.



In order to assess the effect of the credit quality of the issuing bank's home country, we divide the sample in SEOs performed in distressed sovereigns and SEOs that occurred in financially solid countries.[23] Equity offerings in financially weak countries led to a negative average CAR of -6.40%, larger than the -3.91% detected in non-distressed countries. Both results are significant at a 1% level with parametric and non-parametric tests.[24] The Welch's unequal variances t-test confirms that the average CARs across distressed and non-distressed countries are significantly different from each other at the 10% level. The non-parametric two-sample Wilcoxon ranked-sum test however indicates that the average CARs are not statistically different over the two sub-samples. Detailed results of the sign test, Welch's t-test and Wilcoxon rank-sum test for average CARs are reported respectively in Tables 15, 16 and 17 in the Appendix.

[23] As described in Section 5, the dummy variable Distressed Country takes the values of one if at the time of the issuance the firm's home country Fitch rating was below AA+.
[24] Given the limited size of the subsample of SEOs carried out in distressed countries, the average CAR's standard error is computed with bootstrapping (100 replications). We can confirm the significance at 1% level, with a bootstrapped standard error of 1.45%

Overall we can only provide limited evidence against *hypothesis H0c,* as we observe larger average CARs during the second period of our analysis – i.e. the European sovereign debt crisis – and larger average CARs in distressed countries, but the differences across subsamples display only limited significance levels.

7.1.2 Cross Sectional Analysis

Table 6 – OLS Regression of CARs on Firm and Issue Characteristics

Table 6 displays the results of our cross-sectional analysis, in support of our analysis of hypothesis H0b. CARs are calculated as the sum of the abnormal returns for each security over a symmetrical three-day event window around SEO announcement. The sample includes all the SEOs carried out by European commercial banks over the period 2007-2013. The minimum size considered is USD 25mn. Secondary offerings, private placements and public bailouts have been excluded. We control by country and year by means of the two dummy variables Crisis and Distressed Countries. Crisis takes the value of one in the period 2007-2009 and Distressed Country takes the value of one for countries whose Fitch rating was below AA+ at the time of the event. Robust standard errors clustered at firm level are displayed in parenthesis

	Cumulative Abnormal Stock Return								
	2007-2013			2007-2009			2010-2013		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent variable: CAR(-1/+1)									
Constant	**-0.0391*** **	-0.0167	0.0800	**-0.0378*** **	-0.0003	-0.2201	**-0.0411*** **	-0.0049	0.9073
	(0.009)	(0.0485)	(0.162)	(0.0122)	(0.0652)	(0.239)	(0.0122)	(0.053)	(0.617)
High yield dummy	**-0.0609***	-0.0572	-0.0593	*omitted*	*omitted*	*omitted*	**-0.0588***	**-0.064***	**-0.0726***
	(0.032)	(0.0346)	(0.0357)	*omitted*	*omitted*	*omitted*	(0.0335)	(0.0364)	(0.0378)
Acquisition Purpose		0.0032	0.0004		-0.0234	-0.0310		0.0518	0.0323
		(0.0299)	(0.0302)		(0.0356)	(0.0386)		(0.0504)	(0.0452)
MES		-0.0066	-0.0040		-0.0072	-0.0055		-0.009	-0.0103
		(0.0103)	(0.0093)		(0.0149)	(0.0152)		(0.0122)	(0.0129)
Distressed country		-0.0070	0.0017		-0.0159	-0.0039		-0.0016	0.0508
		(0.022)	(0.026)		(0.0364)	(0.045)		(0.027)	(0.039)
Crisis (2007-2009)		0.0025	0.0017			*omitted*			*omitted*
		(0.0202)	(0.0225)			*omitted*			*omitted*
Relative issuance size			-0.0029			-0.0043			-0.0632
			(0.0022)			(0.0026)			(0.102)
Market to Book			0.0008			0.0201			-0.0171
			(0.0151)			(0.0438)			(0.019)
Leverage			-0.0010			-0.0022			-0.0097
			(0.0016)			(0.0021)			(0.0069)
Volatility			0.0001			0.0002			-0.0016
			(0.0002)			(00028)			(0.0045)
Market Cap			0.0000			0.0000			0.0000
			(0.0000)			(0.0000)			(0.0000)
Observations	64	61	61	34	31	31	30	30	30
R-squared	0.09	0.11	0.16	0	0.03	0.13	0.16	0.21	0.52

***p<0.01, **p<0.05, *p<0.1

Null-hypothesis H0b: The impact of seasoned equity offerings on stock price movements is invariant to the issuing bank's creditworthiness.

In addition to our analysis, we relate the observed average CARs to cross-sectional country and institution variables, in order to find the determinants of the observed negative stock price movements detected in the event study. We observe that the *high yield dummy* is negative for the whole sample and that the coefficients are large in magnitude and significant during the second period, i.e. during the European sovereign debt crisis.[25] Our results suggest that the general negative effect of a SEO announcement on stock prices is even larger in magnitude for institutions rated speculative grade over the analysed period. This shows that market participants did not perceive SEO announcements by distressed banks as a positive signal, at least with regards to equity capital. One possible reason for this is that an equity issuance in turbulent times is perceived by the market as a signal of distress, as institutions find themselves forced to raise more capital in unfavourable market conditions. With regards to equity, our findings provide evidence against *hypothesis H0b,* and show that *SEOs from banks with a low credit rating are significantly correlated to more negative stock market reactions,* likely due to debt overhang related issues.

In fact, the distinction between investment and speculative grade firms depends on credit ratings, which assess the probability of default on debt. As argued earlier, in case of severe financial distress, as it is the case for sub-investment grade banks, a capital injection mainly increases the probability of debt repayment, creating value for the debtholders, who gain most of the upside from the SEO. In such a scenario, debt markets would receive a SEO announcement as positive news, while stock market participants would be willing to invest only at a discount. Our observed results are consistent with Admati et al. (2012) arguments and Eberhart and Siddique's (2002) documented wealth transfer from incumbent shareholders to debtholders.

We then observe that SEOs motivated by *mergers or acquisitions* have a negative effect on stock prices around SEO announcements during the first period, while positive in the second. However the coefficients have a very low significance level, and are small in magnitude. Our results suggest that with regards to our sample there is no significant difference in average CARs across equity offerings motivated by M&A opportunities and SEOs whose purpose is raising new capital to strengthen the balance sheet, different from what Cornett et al. (1998) documented for the US market.

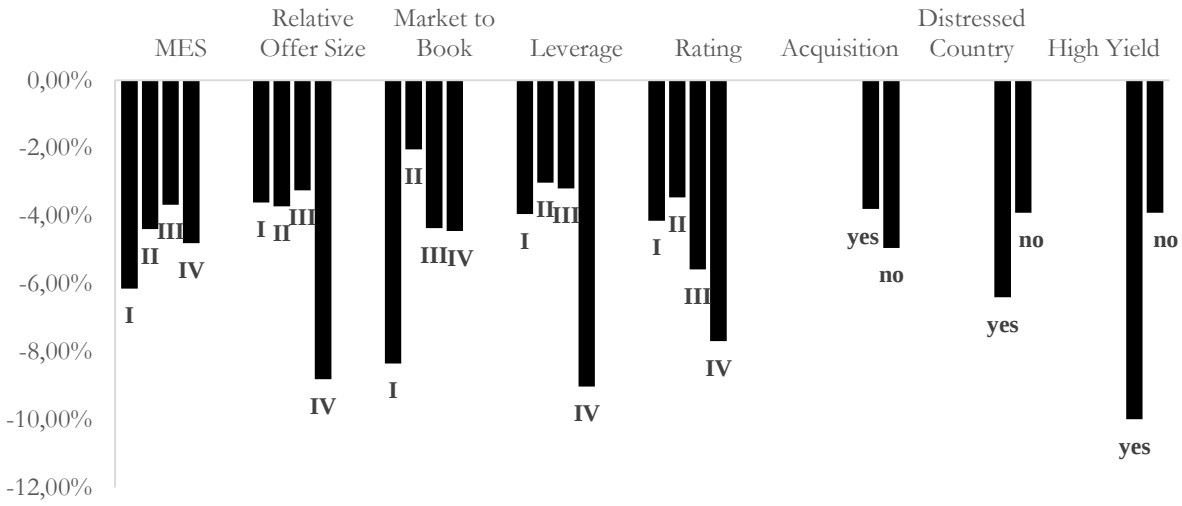
[25] All the nine SEO announcements by speculative grade institutions in our sample take place during the period 2010-2013

Relative issuance size has a negative coefficient, consistently with literature; to the extent that an SEO announcement is received as negative news by the market, due to negative signalling and shareholder dilution, the larger the secondary equity issuance in percentage of market capitalization, the more negative the stock market reaction.

