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Does Subordinated Debt Discipline Banks? Empirical Evidence of Market Discipline in Europe

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Abstract

This thesis provides a differentiated answer to the question whether subordinated debt disciplines bank's risk-taking behavior. I investigate the conditions and applicability of market discipline through subordinated debt instruments by critically reviewing the state of research. Relating to the regulatory context, I discuss proposals and various empirical studies and find that subordinated debt is an adequate measure to discipline banks under certain conditions.

My own empirical analysis contributes to evidence provided by prior studies and updates them for the European case. I conclude that subordinated debt investors perceive differences in risk between banks and across time and are sensitive to credit ratings and accounting variables at generally higher spread levels compared to senior bonds. Results include that spread is positively sensitive (increases with respect to one standard error) to equity to capital (225 BPS), provision for loan losses (200 to 225 BPS), non-performing loans to equity (400 to 715 BPS) and interest coverage ratio (60 BPS). Spread is negatively sensitive (decreases with respect to one standard error) to ROA (120 BPS) and loan loss reserves (360 to 620 BPS).

Keywords: debt market discipline; bond spreads; subordinated debt; bail-in; bail-out; BRRD; Basel II; Basel III; market monitoring; market influence.

1. Introduction

During the Great Financial Crisis ("GFC"), tax-payer's money was repeatedly used to bail out banks considered 'too big to fail' and as such seen as a relevant risk to the financial and economic system (Barth and Wihlborg, 2016). It was widely criticized that banks did not bear the costs of their own risks anymore and that risks were not controlled properly (Hakenes and Schnabel, 2010). Underestimating the fragility, interconnectedness and complexity of global banks led regulators to weaken supervisory efforts and elevated risk-taking behavior of banks in the years preceding the crisis. In the aftermath of the crisis, however, regulation in the banking sector and especially in Europe tightened significantly to mitigate excessive risk-taking and to avoid further costly bail-outs (Dewatripont, 2014). Exclusively relying on direct regulation measures, such as capital and disclosure requirements, might not be sufficient to cope with banks' risks, as noted in the Squam Lake Report (French et al., 2010).

Lately, regulation is increasingly putting emphasis on the potential of self-controlling, market-based mechanisms, termed 'market discipline' ("MD"). The rationale is that by monitoring bank's behavior and condition, market participants are ultimately influencing risk-taking reciprocally when managers take into account capital market's evaluation (Flannery, 2001). This concept could supplement traditional supervisory measures (Hoang et al., 2014). Research on market discipline of debt capital has expanded with increased interest from supervising authorities. Following a surge in publications in the years around the turn of the millennium, one can notice that more research has been provided since 2009 paralleled by ongoing negotiations on Basel III. With the new European framework on Bank Recovery and Resolution ("BRRD"), regulators are committed to strengthen market discipline further (Lintner, 2017), by implementing a bail-in tool.

Central to the concept of market discipline is the asset class of subordinated debt ("SD")[1]. These high-yield instruments rank just after equity when it comes to absorbing losses in capital restructuring ('bail-in') and are thus exposed to higher risk of default. When reflected in the risk premium on markets (as in spreads), this should provide incentive to investors to monitor default risks (Chen and Hasan, 2011).

[1] More specifically, I will only refer to subordinated bonds in this thesis.

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In theory, this quality makes them an ideal tool for exerting MD, serving as an indicator for investor's sensitivity to risk, when perceiving the bank's risk (Bliss and Flannery, 2002). Higher yields are demanded by investors and account for riskier projects and assets of the bank. I want to test this rationale empirically to answer the question whether SD is an adequate instrument to discipline banks in Europe. I will discuss conditions and implications constituting market discipline and the channels through which SD might discipline banks. Further analyzing the monitoring and influencing phases, I will highlight limitations to the implementation of MD and present proposals which respond to these issues. In the main body of my thesis, the empirical work, I will present my own study on the relevance and sensitivity of SD in Europe. My analysis will contribute to the current discussion since evidence from earlier studies could be outdated due to regulatory adjustments and higher commitment to banking resolution in Europe.

This thesis seeks to answer the following main research questions:

1. What is the context and rationale of subordinated debt when establishing market discipline in the banking sector?
2. Under which conditions can subordinated debt effectively work as an adequate measure to monitor and influence a bank's risk-taking behavior?
3. What are the features and conflicts to the implementation of subordinated debt presented in current proposals?
4. What are the characteristics of the current market for subordinated debt in Europe?
5. Is there empirical evidence of sensitivity of subordinated bond spreads towards the risk profile of a bank, i.e. can investors monitor the bank?

Narrowing the objective of my study, the empirical part of the thesis will clearly focus on the monitoring phase of SD, that is the sensitivity of spreads to risk measures, and will not aim at providing evidence for the influencing phase. Moreover, I will not discuss the general comparison on the rationale of bail-ins versus bail-outs, the role of deposit insurance, legal details of SD or MD or models on moral hazard behavior in banks.

The remainder of this paper is structured as follows: the following section (section 2) introduces the regulatory context and core concepts and briefly reviews the literature on implications, drawbacks and conditions for effective market discipline before presenting proposals, addressing research questions 1 to 3. Section 3 discusses research questions 4 and 5 and provides a review of empirical evidence on spread sensitivity of SD, methodological considerations and my own empirical results for the European case. Section 4 concludes the thesis with a summary, open research questions and an outlook.

2. Analysis of effective market discipline by subordinated debt

This section builds the foundation for understanding the debate on SD as a disciplining instrument. A critical analysis will be undertaken on recent and earlier research papers to evaluate the viability of SD as a measure for disciplining banks.

2.1. Regulatory context

The regulatory framework of banking supervision is originally designed to protect the economy from systemic risk. However, when governments also act as a lender of last resort and provide a deposit insurance system, this could entail incentives for banks to increase leverage and risk-taking respectively (Flannery, 2001). According to his findings, government guarantees and deposit insurance are mispriced, meaning that banks and their owners do not bear their own risk. Additionally, there could exist higher social cost from public oversight compared to private governance systems in the banking sector. These aspects, combined with the repeated inability of supervisors to mitigate banking crises, as shown in Lall (2012), call for alternative supervisory mechanisms.

After many financial crises (more specific: banking crises) regulators are thus adjusting their framework, imposing stricter regulation on capital adequacy and disclosure (Barth et al., 2004). On a supranational level, banking regulation was established by the Basel programs with the objective of improving transparency and reliability of financial information of banks. Most of these measures are focused on the prevention of public bail-outs, prevalent in the GFC, which can easily spark a chain reaction as a spillover effect on a public debt crisis. Conversely, if regulation is designed too tight in terms of capital requirements, this could contract the vital function of banks creating liquidity (Van den Heuvel, 2008).

