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DIPLOMOVÁ PRÁCE

Bank Subordinated Debt and Market Discipline in Europe

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Prohlášení

Prohlašuji, že jsem diplomovou práci vypracovala samostatně a použila pouze uvedené prameny a literaturu.

V Praze, 30. června 2008:

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Poděkování

Na tomto místě bych ráda poděkovala Mgr. Magdě Pečené, Ph.D. za vedení mé práce a za cenné připomínky.

Zvláštní poděkování patří mé rodině a přátelům za jejich podporu po dobu mého studia.

Abstrakt

Tato práce analyzuje podřízený dluh bank (tzn. podřízený dluh vydaný bankami) z hlediska jeho využitelnosti pro posílení tržní disciplíny v bankovnictví. Práce je zajímavá ve dvou ohledech. Za prvé se věnujeme evropskému bankovnímu sektoru, zatímco většina výzkumu se vztahuje k americkému bankovnictví. Za druhé se práce soustředí na přímou tržní disciplínu (kontrola trhu nad výší bankami podstupovaného rizika), kdežto v popředí současného výzkumu je nepřímá tržní disciplína (schopnost trhu poskytovat signál o finanční situaci bank). V této práci se testuje, zda velké evropské banky byly v období 2001-2006 vystaveny přímé tržní disciplíně. Nakonec je diskutován návrh, jak utužit přímou tržní disciplínu v evropském bankovnictví a jaké jsou možné náklady této politiky.

Abstract

This paper attempts to analyze bank subordinated debt (i.e. subordinated debt issued by the banks) from the perspective of its ability to increase market discipline in banking. Doing so, we departure from the prevailing literature in this field in two regards. First, we focus on the European banking sector while majority of the research has been devoted to the US banking. Second, the paper concentrates more on direct market discipline (market control of banks' risk-taking) whereas majority of the current research deals with indirect market discipline (market signalling of bank's financial situation). We empirically test wheather the large European banks were subject to direct market discipline during the period 2001-2006. In the final part, we discuss a proposal designed to increase direct market discipline in Europe and possible costs of this policy.

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1. Introduction

Banking is one of the most regulated industries. This is so, because it is widely believed that banks are somehow more fragile than other firms in the economy. This fragility stems from the specifics of the banking business, such as high debt-to-asset ratio, term mismatch of the assets and liabilities or asymmetric information. Further, it is believed that the banks are interconnected among themselves and thus the failure of one bank may endanger its banking partners. Also the banks impact the performance of the whole economy and thus the problems faced by the banks are likely to spill over to other sectors.

Over the time, there have evolved two prominent ways how to cope with the systemic risk in banking. The first are the capital adequacy rules embeded in Basel I and now substituted by Basel II. The key role of the capital adequacy rules is to set the clear link between banks risk profile and its capital need, i.e. to create capital cushion that would absorb bank's unexpected losses with greater ease. The second arrangement is the capital safety net, more particularly explicit deposit insurance. However, while on the one hand the deposit insurance is to increase credibility of the banking sector, protect depositors and decrease the likelihood of the bank run, the common objection against it is that it introduces moral hazard and hampers market discipline.

The key question rised here is how to discipline the banks under the explicit deposit insurance system. In this thesis, we analyze the ability of the subordinated debt issued by the banks to strenghten market discipline in banking. The instrument appears convenient for this task thanks to its payoff profile, i.e. it is a risk-sensitive investment tool whose costs for the bank decreases along with the expected earnings and increases in expected risk. The concept is based on the mandatory subordinated debt policy which compels large banks to issue standardized bank subordinated debt with sufficient frequency so the investors and regulatory authority can continuously observe the prices, extract the information about bank's risk, evaluate it and take prompt and adequate measures.

The goal of the thesis is to describe the European market for bank subordinated debt, examine what currently stands behind the decisions of large European banks to issue subordinated debt and assess wheather the mandatory subordinated debt policy is appropriate in the European context and if so, how should be designed. It should be highlighted that in the text, we will refer only to the banks from EU member countries before the enlargement in 2004 (EU15 banks). The restriction is made to reasonable limit

the sample range and in the same time include large and established banks which already have experience with subordinated debt issue. The structure of the thesis is as follows:

Chapter 2 will be devoted to the specifics of the banking industry and its systemic risk. We also focus on the pitfall of explicit deposit insurance and stress the role of market discipline in banking.