In addition to the OLS regression, we run a simple analysis of the impact of the control variables on the cumulative abnormal returns on the stock market around SEO announcements, over a three-day event window. The control variables are grouped into quartiles, and the average cumulative abnormal stock return is calculated for each of them. This analysis provides a graphical confirmation for the results shown by the multivariate OLS regression, over the whole 2007-2013 sample, and shows that the magnitude of the negative stock market reaction increases steadily with lower ratings. In addition, excessive levels of leverage are associated with the strongest negative stock market reaction.

Figure 9 – Bivariate Analysis of CARs on Control Variables

Figure 9 provides a graphical confirmation for the results shown by the OLS regression, over the whole 2007-2013 sample. The control variables are grouped into quartiles, and the average cumulative abnormal stock return is calculated for each of them. Higher rating percentiles are associated with lower credit quality.



7.1.3 Robustness

In our study we use the *European 600 Banks* stock index in the calculation of abnormal returns. To check for robustness, we repeat our analysis using the *Stoxx Europe 600* general market index. Over the whole sample we detect a similar average CAR of -4.25%; in the periods 2007-2009 and 2010-2013 the average CARs are respectively -3.13% and -5.51%. The average CAR for SEOs in distressed countries amounts to -5.92% while it is -3.37% in non-distressed sovereigns. Consistent with our previous finding the Welch's t-test displays limited statistical significance for the differences between subsamples, with p-values of -10.5% and -10.4% across country-split and period-split respectively.

Table 7 – Summary of Average CARs - General Market Index

Cumulative abnormal returns are computed as the sum of the abnormal returns over a symmetrical three-day event window for each security, and then mean CARs are considered over cross-sections of securities. 64 SEOs by 37 European commercial banks are considered in this study. Event dates have been extracted from SDC Platinum. The minimum size considered is USD 25mn. Secondary offerings, private placements and public bailouts have been excluded. The index used in the analysis is the Stoxx Europe 600 general market index. Stock returns and the market index have been extracted from Datastream. A SEO occurred in a country in distress if the issuing firm's country Fitch rating was below AA+ at the time of the announcement. Standard errors are robust and clustered at firm level.

	CAR (-1/+1)	standard e	t-statistic	p-value	obs
Full sample	**-4.25%**	0.0098	-4.31	0.000	64
Period 1 (2007-2009)	**-3.13%**	0.0139	-2.25	0.033	34
Period 2 (2010-2013)	**-5.51%**	0.0143	-3.85	0.001	30
Distressed Country	**-5.92%**	0.0168	-3.52	0.003	22
Non-Distressed Country	**-3.37%**	0.0115	-2.91	0.007	42

To assess how quickly stock prices react to the announcements, we repeat our analysis with extended event windows and also use an asymmetrical event window to check for anticipation effects in the market. We observe that the average abnormal returns decrease over larger event windows. This suggests that SEO announcements are considered price-relevant information and are incorporated quickly into stock returns.[26] The magnitude of the average abnormal returns for the asymmetrical event window however shows a possible anticipation effect in the market, since stocks registered an abnormal decline of -0.41% over the whole period if compared to the price movements predicted by the market index, and the effect is larger during the second period. However this can be due to the general distressed situation in the European markets over the period of our analysis; many institutions may have been subject to negative price shocks in proximity of SEO announcements which may have forced them to raise new equity capital in unfavourable market conditions, due to serious financial distress.

Furthermore, with a symmetrical three-day event window we identify six cases of overlapping event periods, and this might pose some clustering issues, as argued by Campbell, Lo and MacKinlay (1997), as the aggregation of abnormal returns over time and cross-section requires independence of residuals. Therefore in this section we also use a one-day window, which exclusively considers the event day $\tau=0$ and limits the cases of event overlap to one date, to verify to which extent the significance of our results is affected by clustering issues. Our results do not appear to be affected by correlation between abnormal returns across firms and time; over the whole sample we detect a -2.99% $\overline{CAR}$, and the $\overline{CAR}$s for the international financial crisis and the European sovereign crisis periods are -2.73% and -3.30%, respectively.

[26] Here the CARs are computed as average abnormal returns over the event window, in line with Marinova et al. (2014)

The results are significant at least at 5%, with both the standard t-test and the non-parametric sign test. We can conclude that the significance of our results is not likely to be overestimated due to calendar clustering issues.

Table 8 – Average Abnormal Returns over Different Event Windows

Table 8 displays the results of our robustness analysis. CARs are computed as the average abnormal returns over different event windows and then mean CARs are considered over cross-sections of securities. 64 SEOs by 37 European commercial banks are considered in this study. Event dates have been extracted from SDC Platinum. The minimum size considered is USD 25mn. Secondary offerings, private placements and public bailouts have been excluded. The table shows the results over the whole sample and over the two periods analysed.

	Mean Abnormal Stock Return		
	2007-2013	2007-2009	2010-2013
	(1)	(2)	(3)
three-day event (-1/+1)	-1.59%***	-1.26%***	-1.96%***
five-day event (-2/+2)	-1.01%***	-0.75%**	-1.29%***
eleven-day event (-5/+5)	-0.30%**	-0.27%	-0.34%
twelve-day event (-10/+1)	-0.41%***	-0.31%*	-0.53%*

***p<0.01, **p<0.05, *p<0.1

7.1.4 Comments

With regards to equity we observe a large and significant fall in stock prices for commercial banks around SEO announcement. This effect is larger over the second part of our sample, during the period 2010-2013, and in distressed countries, but the differences between subsamples display limited significance. Our results are substantially larger in magnitude than Cornett et al.'s (2014) findings for SEO announcements by US financial companies, where an average CAR of -2.02% is detected over the period 2008-2013, significant only at 10%. Cornett et al. (2014) argue that the TARP CPP program, which consisted of equity injections from the US government into the financial sector, might have had a major role in influencing the detected average CAR. As discussed in Section 2, the TARP CPP program provided banks and financial institutions with an additional low cost capital buffer against losses, and had a fundamental certification effect since it was only available to financially sound institutions that were facing temporary liquidity problems. Moreover, the TARP and other measures implemented against the financial crisis enabled US financial institutions to restructure their balance sheets and improve their capital ratios and were eventually successful in re-establishing a sound financial system. Marinova et al. (2014) observe that over the years 2007-2013 US banks were on average better capitalized than European ones; this capital shortage, in connection to the debt overhang effect discussed in Section 3, surely had a role in determining the more negative price reaction detected in Europe.

Moreover, Cornett et al. (2014) suggest that during the crisis the US financial firms that were facing higher risks, i.e. speculative grade rated, did not see their market value drop significantly around SEO announcement dates. This goes against our findings for Europe. We argue that this difference in stock price reactions may in fact be due to the absence of a systematic public program for capital injections into distressed banks on a European level. Different European governments adopted different measures against the crisis, and a large fraction of the banks in our sample are incorporated into countries that faced acute distress in the period we analysed, potentially hindering their ability to fully support distressed banks. A detailed list of the support measures received by the banks in our sample is provided in Table 12 in the Appendix.

Cornett et al. (2014) repeat their analysis over a sample of non-financial institutions in the same time period, and observe that the crisis period - 2008-2013, according to their definition - average CAR is significantly larger than the pre-crisis one, and the magnitude is more similar to what we find in our analysis for commercial banks. This finding supports our argument, since non-financial institutions in the US were not included in any public capital injection scheme, and were therefore left more exposed to distress and default risk.