To overcome this dilemma of direct regulatory requirements, the third pillar of Basel II endeavors to implement alternative regulatory measures, making use of market instruments as a self-controlling mechanism to let the market discipline banks partially. Optimally, this releases governments from the inherent paradigm of giving guarantees to bail out banks (Grossman and Woll, 2014) and returns the accountability for losses back to markets, i.e. investors who are bailed-in depending on the payment rank of their capital. The newly implemented Banking Union in the EU and the recovery and resolution mechanism for banks (BRRD), turned into effective law in the national states by 2016, supports the internalization of liability. Resolution mechanisms in BRRD (Lintner, 2017) prescribe a clear ranking of bail-in procedure with equity holders absorbing losses prior to unsecured junior debt (so-called waterfall principle). Current European regulation under the name Minimum Requirement for Own Funds and Eligible Liabilities ("MREL") specifies the criteria for subordination and bail-in order following the international rules for Total Loss Absorbing Capacity ("TLAC")

introduced by the Financial Stability Board. Beyond the commitment to a bail-in tool, the new regulation wants to evade TBTF guarantees. In June 2017, for the first time since the establishment of BRRD, subordinated debt holders and shareholders of struggling Banco Popular, the sixth-largest Spanish bank, were bailed in and absorbed full losses without harming tax-payers (Buck, 2017). This might serve as a blueprint to further resolutions, possibly in sight regarding the condition of troubled Italian banks (Martino, 2017).

While the bail-in order is not a self-purpose or a mechanism for quick resolution only, it is also intended to have repercussions on the awareness of risk to mitigate the impact of future banking crises (Dewatripont, 2014) eventually. 'Bail-inable' capital is thus elevating market discipline.

2.2. The case for market discipline

Market discipline can be defined in its broadest sense as a mechanism by which bank's risk-taking behavior is monitored and influenced by market forces (Hamalainen et al., 2009). Commentators are arguing to which extent MD might supplement and replace regulators and if it does so at all (Bliss et al., 2001). Whereas the notion of liability and fundamentals of MD are already common for non-financial corporations, implementation in a heavily regulated financial environment seems to be more complex. In a speech delivered at the New York University Law School in April 2007 (see quote on next page), the then-chairman of the Fed, Ben Bernanke, was already aware of the need for MD. It should be noted that this speech was held just few months before the beginning of the crisis – not knowing what was about to happen in the succeeding months.

> "The lesson of history appears to be that neither market discipline nor regulatory oversight alone is completely adequate for keeping the banking system safe and sound. However, regulators have increasingly come to appreciate the value of a hybrid system that supplements direct regulation with a substantial amount of market discipline. Fortunately, regulators have a variety of ways to restore and strengthen market discipline for banks, notwithstanding the existence of the federal safety net." (Bernanke, 2007)

However, the recent incorporation of MD in the banking sector (Bernanke's hybrid system) is not a new phenomenon. Private governance frameworks and incentive-based regulatory design emerged in the US (Bliss and Flannery, 2002) and are generally proposed by opponents of too strict government controls, since they give more weight to market-based mechanisms. Discussions were initially sparked in a similar context to the present post-GFC period, when several US banks defaulted during the savings and loan crisis in the 80s of the last century as government guarantees led them to higher risk-taking (Board of Governors of the Fed, 1999).

Besides concepts of MD focusing on equity and deposits, the "Squam Lake Report" repeatedly stressed the relevance of debt market discipline (French et al., 2010). This form of MD can be broken down into two phases: the monitoring phase followed by the influencing phase. Bliss and Flannery (2002), among other authors, differentiate between the ability to understand, interpret and price information on changes to the banks' decisions (monitoring) and the ability to ultimately impact the decision maker's behavior via security prices (influence).

For the influencing phase, the common literature distinguishes further between direct and indirect disciplinary effects (Hamalainen et al., 2009). Direct influence relates to higher costs of borrowing for new issuances on primary markets through a higher risk premium. Investors are anticipating the risk of default banks and can thus influence bank managers behavior ex-post. Indirect discipline refers to the regulator, who is interpreting and incorporating market signals from secondary markets into its supervisory actions.

2.3. Why subordinated debt?

Until now, I only discussed MD in its theoretical rationale. Both direct and indirect MD, however, require an adequate instrument on markets, where expectations are traded and priced. While MD might be also imposed by shareholders or relevant depositors (Demirgüç-Kunt and Huizinga, 2004), debt markets are particularly suitable for implementing MD due to higher risk sensitivity of debt holders and generally a higher frequency of debt issuances (Chen and Hasan, 2011). Constant payments on the face value encompass a downside risk without the benefit of large upside gains, common for equity holders.

SD is typically unsecured capital and uninsured by any governmental safety net. It can also come with convertible features; however, I will regard CoCos only as a sub-category to SD. Basel III regulation accounts SD to Additional Tier 1 if it is subordinated to the general debt and if it has no maturity (perpetual bonds) and to Tier 2 capital if maturity is longer than 5 years[2]. It thereby ranks lower in the liquidation scheme than normal debt in case of default and acts as an additional capital buffer similar to equity capital, supplementing Tier 1 capital and increasing the robustness of deposit insurance besides strengthening the position of senior debt holders (Caldwell et al., 2005). What makes SD particularly interesting to banks is its simple and quick issuance compared to stocks. Investors, on the other hand, are attracted by higher yields.

Being exposed to a higher risk profile, reflected in the risk premium on markets (as in spreads), should provide more incentive to investors to monitor default risks (Chen and Hasan, 2011). In turn, this price sensitivity of SD possibly carries valuable information about default risks and might better reflect the financial situation of a bank compared to senior debt. SD is thus a better instrument for MD compared to depositors, who can silently withdraw their funds and do not provide an immediate market signal (Calomiris, 1999).

[2] See BCBS publication 189 for Basel III rules on capital treatment, available at http://www.bis.org/publ/bcbs189.pdf

2.4. Conditions for effective market discipline

Reflecting Bernanke's speech quoted above from today's standpoint, the obvious question is why MD failed during the crisis. Since bond spreads seemed to react only when it was too late, we would have to ask which conditions were not met at that time prior to the crisis. In this section, I will discuss conditions and limitations to MD. For further analysis, I will refer to the comprehensive framework graphed in Figure 1, which is an adapted representation from Hamalainen et al. (2009).