Chapter 3 defines the concept of bank subordinated debt and mandatory subordinated debt policy. The emphasis is put on the payoff profile of the subordinated debt and difference between mandatory and voluntary subordinated debt issue.

Chapter 4 reveales the relation between bank subordinated debt and market discipline. The relation is explained via option pricing theory. Pricing model in simple setting without bankrupty costs and in the modification with bankruptcy costs is employed.

Chapter 5 first analyses European market for subordinated debt and then develop the model for large European banks to issue subordinated debt. The discussion about the presence of market discipline exercised via subordinated debt issue decision is at heart of the chapter and the following hypothesis will be tested:

Hypothesis 1: Decision of large European banks to issue subordinated debt was subject to the direct market discipline in 2001-2006.[1]

Finally, chapter 6 addresses the potential for mandatory subordinated debt policy in the European context.

[1] Direct market discipline is defined in section 2.3.

2. Market discipline in banking

‚Although banking may be more fragile than other industries, this does not imply a higher breakage or failure rate. Rather, greater fragility implies "handle with greater care," much as it does with glass and porcelain objects.‘

H. Kaufman, 1996

2.1 Bank's Capital Structure, Systemic risk and Regulation

Capital structure of a company is a mixture of different types of securities (equity, debt or hybrid instruments) through which the assets are financed. There is enourmous number of capital structure combinations and thus the main task is to find the one maximizing market value of all securities under given conditions faced by the company. The usual starting point of financial theory is the *Modigliani-Miller theorem* proposed by Franco Modigliani and Merton Miller in 1958. The theorem states that under the assumption of perfect markets, the financing choice between debt and equity does not affect the value of a company and capital structure is not uniquely determined. However, in real world, there exist deviations from the perfect markets which bring the question what happens if the assumptions of perfect market are released. There are many compeating corporate finance theories which aspire to clarify how the company's optimal capital structure is decided. Myers (1984) confronts two models of capital structure. The first is a *static tradeoff* framework, in which the company, based on marginal costs and benefits of debt financing, sets a target debt-to-asset ratio and then moves towards it. The second is *pecking order* framework, which is based on the assumption that the company prefers internal (e.g. retained profit) to external financing (debt and equity), and further prefers debt to equity if it issues securities. There is no well-defined target debt-to-asset ratio. In contrast to these two models, Baker and Wunrgler (2002) introduced *market timing hypothesis*. The theory states that there is no a priori capital structure but rather it evolves over time based on the company's past attempts to time the equity market. Thus, market timing financing decisions accumulate over time into particular capital structure outcome.

To see the specificity of bank's capital structure, we follow up with the static tradeoff (Myers, 1984). This is so, because first, it determines the optimal capital structure, second,

it enables to incorporate various market imperfections. In this framework, there exist two important deviations from perfect market, those are taxes and bankruptcy costs.[2] Let's suppose that the interest paid from debt is tax-deductible expense. Therefore, taking on more debt lowers the tax paid and provides the company with a tax shield. On the other hand, increasing debt raises the probability of default and thus expected bankruptcy costs. These costs are direct (e.g. costs on court proceeding and lowyers in case of bankruptcy) and indirect (e.g. loss of credibility, loss of certain business opportunities). The company's optimal debt-to-asset ratio is determined by the benefits of debt financing and their costs, i.e. the benefits from tax shiled and the cost of bankruptcy. The marginal benefit of further increase in debt declines as debt increases, while the marginal cost increases. The company sets the optimal debt-to-asset ratio to a level where the marginal benefit from the tax shield and marginal cost of bankruptcy equal.