7.2 Reactions in the CDS market

7.1.1 Cumulative Abnormal CDS Spread

Null-hypothesis H0d: Seasoned equity offerings have no impact on CDS spreads.

On an aggregated basis, there does not seem to be a similar drop in CDS spread following the announcement of SEOs for European commercial banks during the period from 2007 to 2013. Across the whole sample we find a non-significant average drop of -2.89 bps, using a symmetrical five day event window.[27] Therefore we cannot reject null-hypothesis *H0d.* Our results show that during the crisis equity issuances did not lower the risk profile of European banks on an aggregated basis.

[27] We consider a five day event window as the optimal event window for our analysis, because the CDS contracts are not as frequently traded as equity. By using a three-day event our results lose magnitude and significance, and that is largely due to some cases of missing daily changes in CDS spread over the event window for a few firms in our sample.

Table 9 – Summary of Average Cumulative Abnormal CDS Spreads

Cumulative abnormal spreads are computed as the sum of the abnormal spreads over a symmetrical five-day event window for each security, and then mean CASs are considered over cross-sections of securities. 64 SEOs by 37 European commercial banks are considered in this study. Event dates have been extracted from SDC Platinum. The minimum size considered is USD 25mn. The index used in the analysis is the DS Europe Banks 5 Year Credit Default Swap Index. CDS spreads and the market index have been extracted from Datastream. CDS spreads changes are calculated in basis points. Standard errors are robust and clustered at bank level.

	CAS (-2/+2)	std error	t-statistic	p-value	obs
Full sample	**-2.89 bps**	3.347	-0.86	0.394	64
Period 1 (2007-2009)	**.059 bps**	3.117	0.02	0.985	34
Period 2 (2010-2013)	**-6.23 bps**	5.288	-1.18	0.253	30
Distressed Country	**-5.97 bps**	6.658	-0.90	0.385	22
Non-Distressed Country	**-1.28 bps**	3.080	-0.42	0.681	42

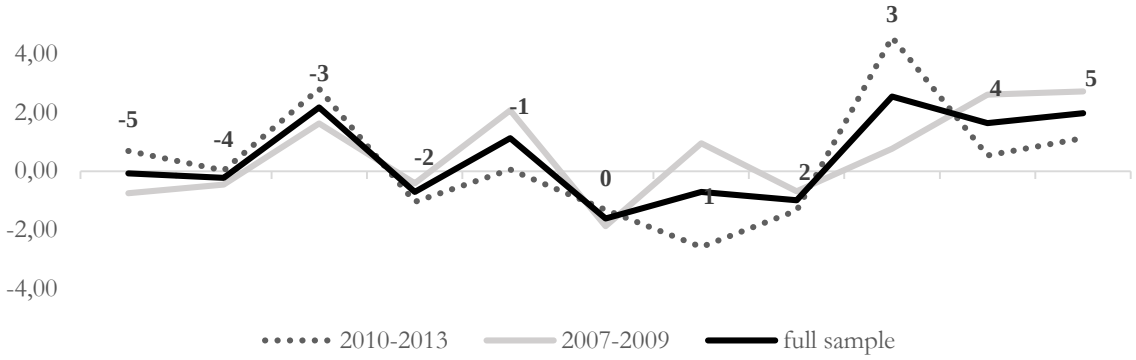
Null-hypothesis H0f: The impact of seasoned equity offerings on CDS spread movements is invariant to the period considered and the credit quality of the issuing bank's home country.

Splitting the sample into two periods reveals that the average price drop of default insurance was -6.23 bps during the European sovereign debt crisis, much larger in absolute terms than for the period 2007-2009 when the average CAS was 0.59 bps; however, neither of them appears to be statistically significant. Therefore, for neither of the two periods we can reject the null hypothesis that the average cumulative abnormal spread is different from zero. Similarly, splitting the sample depending on the creditworthiness of the sovereign countries shows with -5.97 bps a larger decrease in CDS spread in distressed countries compared to the smaller -1.28 bps drop in non-distressed countries, but neither of them is statistically significant. Overall, we cannot safely reject hypothesis *H0f*. In fact, we find that *the effects differ across the two periods and across distressed and non-distressed countries, but none of them is statistically different from zero.*

Our findings differ substantially from Cornett et al.'s (2014), who instead find average CASs of -16.15 bps and -18.84 bps (depending on the date identified as the start of the crisis) for the period 2008-2013 in the US, both highly significant.

Figure 10 – Average Abnormal CDS Spreads around the Event Date

Figure 10 shows the average abnormal CDS spreads across all the events in our sample, in a window of eleven days around the event. Day zero is when the SEO announcement occurred. The Figure also displays the different average abnormal CDS spread across the two periods in our sample. CDS spreads are computed in basis points.



By splitting the sample across rating categories we observe that equity offerings from speculative grade firms tend to lead to higher decreases in CDS spreads, with an average drop of -23.52 bps. However, our result displays limited statistical significance. When repeating our analysis with daily percentage CDS spread changes instead of the absolute change in basis points, we detect an analogous CDS spread drop for sub-investment grade firms of -4.53%**,** this time significant at 5%[28]. We can conclude that over our sample equity offerings by speculative grade banks had a positive impact on their cost of default insurance. Given that all of the sub-investment grade offerings in our sample were announced during the European sovereign debt crisis, this is the most likely explanation for the detected difference between the two subsamples mentioned above.

[28] Given the limited number of SEOs by speculative grade banks in our sample, we recalculate the standard error of the average CAR across Low Quality firms with the bootstrap method. With 100 replications we find a standard error of 1.7% and therefore we can confirm the significance of our result.

Table 10 –Average Cumulative Abnormal CDS Spreads by Credit Rating

Table 10 displays the average CAS distribution across different credit ratings of issuing institutions at the time of the announcement. S&P credit ratings have been extracted from Bloomberg. CASs are calculated as the sum of abnormal spreads over a symmetrical five day window for each security. The table displays both average CASs calculated as basis points and percentage changes. The Low Credit quality category coincides with the sub-investment grade definition provided by S&P.

CASs by Credit Rating over the Full Crisis Period (2007-2013)

Credit Rating	CAS (in bps)	CAS (relative change)	Count
AA	16.26	0.1493	3
AA-	-4.29	-0.0129	14
A+	-12.13	-0.0953*	5
High Quality	**-3.27**	**-0.0095**	**22**
A	-0.10	-0.0015	19
A-	6.71	-0.0118	8
BBB	-1.60	0.0057	1
BBB-	18.71	0.0368	2
Medium Quality	**2.82**	**-0.0015**	**30**
BB	-26.81	-0.0804	3
BB-	8.84	-0.0016	2
B+	-94.84	-0.1079	1
B	-89.09	-0.0818	1
CCC	17.51	0.0128	2
Low Quality	**-23.52**	**-0.0453****	**9**

***p<0.01, **p<0.05, *p<0.1

7.2.2 Cross Sectional Analysis

By analyzing cross-sectional country and institutional variables, we can confirm that there are significant common factors explaining the variations in CDS reaction to SEO announcements. Table 11 reports the results for the multivariate OLS regression where CDS spread changes are measured in basis points. We verified that using daily percentage CDS spread changes does not influence the outcome of our analysis, as the coefficients show the same signs and similar significance levels. Results are displayed in Tables 20, 21 and 22 in the Appendix.