2.4.1. Market monitoring

The market monitoring phase (or recognition phase in Hamalainen et al., 2009) can be seen as the necessary pre-phase for the succeeding phase of market influence (see section 2.4.2). Market participants should be able to understand changes in a bank's condition (sub-phase 1 in the above framework), consider themselves at risk (sub-phase 2) and price this perception accordingly (sub-phase 3). Several studies show that bond prices are indeed related to the condition of banks or bank holding companies, especially prior to bank failure (Jagtiani and Lemieux, 2001)[3]. There are, however, several conditions which must be fulfilled to allow investors to perceive and price risk accordingly.

First, to satisfy condition C1, the 'informed investor' hypothesis must hold (Hancock and Birchler, 2004). Information gathering must not be linked to high costs and there must be constant information provision towards investors. This requires a regulatory framework with high transparency. The strengthened reporting and disclosure rules together with credit ratings should set the baseline for informed markets. Nevertheless, the reliability of the signal of subordinated bond yields might be limited due to infrequent issuing behavior (Evanoff et al., 2011). Admati and Hellwig (2013) even call debt market discipline a myth due to high informational costs incurred by the creditors. Investors could well be 'free-riding' on information provided by other investors which, in effect, lowers the incentive for monitoring. Moreover, the efficacy of monitoring also depends on the type of investor and their ability to detect risks. While institutional investors or peer banks might actively monitor banks and financial status, private investors incur much higher information costs for monitoring internal risks. For example, in the Italian SD market, half of the amount issued is allocated to individual investors (see Martino, 2017). This undermines the 'informed investor' assumption further.

Regarding the second condition (C2), the 'too-big-to-fail' argument presented in Mishkin et al. (2006) undermines the relevance of MD since investors anticipate being bailed out by the safety-net of the government. For effective MD, however, explicit and implicit guarantees for public bail-out must be irrelevant to investors so that they bear the full risk of losses on their investments and thus internalize the bank's risk. In the current European context, this condition is increasingly enforced through the BRRD framework.

To further ensure efficiency (condition 3), markets must be sufficiently deep in terms of liquidity. Although this might be fulfilled for large banks and issuances, Chen and Hasan (2011) note that SD might not be the right instrument of choice for monitoring small banks, since low liquidity on these markets (especially on secondary markets) comes with increased noise and volatility. The lower trading volume on secondary markets leads to a liquidity premium one would have to adjust for (Evanoff et al., 2011).

Another pitfall to monitoring goes beyond the three conditions. The so-called 'double endogeneity problem' presented in Birchler and Facchinetti (2007) questions the ability of markets to price risk when participants assume that banks are disciplined by their own monitoring efforts. They anticipate their own disciplining effect into their pricing process and do not exert discipline consequently.

2.4.2. Market influence

The ability to monitor risk solely is not sufficient for holistic MD. The signal provided must also be put into actionable controls, either by creditors (direct MD) or by the supervisor (indirect MD).

Direct market discipline ("DMD") is exerted directly by markets when demanding a higher risk premium. Hwang and Min (2013) distinguish DMD further between weak and strong MD. The former is referring to higher financing costs incurred when investors are pricing the risk accordingly; the latter is reflecting the inability to raise further capital if the probability of default surpasses a critical line. Strong MD will probably only be observed in times of approaching distress. Besides to the pure financing view, one might also expect an ex-ante effect of influence imposed by covenants as another channel of MD, as shown by Goyal (2005). Since the strength of covenants of different instruments is negatively related to the risk premium, there can surely be observed different spreads across instruments.

The Board of Governors of the Fed (1999) emphasizes that the share of SD must be relevant and sizeable (Condition 4.2) to impact total funding costs and influence managerial behavior. Bliss and Flannery (2002) provide research regarding this question on cost effects of spreads. They generally find that market prices alone are not strong enough to influence key decisions like the choice of leverage, dividends and the level of liabilities, probably due to the small market size of SD (breaching C4.2 in the framework).

There remains another pitfall to the use of SD regarding incentive structures (condition 5) which can be easily understood when considering SD as a capital source with similar characteristics as equity, particularly vulnerable to moral hazard problems. In the case of default, or rather close to that state, SD investors would as well support risky investments and be supportive for so-called 'gambling for resurrection' decisions (Bliss et al., 2001). In this case, the impact on spreads would be distorted.

[3] Refer to section 3.1 for an overview over other prior studies.

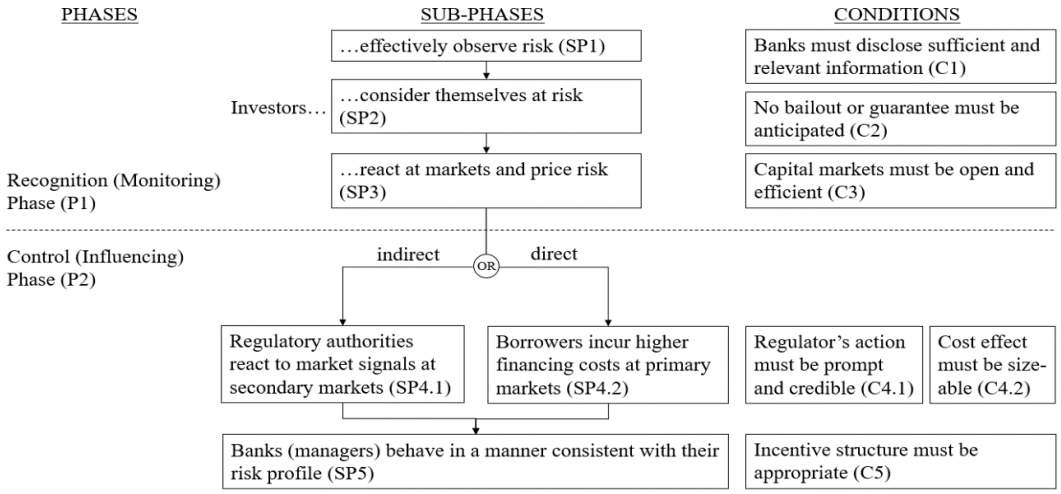

Figure 1: The phases of effective market discipline, adapted from Hamalainen et al. (2009)

SD spread signals attained from monitoring could also indirectly influence banks when anticipating regulatory action, which should be timely and credible (see condition C4.1). In contrast to DMD, indirect market discipline can only be exercised through publicly placed instruments as the pricing by markets must send an observable signal to the regulator. Although this market signal means a partial delegation of monitoring activities from the supervisor to markets, the supervisor will still step in to perform prompt corrective action or on-site examinations if distress is expected.