How does the banking sector differ from the general case described above? [3] The answer emerges when taking into consideration three facts. First, a bank is a financial intermediary in particular. Its business is based on generating large pool of money from depositors. The depositors usually prefer high liquidity and thus they are willing to accept a lower interest rate for its claims. Due to this, banks commonly face lower marginal costs of (short term) debt than other companies (Bichsel, Blum, 2005). They have rationale to take on more debt and their debt-to-asset ratio is higher than in the companies from other sectors of the economy. Second, the proceeds gained from the depositors are invested in granting loans with longer maturities. This results in a 'term mismatch' and exposes the bank to the inherent liquidity risk (Diamond and Dybvig, 1983). Third, there is asymmetry of information between bank and its depositors, investors and supervisors about the quality of bank's assets and this may eventually and especially in case of depositors, give a rise to a wave of doubts about bank's asset management (Santos, 2000). This elevates the risk of a bank run. Unexpected deposit withdrawal may cause a severe problem for any bank. More importantly, the failure of a bank has potential to endenger the whole financial system and trigger broader harmful effects in the economy. This danger we call the *systemic risk* (Kaufman, 1996).

[2] Modigliani and Miller considered the tax deductible interest payments as well, first in 1958 and later in their corrected framework in 1963. The bankruptcy cost were first introduced by Baxter (Baxter, N., Nevins, D. (1967): ‚*Leverage, Risk of Ruin and the Cost of Capital,' Journal of finance 22*, September, 395-403).

[3] For the microeconomic explanation of the roles of banks in the economy, see e.g. Freixas and Rochet (1999): ‚*Microeconomics of Banking*,' Cambridge, MIT Press.

The systemic risk is the main argument to justify the bank regulation and supervision which has become a standard over the past two decades in the developed economies. The most prominent ways how to cope with the systemic risk in banking are capital adequacy rules embeded in Basel I, later in Basel II and bank's safety net. While the main aim of the former one is to regulate bank's capital so it is adequate to the risk undergone by the bank and the bank itself could cope with the unexpected losses with greater ease, the main aim of the safety net is also to promote the credibility of the banking sector but, in this case, via protection of the bank's depositors. In the followint text, we focus on the bank's safety net. While, at the very first glance, it can seem as a reasonable measure, the safety net faces the critique that it increses moral hazard and hampers market discipline in banking.[4,5]

[4] See e.g. Demirguc-Kunt and Kane, 2001.

[5] In this thesis, we focus on moral hazard problem and abstract from other negative externalities of the safety net such as adverse selection problem (inherent to any insurance) or the costs of insurance paid which result either in lower profitbility of banks or higher price of services offered by the bank.

2.2 Pitfall of Bank's Safety Net

Bank's safety net is a financial guarantee for a bank, which consists of three elements.[6] The first is a *deposit insurance* which is designed to protect deposits, in full or in part, in the event of a bank run. Next, there is a *lender of last resort* function, i.e. a provision of liquidity to the financial system by the central bank. The third is a *too-big-to-fail policy*. This means that the biggest banks in the economy are expected to be bail out in the event of failure. The guarantees may be implicit or explicit. Implicit means that there is no contract between the guarantor (government) and the bank, but the guarantor is expected to bail out the bank in case its failure should reduce the credibility in nation's financial system. Explicit guarentee is a formal commitment of the guarantor, usually in a form of the explicit deposit insurance.

The arrangement, however, has one strong weakness - the bank doesn't bear the full cost of the safety net and therefore it reduces its bankruptcy costs and thus it motivates the bank to take on more risk. Futhermore, thanks to the financial guarantee, bank's debt is perceived to be relatively secure which, on one hand, makes it cheaper, on the other hand, it increases the demand for it and thus it motivates the bank to take on more 'cheap' debt (Demirguc-Kunt, Kane, 2001). This describes so called *incentive problem* of the safety net, i.e. the bank's safety net is a source of moral hazard because it creates incentives for the bank to act more risky and discourages the depositors from monitoring the bank.[7]

We arrived to the point where the safety net in the banking sector seems twofold. On the one hand, it is a measure introduced by the regulators to protect banking sector from devasting effects of bank runs, strenghten stability of the financial sector, and hence the stability of the economy (McCoy, 2007). On the other hand, the costs of the guarantee are not fully borne by the banks, rather, in case the financial guarantor is government, the costs are paid by the taxpayers and thus the bank has incentive to behave more risky (Demirguc-Kunt, Kane, 2001). However, the presented trade-off between increased confidence in banking sector and moral hazard is not steadfast. While there is a broad consensus that implicit guarantees appear to increase the moral hazard problem, the explicit guarantees are supposed to be more incentive-compatible.[8] In the folowing text, we will focus first on the explicit deposit guarantees and incentive problem. Then, we

[6] Based on Sinkey (2002).
[7] Here we abstract from any incentive-compatible measures to see the heart of the matter.
[8] See, e.g. Gropp, Vesala (2004) or Calomiris (1997).

concentrate in greater detail on icentive-compatible features of the explicit deposit guarantees.