Table 11 – OLS regression of CASs on Firm and Issue Characteristics

Table 11 displays the results of our cross-sectional analysis, in support of our analysis of hypothesis H0e. CASs are calculated as the sum of the abnormal spreads for each security over a symmetrical five-day event window around SEO announcement. The sample includes all the SEOs carried out by European commercial banks over the period 2007-2013. The minimum size considered is USD 25mn. Secondary offerings, private placements and public bailouts have been excluded. We control by country and year by means of the two dummy variables Crisis and Distressed Countries. Crisis takes the value of one in the period 2007-2009 and Distressed Country takes the value of one for countries whose Fitch rating was below AA+ at the time of the event. Robust standard errors clustered at firm level are displayed in parenthesis

	Cumulative Abnormal Spread								
	2007-2013			2007-2009			2010-2013		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent Variable: CAS (-2/+2)									
Constant	.48	**-33.82***	-15.78	.059	-11.30	-33.92	1.17	**-76.27****	**-384.19*****
	(2.58)	(17.89)	(50.55)	(3.12)	(18.07)	(44.52)	(3.10)	(27.94)	(143.71)
High yield dummy	**-24.00****	**-30.65****	**-26.06***	*omitted*	*omitted*	*omitted*	**-24.69****	**-30.97***	**-26.56***
	(11.67)	(12.54)	(14.03)	*omitted*	*omitted*	*omitted*	(11.75)	(14.99)	(13.6)
Acquisition Purpose		9.83	8.35		-.380	-3.52		**27.00****	**63.85****
		(11.00)	(12.19)		(12.24)	(13.30)		(10.27)	(27.27)
MES		**6.60***	**6.64***		2.42	2.88		**16.02*****	**17.42*****
		(3.35)	(3.63)		(4.14)	(4.94)		(5.57)	(6.03)
Distressed country		14.44	11.6		2.69	.110		19.07	30.27
		(10.41)	(12.7)		(12.82)	(14.68)		(13.36)	(21.39)
Crisis (2007-2009)		1.17	6.22			*omitted*			*omitted*
		(6.02)	(5.86)			*omitted*			*omitted*
Relative issuance size			**-.69***			-.800			**-72.88*****
			(.39)			(.64)			(23.53)
Market to Book			**-13.84****			-.12			**-22.81*****
			(6.21)			(14.65)			(2.88)
Leverage			-.099			.285			**3.54****
			(.45)			(.458)			(1.52)
Volatility			-.054			-.022			**4.60***
			(.06)			(.084)			(2.47)
Market Cap			.000			-.0001			**-.0005***
			(.000)			.0001			(.0003)
Observations	64	61	61	34	31	31	30	30	30
R-squared	0.10	0.21	0.32	0	0.04	0.11	0.12	0.38	0.68

***p<0.01, **p<0.05, *p<0.1

Null-hypothesis H0e: The impact of seasoned equity offerings on CDS spread movements is invariant to the issuing bank's creditworthiness

We can provide evidence against hypothesis *H0e*, as our results show that SEOs by banks with lower credit rating are significantly correlated to a larger drop in CDS spread, reflecting a perceived reduction in default probability on debt, as discussed above. The dummy *high yield* has negative, large in magnitude, coefficients in the multivariate OLS regression, significant at least the 10%-level. Cornett at al. (2014) find similar results for US financial firms over the period preceding 2008. For the period after announcement of the TARP program, they find insignificant coefficients, indicating that the risk profile of the issuing financial firm loses relevance for US financial firms with regards to explaining CDS spread changes during the crisis

(2008-2013). The authors suggest that due to prevalence of capital injections from the government, capital increases by banks with a high risk profile did not provide the same degree of default relevant information as they did before 2008, as the TARP capital was junior to debt and provided an important capital buffer to creditors. We document a larger and more significant effect of the risk of the issuing firm on CDS spread movements over the years 2007-2013. That could be once again due to the difference between the European and US public intervention schemes, as discussed above, especially considering the extent to which public intervention provided certification for the targeted firms. Overall, even though we cannot reject hypothesis *H0d* as we do not identify any general significant drop in CDS spread of commercial banks around SEO announcements in the period of our analysis, we can reject hypothesis *H0e,* as *SEOs by banks with lower credit rating are significantly correlated to larger drops in CDS spreads.*

From the OLS multivariate regression we also observe that for our sample the magnitude of the CDS spread drop increases with *offer size*. The effect is significant at the 5% level over the whole sample and is present over both periods, even though not statistically significant in the years 2007-2009. The effect is more profound during the European sovereign debt crisis. De Bruyckere et al. (2013) documents a strong correlation between country and bank CDS spreads during the European crisis, but the effect decreases significantly with higher Tier 1 capital ratios for the individual banks. Based on their findings it can be argued that larger equity issuances from individual banks, aimed at increasing the Tier 1 capital level, are likely to loosen the link between a single institution's and its home country's default risks. This must be seen as a positive signal by creditors, especially if the SEO is announced by a firm incorporated in a distressed country. We argue that this can be one explanation for the large difference in magnitude and significance of coefficients for the variable *relative offer size* across the two periods we analyzed. Over the two subsamples, the relative size of the SEO appears to be much more relevant for reducing CDS spreads during the European debt crisis.

The dummy *acquisition purpose* displays significant coefficients only during the European debt crisis, and they appear positive and large in magnitude. This suggests that over the years 2010-2013 SEOs motivated by a merger or an acquisition have been on average associated to a less pronounced decrease in default risk by the market. This confirms the idea that acquisition or growth related SEOs should lead to a lower decrease in CDS spread compared to SEOs aimed at improving the Tier 1 capital ratio and also provides additional evidence for De Bruyckere et al.'s (2013) argument that the contagion effect between sovereigns and banks is less profound for better capitalized banks. As discussed above, debtholders react more positively to news of a SEO if the purpose is to improve a bank's capital ratio. However, this

seems to be valid only during the European debt crisis period, while the coefficients for the years 2007-2009 are not statistically different from zero.

The variable *marginal expected shortfall* has positive and significant coefficients over the whole sample, but not in the years 2007-2009. The impact of *MES* on the average CAS increases in magnitude and significance over the European sovereign debt crisis, and the results suggest that higher exposure to the financial system was associated with increases (or smaller decreases) in CDS spread around SEO announcements. This is not surprising, given the documented high spill overs between sovereigns and banks in Europe over the period of our analysis. The markets did not receive SEO announcements as positive news with regards to credit risk for highly exposed banks, and this is consistent with Alexopoulou et al. (2009), who observes that CDS spread movements became less sensitive to firm-specific factors over the European crisis, due to the raising importance of common, systematic factors. As the *MES* is a proxy for the exposure to these systematic factors, in fact positive and significant coefficients can be expected.

7.2.3 Comments

There are several reasons that could explain the differences in findings between the US and Europe. First, Cornett et al. (2014) only find significant changes in CDS spreads for financial firms after the TARP support program was introduced, i.e. from 2008. Contrary to the US, there were no coordinated support programs of similar size in Europe. While the ECB adopted substantial liquidity support measures, the bailout and guarantee programs were on a country by country basis and included ad hoc measures, with many European banks that were in fact 'too big to save'. Furthermore, contrary to the TARP program in the US that was specifically targeted to healthy institutions, European public help schemes did not always have the same certification effect for the targeted banks, as the credibility of the explicit and implicit guarantees and their application criteria depended on the financial position of the sovereign countries. Supporting this argument, De Bruyckere et al. (2013) found considerable spill overs between sovereign and domestic banks CDS spreads in Europe, finding a correlation from 85 % to up to 100 % for banks in distressed European countries in 2009. This might partially explain the limited significance of our results on an aggregated basis if compared to the US and suggests that sovereign country risk may play an important role in explaining movements in CDS spreads for the banking sector over the crisis period, given the documented interactions between countries' and banks' balance sheets and the increasing importance of systemic factors in determining CDS spread movements.

7.3 Limitations of Results

Our study aims to provide an assessment of the short-term costs associated with raising equity via SEOs for European banks. Our results approximate the long run impact on banks' cost of capital only if the assumption of market efficiency holds, i.e. if price relevant information is quickly incorporated into prices and asset price movements accurately reflect future performance.

Furthermore, banks in our sample are heterogeneous, both with regards to access to country specific support measures and risk exposure. Therefore, some variation in market reactions can be expected between different countries, even within the categories we considered, e.g. within distressed countries. While the equity market reaction shows a very clear picture, CDS spreads tend to be influenced by external factors as described in Section 2.5. A limitation of analyzing CDS spreads is that the contracts are less frequently traded than equity which may also impact the significance of our results. However, as argued in Section 3, CDS spreads represent a good proxy for cost of debt, especially in short-horizon studies, as they are more liquid than the underlying bonds and lead the bond market in incorporating new price relevant information. In addition, given the volatile conditions during the crisis, conducting a long-horizon event study with regards to assessing the impact of SEOs would likely present major shortcomings.