Current early-warning models and triggers for regulatory action primarily focus on book variables and the so-called CAMELS[4] rating to evaluate distress. Conversely, SD spreads could also be an adequate measure to incorporate market-based information on distress (Jagtiani and Lemieux, 2001). They could even be better predictors than traditional Tier 1 capital ratios (Evanoff and Wall, 2000). However, the noise of SD spreads (vide supra) makes them hard to interpret as a stable indicator, additional factors might naturally distort market data (see Chen and Hasan (2011) and Bliss et al. (2001)). One can also categorically question whether yields really comprise additional information to supervisors. Bliss et al. (2001) points out that investors only observe publicly available information also available to supervisors. He questions the signaling effect of bond spreads and advises to use combined measures, such as incorporating equity prices into risk assessment. Nevertheless, even an imprecise signal could complement supervisor's assessment and actions and could help them to react promptly to banks in distress (Flannery, 2001).

Summing up the previous sections, I refer to the conclusion of Flannery (2001), who supposes that SD spreads might inform about different risk levels (monitoring phase) but do not necessarily discipline banks accordingly (influencing phase). In his view, supervisors are better at influencing firms and investors have a comparative advantage in monitoring banks via markets. To minimize the probability of failure in supervision, he calls for a combination of both channels.

2.5. Mandatory subordinated debt proposals

Due to high financing costs, banks are inherently reluctant to issue more SD voluntarily. Frequency of issuance and amount issued might rest at low levels in the future. Besides using market information from SD spreads only as evaluative information, authorities could turn to mandatory regulation to strengthen the role of MD, as desired in the speech by Bernanke quoted above. To enforce mandatory proposals, the regulator could require predefined levels of SD, for example calculated as a share of total debt, and act if banks are reluctant to issue sufficient SD (Chen and Hasan, 2011).

In the following, I will summarize only the most relevant proposals of mandatory programs and link them to the framework in Figure 1. For an extensive review of mandatory SD proposals, one can refer to a 'Staff Study' by Fed Board members (Board of Governors of the Fed, 1999). For an overview of proposals on features like maturity, size and further SD features, refer to Hamalainen (2004).

Early proposals emerged in the US with the Gramm-Leach-Bliley Act from 1999, which led the Fed to examine a mandatory program. However, the Board did not see extended need to take prompt action. They called for further research on smaller banks' barriers to issue and delayed a decision due to increasing numbers of voluntary issuances (Board of Governors of the Fed, 1999).

Calomiris (1999), as an outstanding advocate for the mandatory solution, puts forward a radical proposal. While a cap on spreads at issuance would serve to account for excessive risk-taking behavior, he also proposes a minimum frequency of issuance to provide markets with a constant stream

[4]Rating system to classify a bank's overall condition, evaluating (C)apital adequacy, (A)ssets, (M)anagement Capability, (E)arnings, (L)iquidity and (S)ensitivity.

of information (addressing condition C1). This would, however, require maturities to decrease far below current levels. If banks do not comply with the frequency of issuance or if bonds hit the spread cap, he proposes an obligation to shrink the asset side monthly to meet requirements.

Caldwell et al. (2005) picks up the debate on desired minimum maturity of SD instruments. He states that short-term SD does not anticipate long-term risks and would additionally come with higher costs of issuance given the higher frequency. The positive effects of liquidity come at a price. Both banks and supervisors might be willing to tend to longer maturities, seeking for permanence and stability. Long maturities, however, increase the risk to debt holders, tying them to the bank. The maturity requirements are therefore a pure trade-off between liquidity and information provision (monitoring phase) and the strength of the disciplining effect (influencing phase).

Caldwell et al. (2005) also points out that mandatory programs could prevent small banks from timing their issuance decision. By studying the SD market for large and small Canadian banks, he assesses an incentive for small banks to systematically place SD in 'quiet times' while avoiding issuance when spreads are higher. They might also issue SD before negative news on their risk-taking behavior reach the market and thus actively evade MD. In contrast to big banks, small banks seem to be more inclined to time their issuing behavior due to higher cost of funding. He suggests a framework which accounts for this characteristic. Hamalainen et al. (2010) review the case for mandatory SD policy for companies in the UK. Conversely to the findings of Caldwell et al. (2005), their findings suggest, that in the highly concentrated banking sector in the UK, only the six largest banks should be obliged to issue SD.

Chen and Hasan (2011) point out a side-concern which has not been discussed so far. They describe the possible scenario of investors 'colluding' with the bank (violating condition C3), in which the bank indirectly 'pays' investors in terms of higher coupons for not being monitored by them. This limitation to the efficiency of markets would require interest ceilings similar to those proposed by Calomiris (1999).

In a recent paper, Evanoff et al. (2011) discuss questions on the frequency and amount issued, again. They ask under which conditions SD spreads would be more inclined to be sensitive to bank risk and test their hypothesis that market depth is crucial here. Deeper markets, measured in terms of liquidity and size, could positively moderate the sensitivity since more information is provided around the issuance of debt instruments (condition C1). Risky banks could not avoid market exposure and market discipline anymore and low-risk banks could be incentivized to be transparent and benefit from lower funding costs (Evanoff et al., 2011).

Following the positive assessment of the effectiveness of SD in Evanoff et al. (2011), regulators should consider incorporating convertible features to SD into their reforms. Contingent convertible SD could increase the incentive for monitoring and lever risk sensitivity since investors would fear losses from conversion (Posner, 2010). These so-called CoCo bonds received broad attention by researchers and regulators (Avdjiev et al., 2013) and have developed a relevant market since their set-up in 2009, when regulators forced banks to issue this specific type of SD. Basically, CoCo bonds are hybrid debt instruments which are converted into equity when a predefined trigger is breached. Their qualities as (subordinated) mezzanine debt make them first choice in overcoming classic issues of debt-equity agency problems. Further papers discuss the design of such contingent convertible requirements (Herring and Calomiris, 2011). In a more recent paper, Hilscher and Raviv (2014) present their research on how CoCo bonds influence risk-taking behavior and default probabilities of banks and find that optimally constructed CoCo bonds strongly impact these factors. They point out that contract terms (e.g. conversion ratio and thresholds) significantly matter here.

The discussed proposals could be adopted along current regulation on bail-in capital in Europe but require further research on their implementation. Future role of market discipline by SD will be determined by viable approaches and subject to regulators' decisions.

3. Empirical evidence on the monitoring phase

In the previous section 2, I laid out various conditions for verifying the existence and effectiveness of MD through SD and presented main proposals for implementation prevalent in the literature. The following part will revise empirical findings from prior studies and offer an own empirical approach to the assessment of risk sensitivity of SD. I will test for the monitoring phase of MD, more specifically for condition 3 in the framework in Figure 1 (vide supra). A positive assessment of the awareness of bank's risk by investors would partially prove MD.