2.2.1 Explicit deposit insurance and moral hazard

As it was mentioned above, the implicit guarantees are source of the moral hazard in banking. As Gropp and Vesala (2004) emphasize, deposit insurance may reduce moral hazard only under condition that deposit guarantee leaves out non-deposit creditors and this is credible. Thus, the system is transparent and uninsured creditors have incentive to monitor the bank which reduces moral hazard.

So far, we highlighted the necessary condition to make all the guarantees explicit, transparent and credible because it contributes to solve the incentive problem. Nevertheless, this is not the end of a story. Still, there are two sources of moral hazard in the explicit deposit insurance system. First, explicit insurance system gives insured banks incentives to undergo more risk bacause they can accrue any profits and at the same time shift any losses to the deposit insurerer. Second, there is a concern that explicit deposit insurance system reduces incentives of depositors and shareholders to monitor (not only their) banks and consequently they will not demand adequate risk premiums (Demirguc-Kunt, Kane, 2001). McCoy (2007) stresses that moral hazard will exist as long as the total expected profits from a bank's assets exceed the explicit costs of deposit insurance and implicit costs of the regulation. So the question is – what else can be done to reduce moral hazard introduced by the explicit deposit system? The following text presents three measures which try to make explicit deposit insurance incentive-compatible.

2.2.2 Quelling moral hazard from the explicit deposit insurance

To curb the moral hazard introduced by the explicit deposit insurance, it is necessary to awake the depositors so they monitor the banks and consequently require an adequate risk premium which reduces banks' incentives to take on more risk. This may be achieved through various arrangements of the system (described in McCoy, 2007). The most common practices are to leave out some of the depositors or part of the deposited claims from the deposit insurance and left them without insurer's guarantee. Recently, there are also discussed so called risk-adjusted risk premiums.

The examples of the 'leaving-out' practices are widely used coverage limits and coinsurance. To the coverage limits first. The *coverage limit* is a maximum amount a

depositor can claim from the deposit insurer in the event of bank failure. Usually there are limits per account, per person or both. The advantage of coverage limit is, that it determines the potential liabilities under the system and also it influences the extent to which depositors' confidence can be promoted and sustained (IADI, 2007). Thus, we can create incentives compatible with reducing moral hazard (e.g. large creditors have their many at stake and thus have incentive to monitor the bank or leaving out interbank deposits creates incentives for bank's to monitor their peers (McCoy, 2007).

Now to the coinsurance - in the explicit deposit insurance framework, *coinsurance* means that the depositors are contractually required to bear a share of their bank's accrued losses when their bank fails (Demirguc-Kunt, Kane, 2001). The usual form of coinsurance is that the insurer covers only a fixed proportion of the deposited amount. However McCoy (2007) points out that this may increase the likelihood of bank runs because the banks are those who create the risk but the depositors are those, who pay for it. This may be partly resolved by imposing coinsurance only on large depositors who will have incentives to monitor the bank, while the small depositors remain fully insured.

Finally, we get to the risk-adjusted premiums. They represent an alternative to the flat premiums where all banks pay the same rate. The main idea of *risk-adjusted premiums* is, that the individual risk undergone by the bank should be reflected in its insurance premium. Thus more risky banks pay higher premiums than less risky ones. This means that the premiums force the banks to internalize the risk that they take (McCoy, 2007). Nevertheless, there are limitations. Santos (2000) argues that to eliminate the risk-shifting by the banks, the deposit insurance needs to be fairly priced. However, asymmetry of information (about the risk of bank's assets) may make the computation of fair premiums impossible or undesirable from a welfare point of view. He refers to the works of Chan, Greenbaum and Thakor (1992) and Freixas and Rochet (1995). Chan, Greenbaum and Thakor found that in the setting where there is asymmetry of information and the insurer offers a menu of contracts, each requiring the bank to hold a certain capital-to-assets ratio and charging it a given insurance premium per unit of deposits, it is generally imposible to implement incentive-compatible, fairly priced deposit insurance. Freixas and Rochet went even further and showed that under more general framework, fair pricing is feasible but it is not desirable from the welfare point of view. Their argumentation is based on Pareto improving cross-subsidies between banks.[9] McCoy (2007) discusses other limitations. She