Lastly, our sample might suffer from selection bias, as we had to dismiss announcements by banks for which no actively traded CDS data was available. That primarily tends to be the case for smaller banks that are less integrated into global financial markets and hence less systemic. Therefore it is questionable if our results are valid for minor banks. It can be argued that smaller banks are less likely to be bailed out in case of crisis and hence their individual capital base is more relevant for assessing their default probability.

8. Concluding Remarks

Over the crisis period 2007-2013 recapitalizations via SEOs by European banks appeared to be costly. With regards to equity, we observe large negative stock price reactions around SEO announcements. The effect appears to be larger in distressed countries and, to some extent, over the European sovereign debt crisis, i.e. in the years 2010-2013. In addition, SEOs by speculative grade banks, which in our sample exclusively occurred during the sovereign debt crisis, are related to stronger negative stock market reactions.

Regarding credit risk, we do not see any significant decrease in CDS spreads around SEO announcements, indicating that the perceived default risk does not decrease, despite the increased capital buffer. We observe the predicted reduction in CDS spreads only for sub-investment grade banks, whose equity offerings lead to a noticeable reduction in their perceived credit default risk. Overall, SEOs by distressed banks lead to larger drops in stock prices but are also associated with the highest reduction in CDS spreads, providing evidence for the debt overhang theory described by Admati et al. (2012), which implies that SEOs by highly leveraged banks lead to a wealth transfer from incumbent shareholders to debtholders.

Compared to Cornett et al.'s (2014) previous study assessing the effect of SEO announcements of US financial firms during the crisis, we find a substantially larger, negative stock market reaction and the absence of any significant reduction in CDS spreads, indicating that over the period 2007-2013 it was substantially more costly for European banks to issue new equity. We attribute this to the more favourable terms of the support measures in the US, compared to Europe. Overall it can be argued that the liquidity measures implemented by the ECB and by other national authorities in Europe have been successful in containing the first part of the crisis. However, once the crisis evolved into a sovereign debt crisis, with banks' destinies becoming increasingly interconnected to their respective home countries, the ECB in particular did not have the instruments to prevent a spreading of the sovereign crisis into the financial sector, especially with regards to peripheral countries. Banks were indeed "European in life but national in death".[29] Given that many of the banks were comparable in size to the GDP of their home countries, weaker governments did not have the resources to guarantee the banks' liabilities or bailout the most distressed financial firms. It appears that not enough measures were taken to start a deleveraging process in the European banking sector, compared with the large scale programs in the US. To sum up, in light of the results for US financial firms by Cornett et al. (2014), our results suggest that the measure adopted by the US authorities to contain the financial crisis have been more successful than the European ones at re-establishing the health of the financial system. As a consequence, the recapitalization process over the crisis

[29] Quote from European Commission Memo, April 2014.

period appeared to be more costly for European banks compared to their US peers. Following the reasoning that funding costs of banks directly impact their ability to provide loans to the private sector, it can be argued that Europe could have benefitted from a more coordinated effort to recapitalize their banking sector.

In this thesis, we contribute to the research assessing the impact of stricter capital regulation on the banking sector by providing empirical evidence on the impact of European banks' SEOs during the crisis period. In addition to finding a strong negative stock market reaction, we find no significant average drops in CDS spreads, and provide evidence in favor of the results of earlier studies indicating that European banks' CDS spread movements were highly correlated to common, systemic factors during the crisis period.

For further research, we believe an analysis of the long-term impact of recapitalizations through SEOs on lending behavior by banks and their long-term performance could provide valuable insights to regulators and market participants.

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Appendix: Additional Tables

Table 12 – Government Bailouts for European Banks included in Sample

Table 12 displays a list of direct capital injections from European governments into banks in our sample. None of the listed dates appears in our sample of SEO announcements. Information has been extracted from http://ec.europa.eu/competition/antitrust/cases/#, King (2009), Petrovic and Tutsch (2009), Natixis special report no 145, Nov 2008, Bloomberg, Thomson Reuters and the European Commission's Press Release Database.

Country	Company	Public recapitalization
Austria	Erste Group Bank AG	March 2009 - € 1bn in Tier 1 capital.
Belgium	Fortis SA/NV	September 2008 – USD 16bn capital injection from the Dutch, Belgian and Luxembourg governments, representing 49% of capital.
France	Credit Agricole SA	October 2008 - €3bn in subordinated securities.
France	Natixis SA	October 2008 - Casse D'Eparagne and Banque Populaire receive €1.9bn in subordinated securities - Natixis is a listed subsidiary of the two.
France	Societe Generale SA	October 2008 - €1.7bn in subordinated securities.
Germany	Commerzbank AG	December 2008 - German government buys € 8.2 bn of preferred shares in Commerzbank.
Germany	Commerzbank AG	January 2009 - German government buys another € 10bn of preferred shares in Commerzbank.
Greece	Alpha Bank AE	May 2012 - €1.9bn in Tier1 capital.
Greece	Eurobank Ergasias SA	May 2012 - €4bn in Tier1 capital.
Ireland	Bank of Ireland PLC	March 2009 - €3.5bn injected by the government.
Italy	Monte dei Paschi di Siena	2009 - €1.9bn state loans.
Italy	Monte dei Paschi di Siena	January 2013 - €3.9bn loans from government.
Italy	Banco Popolare SC	October 2009 - €1.5bn in convertible bonds.
Portugal	Banco Comercial Portugues SA	July 2012 - €3bn in convertible bonds.
Spain	Banco de Sabadell SA	December 2011 - Government capital injection of €5.2bn Tier1 into CAM, then sold to Sabadell for 1€.
Switzerland	UBS AG	October 2008 - Swiss bank recapitalization and asset purchase plan. UBS transfers USD 31bn of illiquid assets and receives CHF 6bn in equity.
UK	Royal Bank of Scotland Group	13 October 2008 - package of financial support measures, £ 20bn in preference shares.
UK	Royal Bank of Scotland Group	19 January 2009 - participation in Asset Protection Scheme and recapitalization of the group by the state. £5bn preference shares converted into common stock.
UK	HBOS PLC	October 2008 - £11bn Tier1 capital.
UK	Lloyds TSB Group PLC	October 2008 - £ 5.5bn Tier1 capital.

Table 13 – Government Support Schemes for European Banks

Table 13 displays a list of banking sector support schemes from European governments for countries in our sample. All amounts are in €bn and the approved amount represents the maximum capacity of the program. The actual subscription rate was usually much lower, given that the pricing was sometimes expansive and the provisions attached were strict. The Date of approval refers to the approval of the European Commission which usually trails the announcement date. The information has been collected from a CEPS Taskforce report on bank state aid (October 2010), Panetta et al. (2009) and the European Commission's Press Release Database.

Date of Approval	Country	Measure	Amount	Description
13 Oct 2008	UK	Debt guarantee Capital injection	286 57	Comprehensive plan targeted at UK financial institutions.
13 Oct 2008	Ireland	Debt guarantee	N/A	Covering existing and new facilities issued by banks with systemic relevance for the Irish economy.
27 Oct 2008	Germany	Debt guarantee Capital injection, asset purchase.	400 80	Targeted at financial institutions, entailed strict capital requirements and restrictions on compensation of upper management.
30 Oct 2008	Sweden	Debt guarantee	140	Covered new issuances of short and medium term non-subordinated loans.
30 Oct 2008	Portugal	Debt guarantee	20	State guarantees available to all banks incorporated in Portugal, available for financing agreements and issuance of short and medium term debt.
31 Oct 2008	France	Debt guarantee Capital injection	360 40	Available to all French financial institutions; entailed strict caps on executive compensation.
4 Nov 2008	Spain	Debt guarantee	100	Government was only purchase AAA rated bonds; AA bonds were allowed for Repo transactions.
		Asset purchase	50	Acquisition of sound assets from banks
5 Nov 2008	Switzerland[1]	Debt guarantee	N/A	Announcements of guarantee on bank liabilities.
14 Nov 2008	Italy	Debt guarantee	N/A	Government provided guarantee aimed at solvent banks, for the purpose of issuing new liabilities with maturities between 3-month to 5-years.
19 Nov 2008	Greece	Debt guarantee, capital injection	N/A	Purchase of preference shares combined with a guarantee scheme for debt.
20 Nov 2008	Belgium	Debt guarantee	N/A	Available to any financial institution that faces liquidity or insolvency problems, Ministry of Finance determines conditions of guarantees.
08 Dec 2008	France	Capital injection	21	Approval of French capital injection scheme.
10 Dec 2008	Austria	Debt guarantee Capital injection	75 15	Available to credit and insurance institutions, conditional on dividend restrictions.
23 Dec 2008	Italy	Capital injection	20	Scheme to inject capital into sound banks via subordinated debt instruments.