3.1. Prior empirical studies

First studies, published in the 1980s as a reaction to higher perceived risk in the US banking sector, show ambiguous results for the significance of efficient monitoring. For a sample period prior to 1991, Avery et al. (1988) do not find significant relationship between SD spreads and bank's risk-taking behavior. Later studies reviewing their findings explain the lack of explanatory power with implicit government guarantees in place (violating condition C2), possibly distorting market prices. Bail-outs of banks like Continental Illinois were then common practice by the Fed. Another study by Gorton and Santomero (1990) extends the previous model, adjusting it for leverage ratios which were not considered earlier. The rationale behind this adjustment comes from the insight that SD rather behaves like equity and higher risk could lead to higher returns. The findings of Avery et al. (1988) are confirmed, refusing the hypothesis that SD spreads and investors incorporate risk measures.

The second generation of studies, emerging in the 1990s, uses more recent data and comes to a positive assessment on the existence of SD sensitivity to risk measures. For this

period, there was a structural change in the banking landscape due to the Federal Deposit Insurance Corporation Improvement Act ("FDICIA") in 1991, when the US government ended their bail-out policy of banks considered TBTF. Flannery and Sorescu (1996) provide this opposing evidence for the 1983-1991 period, finding a significant correlation of risk measures (especially on credit ratings) for bank holding companies for later years, when banks were not considered TBTF anymore.

Most studies, until the turn of the millennium, focused on US markets and banks. Sironi (2003) presents a first study on European banks, methodologically similar to previous studies on US banks, with a sample period from 1991 to 2000, also confirming a sensitive relationship. His findings give evidence that (1) investors are sensitive to bank risk, using stand-alone credit ratings which exclude the impact of implicit guarantees, (2) sensitivity has increased with disappearing guarantees from governments and (3) public banks (especially referring to Germany) show no spread-relationship of risk measures since they enjoy explicit government guarantees. de Mendonça and Loures (2009) present a first study for an emerging country, Brazil, but only find weak evidence of MD. These studies aside, the number of recent studies using panel regressions, like I do, is limited and therefore updates are overdue.

There remain important caveats to cross-sectional studies investigating yield-risk relations (Bliss et al., 2001). Besides giving ambiguous evidence, most of the studies do not analyze the relevance of timeliness. Moreover, while most of the studies use accounting variables or credit ratings to explain different spread levels and movements, only few like Park and Peristiani (1998) make use of variables on market condition.

3.2. The market for subordinated debt in Europe

Using available data from Bloomberg data services, I will briefly describe the primary market for SD in Europe, based on own calculations. The total sample consists of 3712 bond issuances during the period from 1982 to 2017, whereas I will focus on the post-crisis period from 2007 to 2016 in the analysis.

Subordinated bonds are predominately denominated in EUR (65% of all issuances), followed by denominations in USD (17%), GBP (8%) and other currencies (10%). European banks have issued a total of EUR 326bn, USD 204bn and GBP 45bn over the analyzed period. The largest Euro issuers (share of all issuances: Italy 24%, Spain – 21%, the Netherlands – 9%, France – 8% and Great Britain – 7%) are accounting for EUR 224bn or 69% of the total amount issued in Euro.

Analyzing the amount issued over time, I observe an increasing amount of Euro issuances from EUR 23.8bn in 2000 peaking at EUR 52.5bn issued in 2007, but decreasing again to EUR 19.9bn in 2016. The same pattern is observed for USD issuances (USD 6.3bn in 2000, USD 24.1bn in 2009 and USD 21.8bn in 2016). Total market size of SD seems to be at moderate to low levels at this point of time.

With an average of 10 years to maturity, 42% of all issuances are maturing at 10 years from issuance and 20% are perpetual bonds. Half of all bonds are callable, containing a premium for the call option, while only 43% come with no further specification on maturity type. Average spread-to-benchmark of the debt notes at issuance in my sample is 336 BPS (with a standard error of 186 BPS) and coupons are oftentimes paid on a floating basis. Average credit ratings of these high-yield instruments are ranging from BBB (Standard&Poor's and Fitch) to Baa3 (Moody's).

Secondary markets for SD, however, are still considered relatively illiquid in Europe, as I infer from the fact that subordinated bond prices are only rarely quoted by brokers.

3.3. Hypotheses

I will narrow the focus of my empirical work to testing the necessary condition for MD, the monitoring phase, and want to assess the risk perception and sensitivity of SD investors. This is to determine which accounting variables are significantly contributing to the spread of SD bonds. Finding significant evidence for risk-indicating variables explaining spreads would substantiate market monitoring by investors as discussed in section 2.4.1. The view that market efficiency is per se given should not be considered as self-evident in the banking sector according to Flannery (2001), especially when governments make use of guarantees, as discussed in section 2. The hypotheses reflecting my approach are formulated in the following way:

> Hypothesis 1 (H1): Spreads of subordinated bonds are significantly higher than spreads of senior bonds.
>
> Hypothesis 2 (H2): External credit ratings have significant influence on SD spreads, investors perceive the risk of default assessed by external rating agencies.
>
> Hypothesis 3 (H3): Key accounting ratios have significant influence on SD spreads. Investors perceive and price key risk derived from leverage, profitability, asset quality and liquidity.

Whereas H1 and H2 can be tested with decent effort, H3 requires more intense dedication to data collection and modelling and constitutes my main work. It should be noted that H1 is rather an auxiliary test, necessary because my further regressions only test subordinated bond spreads solely and not relative to senior debt. A comparison of both groups of debt would be feasible but harder to implement, given a lack of data and time constraints. If I accept H1, as I expect per definition, it can be inferred that subordinated bonds are high-yield bonds. This potentially makes them more sensitive to risk and SD is thus an adequate instrument for MD. H2 and H3 will then be testing spread sensitivity of subordinated bonds towards either ratings or accounting measures.

Furthermore, it is important to note that my analysis will not be able to render a differentiated answer to the question

how higher spreads influence a bank's reaction on asset composition and risk management decisions. To test for this type of market influence, one can inverse the spread relation and regress asset composition on spreads (Nguyen, 2013).