[9] For detailed argumentation, see Freixas, X., Rochet, J. C. (1995): *'Fair Pricing of Deposit Insurance. Is it Possible? Yes. Is it Desirable? No.,* 'Mimeo, Universitat Pompeu Fabra, Barcelona.

argues that risk-adjusted premiums are better suited for the past and current risks, not fot the future risks. Insured banks than have incentives to undergone greater risk as soon as their premiums are announced. Another problem is how to measure the bank risk. Most commonly, capital adequacy and examination rating are used but they are not direct measures of bank risk. Risk-adjusted premiums are also exposed to subjective judgment and political manipulation. Despite these importat objectives, evidence shows that risk-adjusted premiums work better than flat-rate premiums and reduce bank risk-taking (Demirgus-Kunt and Kane, 2001). Following table 1 documents the application of three risk-reducing factors in selected European countries.

Table 1: Risk-reducing factors in European countries

Country	Limit per account/person	Coinsurance	Premium based on risk
Austria	Yes/Yes	No	No
Belgium	No/ Yes	No	Yes
Czech rep.	Yes/Yes	Yes	No
Denmark	Yes/Yes	No	No
Norway	Yes/Yes	No	Yes
Sweeden	No/ Yes	No	No

Source: World Bank database on Bank regulation and Supervision, 2007

2.2.2.1 Empirical evidence

There are currently 98 countries with explicit deposit insurance system in operation.[10] This number indicates that the deposit insurance has become an important feature of the modern banking architecture, despite the fact that the objections have not been fully mitigated. Demirgus-Kunt and Datragiache (2000) examined the effect of the explicit deposit insurance system on the sample of 61 countries worldwide in 1980-97. They found that the explicit deposit insurance tends to be detrimental to the bank stability, the more when the bank interest rates are deregulated and the institutional environment is weak. On the other hand, where institutions are good it is more likely that the refined system of regulation and supervision is in place to offset the lack of market discipline created by the explicit deposit insurance. They also showed, that the adverse impact tends to be stronger

[10] According to the International Association of Deposit Insurers, currently, there are 119 countries with a deposit insurance system in operation, pending, planned or under serious study (i.e. 98 in operation, 8 pending, 13 planned or under serious study).

the more extensive is the coverage offered to the depositors, and where the system is funded and run by the government rather than the private sector.

Gropp and Vesala (2004) tested the effect of the explicit deposit insurance on the sample of EU banks during the 90s and brought important insight concerning the ralation between the explicit deposit insurance and market discipline. They argue that if some market participants are credibly excluded from the safety net, it increases their incentives to monitor the banks and that the explicit deposit insurance may reduce the moral hazard. They also provide evidence that the banks with low market to book value of assets, high shares of uninsured liabilities and banks that are not too-big-to-fail respond to the market signal by changing their risk-taking behaviour, i.e. they are subject to the market discipline.

2.2.3 Market Discipline

In the previous part, we described why the banking sector is exposed to the systemic risk. Because of the systemic risk, there arised fears that letting the banks at the mercy of pure market discipline could bring negative externalities. In a situation when the market signal is nagative, this could trigger rumours (even false) about financial health of the bank and cause bank run with contagious effect. This is why the banking sector appears to be more vulnerable than other sectors of the economy and it is generally accepted that it desires special treatment, i.e. regulation. We focused on the role of bank's safety net which, on one hand, should strenghten the confidence in the banking sector and suppress systemic risk, on the other hand, is often criticized for increasing moral hazard and hampering market discipline which is essential for the efficient allocation of the resources. The situation seemed quite a vicious circle. But we also argued, on the example of coverage limits, coinsurance and risk-adjusted premiums, that it is possible (at least to certain extent) to break the circle by ‚preserving' the principles of the market discipline in the system.