03 Feb 2009	Denmark	Capital injection	13.5	Introduction of recap scheme; expansion of existing guarantee scheme.
24 Mar 2009	UK	Debt guarantee	10	Working Capital Guarantee Scheme to be offered to banks in exchange for business loans.
21 Apr 2009	UK	Asset guarantee	55	Possibility to insure portfolios of illiquid assets with a government provided backstop insurance.
13 May 2009	Germany	Asset guarantee	200	Banks can transfer toxic assets into a SPV in exchange for government-guaranteed bonds.
20 May 2009	Portugal	Capital injection	4	Recap scheme for banks.
28 Jan 2010	Spain	Capital injection	N/A	Recapitalization scheme.
11 Feb 2010	Sweden	Capital injection	4.7	Scheme to recapitalize banks.
26 Feb 2010	Ireland	Asset guarantee	N/A	Irish impaired asset relief scheme.
10 Oct 2010	Denmark	Debt guarantee	N/A	Guarantee scheme limited to fundamentally sound financial institutions.
20 Jul 2012	Spain	Capital injection	100	Capital injection scheme financed by loan from other EU countries.

[1] Approval Date by Swiss parliament.

Table 14 – Correlation Matrix

Table 14 shows the correlations between the independent variables used in the OLS cross sectional analysis

	High yield	Acquisition purpose	MES	Distressed country	Relative offer size	Market to book	Leverage	Volatility	Market Cap
High yield	1.00								
Acquisitio purpose	-0.04	1.00							
MES	-0.12	-0.25	1.00						
Distressed country	0.57	-0.20	-0.22	1.00					
Relative offer size	-0.05	-0.08	0.30	-0.10	1.00				
Market to book	-0.01	0.11	-0.16	-0.18	0.01	1.00			
Leverage	0.12	0.01	0.07	0.25	0.25	-0.32	1.00		
Volatility	-0.17	-0.11	0.32	-0.29	0.17	0.04	-0.32	1.00	
Market Cap	-0.37	0.14	-0.12	-0.50	-0.19	0.20	-0.48	0.21	1.00

Table 15 – Non-Parametric Sign Test Results for CARs

In our analysis we include non-parametric tests as a robustness check, in addition to the standard t-test, as outlined by Campbell et al. (1997).We use the non-parametric *sign test* described by Campbell, Lo and MacKinley (1997) to assess the significance of the cumulative abnormal returns. The sign test tests the null hypothesis that the distribution of a variable has median zero and no further assumptions about the distribution are made. The test relies on the fact that under the null hypothesis it is equally likely that the CAR will be positive or negative. The p-values show that all the results are significant at the 1% level. Cumulative abnormal returns are computed as the sum of the abnormal returns over a symmetrical three-day event window for each security, and then mean CARs are considered over cross-sections of securities. 64 SEOs by 37 European commercial banks are considered in this study. The minimum size considered is USD 25mn. Secondary offerings, private placements and public bailouts have been excluded. The index used in the analysis is the European 600 Banks stock index. Stock returns and the market index have been extracted from Datastream. A SEO occurred in a country in distress if the issuing firm's country Fitch rating was below AA+ at the time of the announcement

Sign test - Full sample

sign	observed	expected
positive	13	32
negative	**51**	32
zero	0	0
all	64	64

One-sided tests:

Ho: median of cumulative_abnormal return - 0 = 0 vs.
Ha: median of cumulative_abnormal_return - 0 > 0
Pr(#positive >= 13) = Binomial(n = 64, x >= 13, p = 0.5) = 1.0000

Ho: median of cumulative_abnormal_return - 0 = 0 vs.
Ha: median of cumulative_abnormal_return - 0 < 0
Pr(#negative >= 51) = Binomial(n = 64, x >= 51, p = 0.5) = **0.0000**

Two-sided test:

Ho: median of cumulative_abnormal_return - 0 = 0 vs.
Ha: median of cumulative_abnormal_return - 0 != 0
Pr(#positive >= 51 or #negative >= 51) =
min(1, 2*Binomial(n = 64, x >= 51, p = 0.5))=**0.0000**

Sign test - Period 1 (2007 - 2009)

sign	observed	expected
positive	8	17
negative	**26**	17
zero	0	0
all	34	34

One-sided tests:

Ho: median of cumulative_abnormal_return - 0 = 0 vs.
Ha: median of cumulative_abnormal_return - 0 > 0
Pr(#positive >= 8) = Binomial(n = 34, x >= 8, p = 0.5) = 0.9996

Ho: median of cumulati~n - 0 = 0 vs.
Ha: median of cumulati~n - 0 < 0
Pr(#negative >= 26) = Binomial(n = 34, x >= 26, p = 0.5) = 0.0015

Two-sided test:

Ho: median of cumulative_abnormal_return - 0 = 0 vs.
Ha: median of cumulative_abnormal_return - 0 != 0
Pr(#positive >= 26 or #negative >= 26) =
min(1, 2*Binomial(n = 34, x >= 26, p = 0.5)) = **0.0029**

Sign test - Period 2 (2010 - 2013)

sign	observed	expected
positive	5	15
negative	**25**	15
zero	0	0
all	30	30

One-sided tests:

Ho: median of cumulative_abnormal_return - 0 = 0 vs.
Ha: median of cumulative_abnormal_return - 0 > 0
Pr(#positive >= 5) = Binomial(n = 30, x >= 5, p = 0.5) = 1.0000

Ho: median of cumulative_abnormal_return - 0 = 0 vs.
Ha: median of cumulative_abnormal_return - 0 < 0
Pr(#negative >= 25) = Binomial(n = 30, x >= 25, p = 0.5) = **0.0002**

Two-sided test:

Ho: median of cumulative_abnormal_return - 0 = 0 vs.
Ha: median of cumulative_abnormal_return - 0 != 0
Pr(#positive >= 25 or #negative >= 25) =
min(1, 2*Binomial(n = 30, x >= 25, p = 0.5)) = **0.0003**

Sign test - Distressed Country

sign	observed	expected
positive	2	11
negative	**20**	11
zero	0	0
all	22	22

One-sided tests:

Ho: median of cumulative_abnormal_return - 0 = 0 vs.
Ha: median of cumulative_abnormal_return - 0 > 0
Pr(#positive >= 2) =Binomial(n = 22, x >= 2, p = 0.5) = 1.0000

Ho: median of cumulative_abnormal_return - 0 = 0 vs.
Ha: median of cumulative_abnormal_return - 0 < 0
Pr(#negative >= 20) = Binomial(n = 22, x >= 20, p = 0.5) = 0.0001

Two-sided test:

Ho: median of cumulative_abnormal_return - 0 = 0 vs.
Ha: median of cumulative_abnormal_return - 0 != 0
Pr(#positive >= 20 or #negative >= 20) =
min(1, 2*Binomial(n = 22, x >= 20, p = 0.5)) = **0.0001**

Sign test - Non-Distressed Country

sign	observed	expected
positive	11	21
negative	**31**	21
zero	0	0
all	42	42

One-sided tests:

Ho: median of cumulative_abnormal_return - 0 = 0 vs.
Ha: median of cumulative_abnormal_return - 0 > 0
Pr(#positive >= 11) = Binomial(n = 42, x >= 11, p = 0.5) = 0.9995

Ho: median of cumulative_abnormal_return - 0 = 0 vs.
Ha: median of cumulative_abnormal_return - 0 < 0
Pr(#negative >= 31) = Binomial(n = 42, x >= 31, p = 0.5) = **0.0014**

Two-sided test:

Ho: median of cumulative_abnormal_return - 0 = 0 vs.
Ha: median of cumulative_abnormal_return - 0 != 0
Pr(#positive >= 31 or #negative >= 31) =
min(1, 2*Binomial(n = 42, x >= 31, p = 0.5)) = **0.0029**

Table 16 – Welch's T-Test Results for CARs

The tables below show the results of the Welch's two samples t-test with unequal variances. We use Welch's adaptation of the unpaired samples t-test to test if the average cumulative abnormal returns differ significantly across the two periods of our analysis - i.e. the financial crisis and the European sovereign debt crisis - and across countries that were or were not in distress. The underlying assumption is that the sample is normally distributed within the two subgroups. The null hypothesis is that the average CAR does not differ across the two subsamples. The tables show that in both cases the p-values are close to the 10% significance level.