3.4. Methodology and data

Regarding H1, Welch's t-test is applied to test the null-hypothesis that the group of senior bonds and subordinated bonds have equal means. Welch's t-test is used instead of Student's t-test due to the different sample sizes across each rating group and unequal variances across samples. Filtered for available spread data, my analyzed sample includes 680 subordinated and senior bonds issued from 2007 to 2017. Data is retrieved from Thomson One/SDC Platinum by filtering the payment rank for subordinated bonds (excluding flags containing 'senior', such as 'subordinated senior bonds') and senior bonds (excluding flags containing 'subordinated', respectively). Cardinalized Moody's ratings (see Table X in the appendix) are normalized to a scale from 1 to 10 and thereby clustered in groups to facilitate interpretation. To be able to compare groups of homogeneous bonds, I test for the difference in each rating class. Only classes 1 to 6 are comparable here, lower rating classes are only populated by subordinated bonds or do not present sufficient observations.

To examine the influence of ratings (H2), I will run a simple OLS regression from equation (1), my dependent variables being Moody's and Standard & Poor's rating.

$$SPREAD_j = f(\text{S\&P Rankings}_j \vee \text{Moody's Ratings}_j) \quad (1)$$

A panel regression with ratings would require time-series data instead of static ratings only available. Furthermore, ratings are only adjusted annually (if ever) and changes seem to be too small to be relevant, which makes them a less suitable variable for a panel regression. Filtered for availability of spread data and of ratings, the sample analyzed includes 360 subordinated bonds issued from 2007 to 2017. Ratings, also retrieved from Thomson One/SDC Platinum and Bloomberg, are cardinalized (see Table X in the appendix) and normalized to a scale from 1 to 10 to facilitate comparison between rating agencies.

Regarding H3, testing the sensitivity of SD spreads towards risk factors, a wide variety of studies (see section 3.1) relies on cross-sectional time series models (panel regressions). Studies using this model are evaluating how risk measures of a bank, regarding the quality of the loan portfolio and other accounting data (e.g. capital ratios, leverage, profitability, etc.), can explain the risk premium to assess to which extent SD investors are risk-sensitive to available information. My methodology follows the well-accepted and widespread approach presented in Sironi (2003). I will give an updated review of his evidence from 2003 for European banks and use a wider set of variables to explain the spread.

The model is specified as follows with each observation i for a specific bank and year:

$$SPREAD_j = f(RISK_j) + \epsilon_j \quad (2)$$

RISK is a measure of (default) risk which should be perceived by investors depending on (book) accounting values.

$$RISK_j = f(\text{Leverage}_j, \text{Profitability}_j, \text{Asset Quality}_j, \text{Liquidity}_j) \quad (3)$$

For the dependent variable (SPREAD), three different specifications apply:

SPREAD (prim): These are primary market spreads (to benchmark), extracted as transaction information from all available deals from Bloomberg and Thomson One/SDC Platinum. Static spreads at issuance are aggregated for each year and bank to allow for a cross-sectional analysis. As actual transaction prices (instead of quotes by brokers on secondary markets), they provide a genuine view of the bank's cost and are better observable than secondary market spreads.

SPREAD (sec): I collected daily secondary market spreads of about 700 traded instruments (the other 1000 bonds not quoting prices) from Bloomberg and aggregated them on an annual basis for each bank.[5] Erroneous observations due to wrong quotation (e.g. extremely large spreads) and negative spreads are cleaned from the dataset.

ΔSPREAD (sec): Calculated from SPREAD (sec) as the approximated relative annual change for year t, which should provide results independent of the spread level.

$$\Delta SPREAD(sec) = ln(\frac{SPREAD(t)}{SPREAD(t-1)}) * 100 \quad (4)$$

For the independent variables, serving as risk measures (RISK), I started testing the specification from Sironi (2003) but added own variables to test a wider variety of specifications. The presented specifications on the choice of independent variables result from iterative approaches maximizing the significance level for each variable. The bank-specific accounting data stem from Thomson Reuters DataStream. Independent variables are standardized to their standard error. Being aware of the conditions and caveats of such standardization, I will apply it for better interpretation of the magnitude.[6] The sample is sufficiently large and my explanatory variables are approximately normally distributed. A description of all variables is presented in Table IV in the appendix, together with Table V explaining the expected sign of the explanatory variables chosen. For a sample summary and correlation matrix, see Table VI and VII in the appendix. From the latter, I conclude that correlation within the sample is reasonable and does not distort my regression to great extent.

[5] The first attempt to gather traded spreads focused on meticulous own work compiling a list of representative and comparable individual subordinated bonds in terms of amount issued, currency and maturity date. However, I found that this sample is not representative and only found weak significance in later regressions.

[6] Standardization generally requires sufficient sample size, normal distribution of variables and ignores different standard errors between clusters (here: banks).

The Hausman test suggests fixed effects as the most efficient model for my panel regression. A test indicating heteroscedasticity for my data leads me to use robust standard errors in the model. Furthermore, after running an adequate statistical test, time-fixed effects are implemented as an alternative specification, which render more significant results and notably higher explanatory power. F-tests are used to determine if the coefficients are jointly different from zero.

My panel covers the period from 2007 to 2016 for a sample of 30 large EU banks and 2 large Swiss banks. Size is being measured in terms of total assets; the sample further includes the largest issuers of SD not present in the list of largest banks. See Table IX in the appendix for the list of sample banks.

The impact of sample selection bias for the sample period and entities should be limited due to various reasons: First, a surge in issuances already began around the years around 2005/2006 due to new Basel II regulation emphasizing MD. Second, big mergers across my sample banks were not frequent. Third, the presence of survivorship bias should be limited. The constituent's list of the largest European banks did not vary significantly, except for German public banks (various 'Landesbanken' and DZ Bank), vanishing from the list. Since those banks enjoy explicit guarantees, their exclusion does not harm my results for the sample of private banks.

3.5. Results and implications

Regarding H1, I find that subordinated debt (in contrast to senior debt) exhibits a significantly higher spread level, ranging from 50 to 120 basis points ("BPS") and a higher variation of spread level by looking at the standard errors. See Table 1 on the next page for the overall results of Welch's t-test. SD can thus be an adequate measure for exercising MD since investors are exposed to generally higher risk (measured by spreads).

From Table 1, one might observe that spread levels are generally rising along higher rating classes, however, I did not test for significance of this relationship so far. The test for H2 in Table 2 on the next page delivers results to this question. I can accept the hypothesis that credit ratings have significant impact on primary market spreads. Spreads for bonds with a lower/worse credit rating class increase significantly for each rating class.[7] For S&P ratings, starting from the non-significant intercept close to 0 BPS, spreads significantly increase by approximately 80 BPS per rating class. For Moody's ratings, starting from the significant intercept at 46 BPS, spreads significantly increase by approximately 60 BPS per rating class. I conclude that rating agencies play a vital role in providing information to SD holders in primary markets. There exists a clear and sensitive relationship between rating classes and spread level.