Market discipline takes different forms through which may impose strong incentives on the banks to conduct their business safely and efficiently and thus market discipline reinforces bank regulation and supervison. One important source is a corporate governance structure, which enables to the shareholders to monitor the bank and ensure they get a return on their investment (McCoy, 2007). Another source of market discipline are market participants who monitor the bank to protect their investments. Their behaviour on the financial markets, i.e. buying or selling the bank's securities gives the information about the financial situation of the bank. There are also other market monitors such as uninsured depositors or counterparties in financial transactions such as swap and repurchase agreements (FRBS, 2002). However, in this thesis, we focus on specific group of market monitors - subordinated debtholders.

There are two types of MD: direct and indirect. *Direct market discipline (DMD)* refers to the control or influence all of the market participants have over a bank's behavior, including decisions on investment, financing, and operations (FRBS, 2002). DMD is exerted through a risk-sensitive financial instrument when a bank's expected cost of issuing that instrument increases substantially with an increase in its risk profile (BGFRS, 2000). DMD is exercised rather through debtholders than stockholders, because first, debtholders are more risk-sensitive and second, debt is issued on more frequent basis.

Indirect market discipline (IMD) means that the bank's securities are priced according to the information from the secondary markets which provide a signal of the bank's risk. This information must be extracted properly and constantly to reflect the bank's risk profile. This implies that when the market signals increase bank risk-taking, potential investors, uninsured claimholders, and other bank's counterparties will demand higher returns on other bank instruments or additional collateral to be further involved in the transactions with the bank. If the level of bank risk-taking signaled by the market exceeds certain level, the market participants may limit their supply of funds or refuse certain types of contracts with the bank (FRBS, 2002). These signals can be also useful for regulators to assess the bank's risk level and take corrective measures before it gets too late (BGFRS, 2000).

The potential benefits of the market discipline (MD) were recognised and embeded in the Basel II, specifically in the Third Pillar.[11] The document calls for the development of the disclosure requirements that would allow market participants to assess key pieces of information on the scope of application, capital, risk exposure, risk assesment proceses, and hence capital adequacy of the institution (BCBS, 2004). Undoubtedly, recognizing the importance of MD is very beneficial. It is also true that timely and adequate disclosure is essential for enhancing MD. However, the document is criticized (e.g. by the European Shadow Financial Regulatory Committee)[12] that it still draws little attention towards it and didn't introduce any measures that would impose greater MD on the banks.

The rest of the thesis is devoted to the topic of enhancing MD in banking with focus on European setting. We pay all our attention solely to one market instrument through which both, DMD and IMD, can be exercised. This instrument is a subordinated debt issued by the banks.

[11] The purpose of the Third Pillar is to complement the minimum capital requirements (First Pillar) and the supervisory review process (Second Pillar).

[12] European Shadow Financial regulatory Committe was created in 1998 by the group of European professors and other independent experts in the fields of banking, finance and the regulation of financial institutions and markets. Its aim is to follow and analyse the existing and evolving regulatory framework for financial institutions and markets. It is fully independent of the providers, regulators and supervisors of financial services (from the official website).

3. Concept of Bank Subordinated Debt

3.1 Definition of bank subordinated debt

In finance, *subordinated debt (SD)* is defined as a liability that is either unsecured or has a lower priority than other claims (senior debts) on issuer's assets. If an issuer is liquidated, then subordinated debtholders will only be paid after senior debt has been fully paid off. It means that subordinated debt is more risky and this is reflected in its price - it should have a higher yield than senior debt from the same issuer.