Welch's two-sample t test with unequal variances - Period 1 vs Period 2

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
Period 2 (2010-2013)	30	-.0588	.0127	.0697	-.0848	-.0328
Period 1 (2007-2009)	34	-.0378	.0119	.0699	-.0622	-.0134
combined	64	-.0476	.0088	.0700	-.0651	-.0302
diff		**-.0209**	.0174		-.0559	.0139

diff = mean(period2) - mean(period1) t = -1.1984
Ho: diff = 0 Welch's degrees of freedom = 63.0651

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = **0.1176** Pr(|T| > |t|) = 0.2352 Pr(T > t) = 0.8824

Welch's two-sample t test with unequal variances - Distressed Countries

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
Non-Distressed Country	42	-.0391	.0104	.0672	-.0600	-.0181
Distressed Country	22	-.0640	.0158	.0739	-.0968	-.0312
combined	64	-.0476	.0088	.0700	-.0651	-.0302
diff		**.0249**	.0189		-.0132	.0630

diff = mean(Non-Dsitressed Country) - mean(Distressed Country) t = 1.3190
Ho: diff = 0 Welch's degrees of freedom = 40.9114

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.9027 Pr(|T| > |t|) = 0.1945 Pr(T > t) = **0.0973**

Table 17 – Wilcoxon's Rank Sum Test Results for CARs

The *Wilcoxon rank-sum (Mann-Whitney) test* is used as a non-parametric alternative to the two-sample t-test. This test is based on the order in which the observations from the two subsamples are distributed and relies on the assumption that the observations are independent across samples. The Wilcoxon rank-sum test tests the null hypothesis that the data in the two subsamples are from distributions with equal medians. The tables below show the results of the test for our sample, both for the period sample split and the country sample split.

Two-sample Wilcoxon rank-sum (Mann-Whitney) test - Period 1 vs Period 2

Crisis	obs	rank sum	expected
Period 2 (2010-2013)	30	902	975
Period 1 (2007-2009)	34	1178	1105
combined	64	2080	2080

unadjusted variance	5525.00
adjustment for ties	0.00
adjusted variance	5525.00

Ho: CAR(Period 2) = CAR(Period1)

z = -0.982
Prob > |z| = 0.3260

Two-sample Wilcoxon rank-sum (Mann-Whitney) test - Distressed Country Split

Distressed Country	obs	rank sum	expected
Non-Distressed Country	42	1431	1365
Distressed Country	22	649	715
combined	64	2080	2080

unadjusted variance	5005.00
adjustment for ties	0.00
adjusted variance	5005.00

Ho: CAR(Non-Distressed Country) = CAR(Distressed Country)
z = 0.933
Prob > |z| = 0.3509

Table 18 – OLS Regression of CARs on Firm and Issue Characteristics – Country Split

Table 18 displays the results of our cross-sectional analysis with a sample split between distressed and non-distressed countries, in supports of our analysis of hypothesis H0b. CARs are calculated as the sum of the abnormal returns for each security over a symmetrical three-day event window around SEO announcement. The sample includes all the SEOs carried out by European commercial banks over the period 2007-2013. The minimum size considered is USD 25 mn. Secondary offerings, private placements and public bailouts have been excluded. We control for year by means of the dummy variable Crisis, which takes the value of one in the period 2007-2009. Countries whose Fitch rating was below AA+ at the time of the event are categorized as Distressed Countries. Robust standard errors clustered at firm level are displayed in parenthesis

	Cumulative Abnormal Stock Return								
	Full Sample			*Distressed Country*			*Non-Distressed Country*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent variable: CAR (-1/+1)									
Constant	**-0.0391*** **	-0.0149	0.0788	**-0.0391** **	0.0503	0.4928	**-0.0411*** **	-0.0183	-0.1411
	(0.009)	(0.0390)	(0.158)	(0.0144)	(0.0640)	(0.882)	(0.0104)	(0.0615)	(0.204)
High yield dummy	**-0.0609***	**-0.0608***	**-0.0600***	-0.6088	**-0.0743***	-0.0753	*omitted*	*omitted*	*omitted*
	(0.032)	(0.0334)	(0.034)	(0.0350)	(0.0379)	(0.045)	*omitted*	*omitted*	*omitted*
Acquisition Purpose		-0.0019	0.0007		**0.0378*** **	0.0471		-0.0184	-0.0200
		(0.0285)	(0.029)		(0.0356)	(0.065)		(0.0297)	(0.030)
MES		-0.0062	-0.0042		-0.0231	-0.0176		-0.0045	-0.0014
		(0.0097)	(0.009)		(0.0174)	(0.022)		(0.0134)	(0.013)
Crisis (2007-2009)		0.0050	0.0021		-0.0248	-0.0642		0.0051	0.0031
		(0.0175)	(0.021)		(0.0283)	(0.104)		(0.0223)	(0.027)
Relative issuance size			-0.0028			-0.0661			-0.0040
			(0.002)			(0.145)			(0.003)
Market to Book			0.0009			-0.0166			0.0124
			(0.015)			(0.017)			(0.042)
Leverage			-0.1101			-0.4398			0.1107
			(0.158)			(0.958)			(0.189)
Volatility			0.0001			-0.0199			0.0001
			(0.001)			(0.042)			(0.000)
Market Cap			-0.0000			-0.0000			0.0000
			(0.000)			(0.000)			(0.000)
Observations	64	61	61	22	21	21	42	40	40
R-squared	0.09	0.10	0.16	0.17	0.36	0.55	0	0.01	0.09

***p<0.01, **p<0.05, *p<0.1

Table 19 – OLS Regression of CASs on Firm and Issue Characteristics – Country Split

Table 19 displays the results of our cross-sectional analysis with a sample split between distressed and non-distressed countries, in supports of our analysis of hypothesis H0e. CASs are calculated as the sum of the abnormal spreads for each security over a symmetrical five-day event window around SEO announcement. The sample includes all the SEOs carried out by European commercial banks over the period 2007-2013. The minimum size considered is USD 25 mn. Secondary offerings, private placements and public bailouts have been excluded. We control for year by means of the dummy variable Crisis, which takes the value of one in the period 2007-2009. Countries whose Fitch rating was below AA+ at the time of the event are categorized as Distressed Countries. Daily CDS spread changes are calculated in basis points. Robust standard errors clustered at firm level are displayed in parenthesis