Interpreting the panel regression linked to H3, I find that market participants are well-aware of different risk profiles across banks over time and price this observed risk on primary and secondary markets for SD bonds. Results presented in Table 3 (and Table VIII in the appendix for a model without time-fixed effects) can be read in the following way: A change of the explanatory variable by one standard deviation (due to standardization) leads to an increase or decrease in spread levels measured in BPS (SPREAD) or to an increase or decrease in the relative change of spread measured in percentage points (ΔSPREAD).

Summarizing the most relevant results of the time-fixed effects regression in Table 3, based on significance levels of 1% or 5% and on high magnitude, I find the following: Specification (1) in Table 3 reports the spread level over time, peaking in 2012. For specifications (2) to (4), with a change of standard error by one unit, return on assets decreases spreads by 120 BPS. Equity to capital increases spreads by 225 BPS, loan loss reserves decrease spread by 360 to 620 BPS and provision for loan losses increases spreads by 130 to 225 BPS. Loan losses to loan loss reserves decrease spreads by 110 to 200 BPS. Non-performing loans to equity increase spreads by 400 to 715 BPS. Total loans to total capital unexpectedly reduce spreads by 160 to 175 BPS. Interest coverage ratio increases spreads by 60 BPS. The change in spreads (ΔSPREAD) from specification (5) decreases unexpectedly with non-performing loans to total loans by 15 percentage points ("PPS").

Without time-fixed effects, I observe loss in explanatory power, reflected in lower levels of the coefficient of determination (R^2). These results are therefore only reported in in the appendix in Table VIII. I then find that (with a change in standard error by one unit) return on assets decreases spreads by 90 to 200 BPS, leverage decreases spreads by 225 to 290 BPS, equity to capital decreases spreads by 160 BPS and loan loss coverage increases spreads by 40 to 45 BPS, just as provision for loan losses increases spreads by 155 BPS. Non-performing loans to loan loss reserves increase spread by 150 to 170 BPS. Cash and securities to current debt portion decrease spread by 90 to 170 BPS. ΔSPREAD rises for a change in standard error by one unit with return on assets by 23 PPS, with equity to capital by 14 PPS, with provision for loan losses by 28 PPS, with non-performing assets to total assets by 150 PPS. It falls with loan loss reserves by 85 PPS, with non-performing loans to total loans by 36 PPS (unexpectedly) and with total loans to total assets by 105 PPS (also unexpectedly). ΔSPREAD also rises with the ratio of cash and securities to total deposits by 65 PPS. The inverse and overly high magnitude of non-performing loans to total loans and to equity should be omitted due to high correlation of 0.85 One should notice, however, that the explanatory power measured by R^2 is very low for the specification of the model with ΔSPREAD.

Based on this regression, I can say that many accounting variables are found to be with significant influence and magnitude to the spread level or the relative change in spread level. Some interaction variables from previous studies (Sironi, 2003) linked to leverage, ROALEV and LLRLEV, do not matter as risk variables to spreads in my regressions.

[7] Cardinalized and normalized on a scale from 1 to 10 with 10 being the worst rating class.

Table 1: Welch's t-test for difference between subordinated and senior bond spreads
Table 1 reports the results of Welch's t-test, testing for a significant difference in means of spread levels between subordinated and senior bonds. Dependent variable SPREAD (prim) are spreads to benchmark at issuance. The bonds are clustered in six rating classes obtained from the cardinalized Moody's ratings of the issued instrument. Moody's ratings are chosen because the border to non-investment grade lies just between rating class 5 and 6 which does not distort the means; Standard errors in parentheses; Significance level for difference: *** p<0.01, ** p<0.05, * p<0.1

	SPREAD (prim)					
Rating Class	1	2	3	4	5	6
Bond Group						
Senior	41.46	130.5	95.93	193.1	249.4	417.0
	-7.578	-8.437	-4.409	(25.75)	(18.78)	(37.61)
Subordinated	162.4	180.6	211.5	239.0	311.1	407.6
	(22.50)	(12.94)	(16.57)	(17.12)	(16.01)	(24.02)
Combined	50.47	155.0	142.6	225.7	291.3	409.4
	-7.901	-7.850	-8.446	(14.36)	(12.71)	(20.60)
Difference	120.9***	50.13***	115.6***	45.92*	61.76***	9.355
	(23.75)	(15.45)	(17.15)	(30.92)	(24.68)	(44.63)
N (Senior)	87	101	96	25	33	7
N (Subord.)	7	97	65	61	70	31
N (total)	94	198	161	86	103	38

Table 2: Standard OLS regression of spread on credit ratings
In Table 2, I test for the relationship between credit ratings and the spread to benchmark at issuance for subordinated bonds, SPREAD (prim), in two different OLS regressions for each rating agency. Ratings are cardinalized (see Table X in the appendix) and normalized on a scale from 1 to 10 to allow comparison between the two different rating agencies; Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1;

Variables	SPREAD (prim)	
	Standard&Poor's (1)	Moody's (2)
Rating	83.93***	58.78***
	(6.824)	(4.271)
Constant	0.309	45.91**
	(22.26)	(17.74)
N	360	355
R^2	0.297	0.349

This insignificant relationship might be explained by the fact that I use book values instead of market values for equity and debt. Some results are unexpected, conflicting with the expectations from Table V in the appendix and should receive more attention in future research.

Implications from my results are that investors can discriminate between different risk levels in banks and are especially sensitive to return on assets, leverage, asset quality (non-performing loans to equity), provision for loan losses and loan loss reserves. Despite high significance of my findings, the standard errors are relevant in size, meaning that the effects can differ between banks. Furthermore, primary market spreads seem to be with higher significance compared to secondary market spreads, other specifications of SPREAD (sec) are not reported due to low significance.

Beyond the scope and beyond natural constraints my thesis is subject to, it would be feasible and interesting to analyze some aspects in more detail. My methodology could be extended to cover a larger sample and a longer time horizon. Furthermore, one could use market values for some variables such as leverage, adjust time intervals (quarterly data, if available) and lag these explanatory variables to investigate timeliness of the relation. Considering the specification of my model, further extensions could include aggregated ratings as a time-series and any other variables that could serve as risk indicators. To attain an optimal model, one should systematically choose variables, for example by applying Davidson-Mackinnon P-test. Furthermore, I would advise testing the difference between small and big banks (based on total assets) to uncover implicit guarantees.

4. Conclusion

In this thesis, I reviewed the concept of market discipline exemplified by subordinated debt in the context of European regulation after the financial crisis.

By analyzing the channels of market discipline, I highlighted the relevant conditions for effective market monitor-

Table 3: Linear, time-fixed effects panel regressions of spreads on accounting variables

Table 3 reports the OLS regression results of my panel over the sample period from 2007 to 2016. Dependent variable is the mean of primary and secondary market SPREAD (measured in BPS) and change in SPREAD (ΔSPREAD, measured in percentage points) for each SD-issuing bank for each calendar year. Explanatory variables are reported in Table IV and summarized statistically in Table VI. Independent variables are standardized to their standard error. Estimation method is "fixed effects" augmented with time-fixed effects. Standard errors are set to be robust. Observations with high magnitude and significance at 5% level are highlighted in bold. F-test statistic for common significance of coefficients is not reported, however, the test is significant for every specification at the 1% level.; Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1;

Variables	SPREAD (sec)	SPREAD (prim)			ΔSPREAD (sec)
	(1)	(2)	(3)	(4)	(5)
ROA		-116.4**	-124.5**	-118.6**	9.640
		(41.29)	(47.77)	(47.00)	(7.058)
LEV		-84.60*			
		(41.16)			
EQ			231.9***	223.8***	9.669*
			(39.58)	(48.78)	(4.901)
LLR		-365.9***	-358.3***	-617.3***	
		(124.5)	(105.3)	(184.7)	
PROVLL		132.6**	201.2***	225.3***	18.64*
		(58.41)	(64.32)	(57.27)	(9.620)
LLtoLLR		-118.9***	-112.2***	-203.4***	-7.671*
		(25.67)	(19.93)	(63.39)	(3.986)
NETLL				89.57	
				(62.27)	
NPLtoE		443.4***	403.4***	715.5***	
		(134.7)	(117.5)	(169.7)	
NPLtoTLO					-15.81***
					(5.182)
TLOtoTCAP		-40.67	-159.9***	-175.5***	
		(23.60)	(26.62)	(34.84)	
INTCOV				58.73***	
				(15.43)	
2008	146.0***	5.660	21.09	-17.50	
	(14.47)	(77.95)	(77.89)	(77.95)	
2009	363.9***	207.3***	95.54	82.19	-49.76***
	(35.24)	(66.52)	(109.0)	(108.4)	(9.356)
2010	181.0***	-40.39	-150.2	-141.8	-150.7***
	(29.69)	(109.4)	(101.1)	(116.4)	(11.50)
2011	519.5***	223.4	121.3	173.6	-24.38**
	(88.54)	(166.7)	(171.6)	(142.3)	(9.383)
2012	736.9***	287.0**	226.9**	277.7**	-68.86***
	(107.9)	(114.9)	(100.9)	(112.6)	(11.35)
2013	358.2***	126.6	58.42	49.67	-125.5***
	(44.28)	(100.6)	(82.63)	(90.65)	(10.79)
2014	176.6***	-109.9	-176.1**	-152.1**	-122.7***
	(22.19)	(87.27)	(67.10)	(64.92)	(14.55)
2015	206.5***	-206.5*	-310.7***	-317.8***	-70.73***
	(32.14)	(110.0)	(89.51)	(81.71)	(15.15)
2016	260.8***	-192.1*	-242.7**	-293.8***	-77.80***
	(31.50)	(102.8)	(87.37)	(79.46)	(17.09)
Constant	105.3***	448.8***	491.1***	517.8***	89.32***
	(28.16)	(72.28)	(59.31)	(65.12)	(6.344)
N	265	64	64	63	144
R^2	0.366	0.340	0.201	0.165	0.665

ing and market influence, in brief: sufficient transparency and disclosure, no guarantees for bail-out and efficient capital markets. I gave an overview over the conditions for subsequent market influence, namely credible action (indirect influence), sizeable cost effects (direct influence) and adequate incentive structures. My literature review points out that spreads of subordinated bonds can possibly reflect the risk profile of banks and be implemented on a mandatory level along current regulation.

Complementing the current literature on the monitoring phase of market discipline, my empirical results contribute to the discussion about the sensitivity of subordinated debt instruments to bank risk. The main conclusions emerging from my own empirical work are as follows: Firstly, subordinated debt exhibits a significantly higher spread level of 50 to 120 BPS in contrast to senior debt and is potentially an adequate instrument for MD. Secondly, rating agencies play a vital role in providing information to subordinated debt investors in primary markets and there exists a highly sensitive relationship between an instrument's rating class and its spread level, ranging from 60 to 80 BPS per rating class (for ratings up to class 6 on a scale from 1 to 10). Thirdly, market participants are well-aware of different risk profiles across banks and price this difference on primary and secondary debt markets for subordinated bonds. Many accounting variables are found to be with significant influence and high magnitude to the spread level or the change in spread level. Spreads are significantly sensitive to ROA, equity to capital, loan loss reserves, provision for loan losses and nonperforming loans; each to notably more than 100 BPS per standard error of change in the explanatory variable.

These insights have important implications regarding the future use of subordinated debt as a regulatory measure in Europe. Yield spreads might serve well as a market based risk indicator, supplementing book ratios and ratings, and could influence banks' risk decisions directly and indirectly. Given the positive findings on the monitoring phase of subordinated debt, most of the recent literature points towards the common sense that regulators should perceive the potential of subordinated debt and actively incorporate it into their framework.

The European market for subordinated debt is already sizeable with total issuances of EUR 326bn, USD 204bn and GBP 45bn in the years from 2007 to 2016. Although declining lately, it could be growing substantially if mandatory proposals are implemented by regulators. Such mandatory subordinated debt proposals are widely discussed in research, without coming to implementation in national or supranational frameworks yet. Future role of market discipline by subordinated debt will be determined by viable approaches and subject to regulators' decisions. From a European, but also from a global perspective, a common framework seems unavoidable and common standards indicating the payment rank would be desired to raise transparency.

Open questions emerging from my thesis provide avenue for further research. It would be crucial to reassess whether there is an optimal (minimum) level for shares of subordinated debt. Future research might then wish to explain how the feedback of spreads influences bank managers and risk-taking exactly in extended moral hazard models. We still do not fully understand how banks incorporate higher spreads on subordinated debt markets into their behavior and how TBTF guarantees interfere with a reaction. Therefore, the role of implicit TBTF guarantees (or 'no bail-out' clauses vice versa) should be further discussed in their effect on subordinated debt spreads. This becomes especially crucial in the European Banking Union when member countries are deviating from commitments.

Concluding, I can say that the question motivating this thesis was convincingly answered with sufficient evidence for market discipline regarding the monitoring phase. Future regulation on bail-in capital in Europe should seek to adopt subordinated debt into their framework.

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