	Cumulative Abnormal CDS Spread								
	Full Sample			*Distressed Country*			*Non-Distressed Country*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent variable: CAS (-2/+2)									
Constant	0.48	**-23.20***	-7.26	6.18	**-62.77****	**-348.54****	-1.28	-21.67	-60.36
	(2.58)	(12.30)	(45.78)	(5.26)	(23.82)	(136.37)	(3.08)	(19.43)	(57.07)
High yield dummy	**-24.00****	**-23.19****	**-21.02***	**-29.70****	**-30.93***	**-27.06***	*omitted*	*omitted*	*omitted*
	(11.68)	(11.32)	(11.46)	(12.60)	(16.47)	(14.21)	*omitted*	*omitted*	*omitted*
Acquisition Purpose		7.03	6.09		**28.98***	**36.28****		3.84	2.57
		(9.93)	(11.17)		(14.77)	(15.67)		(11.23)	(11.91)
MES		**5.74***	**5.74***		**17.40*****	**19.08****		3.87	5.40
		(3.09)	(3.02)		(5.81)	(7.10)		(3.60)	(4.38)
Crisis (2007-2009)		-4.11	3.18		15.46	**35.12****		2.87	3.95
		(4.24)	(4.75)		(18.65)	(15.68)		(7.06)	(6.96)
Relative issuance size			**-0.74***			**-94.34*****			-0.74
			(0.41)			(26.22)			(0.54)
Market to Book			**-14.59****			**-25.50*****			0.58
			(5.81)			(3.17)			(13.69)
Leverage			-0.07			**3.56****			0.33
			(0.46)			(1.44)			(0.49)
Volatility			-0.05			9.78			-0.03
			(0.06)			(9.55)			(0.07)
Market Cap			-0.00			**-0.00****			0.00
			(0.00)			(0.00)			(0.00)
Observations	64	61	61	22	21	21	42	40	40
R-squared	0.10	0.18	0.30	0.18	0.40	0.79	0	0.07	0.12

***p<0.01, **p<0.05, *p<0.1

Table 20 – Summary of Average Cumulative Abnormal CDS Spreads - Daily Percentage Changes

Table 20 displays the results of our robustness check with regards to average CASs. Here daily CDS spread changes are computed as percentage changes. Cumulative abnormal spreads are computed as the sum of the abnormal spreads over a symmetrical five-day event window for each security, and then mean CASs are considered over cross-sections of securities. 64 SEOs by 37 European commercial banks are considered in this study. Event dates have been extracted from SDC Platinum. The minimum size considered is USD 25mn. The index used in the analysis is the DS Europe Banks 5 Year Credit Default Swap Index. CDS spreads and the market index have been extracted from Datastream. Standard errors are robust and clustered at firm level.

	CAS (-2/+2)	std error	t-statistic	p-value	obs
Full sample	**-0.87%**	0.0157	-0.56	0.581	64
Period 1 (2007-2009)	**-0.74%**	0.0249	-0.30	0.770	34
Period 2 (2010-2013)	**-1.03%**	0.0143	-0.72	0.480	30
Distressed Country	**-1.89%**	0.0281	-0.67	0.512	22
Non-Distressed Country	**-0.34%**	0.0176	-0.19	0.848	42

Table 21 – OLS regression of CASs on Firm and Issue Characteristics - Daily Percentage Changes

Table 21 displays the results of our cross-sectional analysis where daily CDS spread changes are calculated in percentage, as robustness supports of our analysis of hypothesis H0e. We control by country and year by means of the two dummy variables Crisis and Distressed Countries. Crisis takes the value of one in the period 2007-2009 and Distressed Country takes the value of one for countries whose Fitch rating was below AA+ at the time of the event. Robust standard errors clustered at firm level are displayed in parenthesis.

	Cumulative Abnormal CDS Spread								
	Full Sample			*Period 1 (2007-2009)*			*Period 2 (2010-2013)*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent variable: CAS (-2/+2)									
Constant	-0.0023	-0.0209	-0.4248	-0.0074	0.0447	-0.2515	0.0060	**-0.1568****	**-10.611****
	(0.0174)	(0.0649)	(0.3537)	(0.0249)	(0.0914)	(0.3545)	(0.0161)	(0.0615)	(0.6115)
High yield dummy	**-0.0459***	-0.0503	-0.0442	*omitted*	*omitted*	*omitted*	**-0.0542****	**-0.0758****	**-0.0698*****
	(0.0251)	(0.0468)	(0.0493)	*omitted*	*omitted*	*omitted*	(0.0224)	(0.0347)	(0.0229)
Acquisition Purpose		0.0314	0.0229		-0.0084	-0.0320		**0.0598****	**0.2045****
		(0.0735)	(0.0776)		(0.0972)	(0.1008)		(0.0267)	(0.0766)
MES		0.0068	0.0070		-0.0115	-0.0139		**0.0319****	**0.0412*****
		(0.0149)	(0.0162)		(0.0197)	(0.0263)		(0.0136)	(0.0136)
Distressed country		-0.0069	-0.0165		-0.1970	-0.2118		0.0546	0.0518
		(0.0657)	(0.0621)		(0.1934)	(0.2064)		(0.0389)	(0.0514)
Crisis (2007-2009)		-0.0361	-0.0295		*omitted*	*omitted*		*omitted*	*omitted*
		(0.0445)	(0.0440)		*omitted*	*omitted*		*omitted*	*omitted*
Relative issuance size			**-0.0054*****			-0.0051			**-0.1907***
			(0.0019)			(0.0033)			(0.0927)
Market to Book			0.0005			0.0269			**-0.0179****
			(0.0319)			(0.1199)			(0.0084)
Leverage			0.0044			0.0035			**0.0161****
			(0.0036)			(0.0035)			(0.0066)
Volatility			0.0002			0.0001			0.0094
			(0.0003)			(0.0004)			(0.0058)
Market Cap			0.0000			0.0000			0.0000
			(0.0000)			(0.0000)			(0.0000)
Observations	64	61	61	34	31	31	30	30	30
R-squared	0.02	0.03	0.09	0	0.10	0.14	0.09	0.28	0.56

***p<0.01, **p<0.05, *p<0.1

Table 22 – OLS Regression of CASs on Firm and Issue Characteristics - Daily Percentage Changes

Table 22 displays the results of our cross-sectional analysis with a sample split between distressed and non-distressed countries, where the daily CDS spreads are computed as relative percentage changes. CASs are calculated as the sum of the abnormal spreads for each security over a symmetrical five-day event window around SEO announcement. We control for year by means of the dummy variable Crisis, which takes the value of one in the period 2007-2009. Countries whose Fitch rating was below AA+ at the time of the event are categorized as Distressed Countries. Robust standard errors clustered at firm level are displayed in parenthesis

	Cumulative Abnormal CDS Spread								
	Full Sample			*Distressed Country*			*Non-Distressed Country*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent variable: CAS (-2/+2)									
Constant	-0.0023	-0.0259	-0.4369	0.0014	-0.0589	**-3.4688*** **	-0.0034	-0.0003	-0.1496
	(0.0174)	(0.0526)	(0.3723)	(0.0449)	(0.0703)	(0.8141)	(0.0176)	(0.0709)	(0.3272)
High yield dummy	**-0.0459***	**-0.0539****	**-0.0514***	-0.0497	**-0.0748***	-0.0301	*omitted*	*omitted*	*omitted*
	(0.0251)	(0.0208)	(0.0278)	(0.0513)	(0.0365)	(0.0411)	*omitted*	*omitted*	*omitted*
Acquisition Purpose		0.0327	0.0262		0.0321	**0.2677*** **		0.0115	0.0034
		(0.0737)	(0.0771)		(0.0236)	(0.0639)		(0.0823)	(0.0812)
MES		0.0072	0.0083		0.0213	0.0359		-0.0032	0.0008
		(0.0145)	(0.0149)		(0.0204)	(0.0238)		(0.0153)	(0.0205)
Crisis (2007-2009)		-0.0336	-0.0251		-0.1782	0.1026		0.0029	0.0042
		(0.0308)	(0.0339)		(0.2172)	(0.1153)		(0.0269)	(0.0297)
Relative issuance size			**-0.0054*****			**-0.3601*****			-0.0046
			(0.0018)			(0.1192)			(0.0028)
Market to Book			0.0016			**-0.0368****			0.0446
			(0.0309)			(0.0168)			(0.1099)
Leverage			0.0044			**0.0373*****			0.0012
			(0.0036)			(0.0089)			(0.0029)
Volatility			0.0002			-0.0128			0.0000
			(0.0003)			(0.0458)			(0.0004)
Market Cap			0.0000			0.0000			0.0000
			(0.0000)			(0.0000)			(0.0000)
Observations	64	61	61	22	21	21	42	40	40
R-squared	0.02	0.03	0.09	0.04	0.27	0.82	0	0.004	0.05

***p<0.01, **p<0.05, *p<0.1