Subordinated debt is a very flexible financing tool because on condition that the investor gets his expected yield, he is usually willling to adjust the terms of contract to meet the financial needs of the issuer. This implies that SD is quite heterogenous debt instrument which exists in many forms and the particular arrangements of the contract may differ issuer to issuer. Besides the advantage of SD flexibility, there are other benefits of using this mode of financing. Next merit is that SD strenghtens capital position of the company in the eyes of senior debtholders (this is important in banking). Another positive attribute is that SD holders do not usually seek for control in the company (unlike shareholders) but may bring new insights (the providers of SD are usually large and sophisticated investors with great experience). From the company's perspective, SD may be an appropriate financing strategy when the senior lenders are not willing to advance sufficient funds but the key disadvantage is that SD is significantly more expensive than senior debt and it is risk-sensitive, thus higher-risk projects are much more expensive to finance.[13]

This thesis is dedicated to the subordinated debt issued by the banks. As mentioned above, SD is very heterogenous financial instrument and it complicates the analysis. Thus, for the sake of analytical simplicity, we use definition widely applied by the SD researchers. *Bank subordinated debt (BSD)* is a fixed-income financial instrument that is both unsecured and subordinated to all other obligations of a bank. Unsecured means that there are no underlying assets of the bank that can be claimed by the holder in the event of bankruptcy. Subordinated implies that all other creditors receive a priority on claim

[13] Here, the author summarized the information provided in Levine (1995).

(including the deposit insurer) if the bank is liquidated.[14] This definition suggests that holding BSD is more risky than holding other bank senior debts. This difference is often captured by rating of the issues bacause BSD issues tend to have lower rating than senior debt issues. Table 2 indicates the lag of the issue rating behind the issuer rating of European banks in 1991-2000.

Table 2: Moody's issuer and issue ratings at launch of European banks in 1991-2000

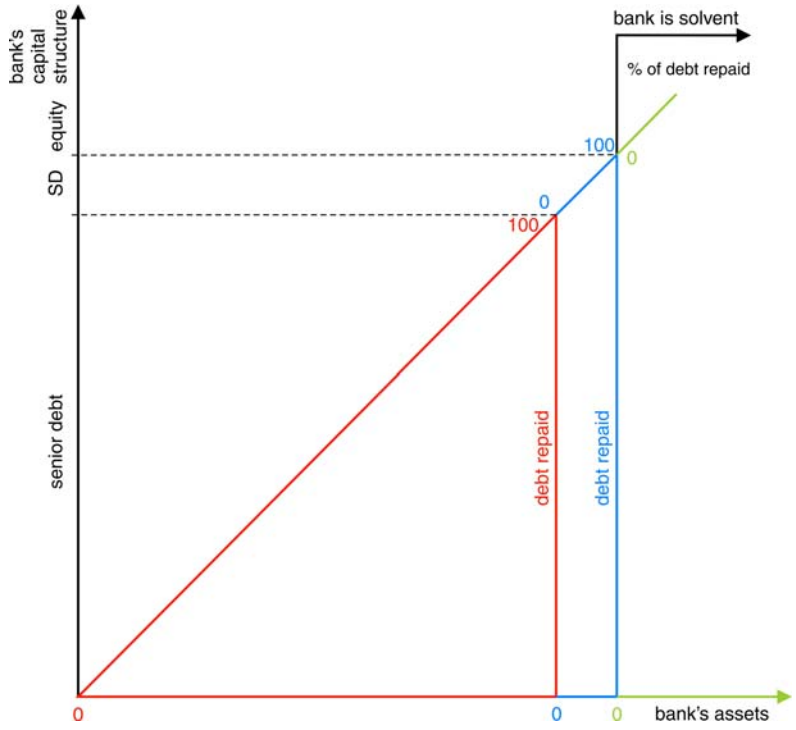
Rating class	AAA	AA+	AA	AA-	A+	A	A-	BBB+	Total
Issuer (No. of issues)	36	68	69	62	16	38	1		290
Issue (No. of issues)	17	40	45	73	43	34	34	4	290

Source: Sironi, 2000

Important feature of BSD is its payoff profile, which was recently described e.g. in Levonian (2000) or Nivorozhkin (2001). To get the idea, let's assume that a bank has three sources of capital: senior debt (depositors and general creditors), BSD and equity. While senior debt is secured and paid off first up to the fixed amount agreed beforehand, BSD is a contingent claim which is paid after senior debt and thus bears higher risk of defualt exchanged for higher yield. However, neither senior debtholders nor BSD holders participate on the bank's profits that are higher than their original claims. On the other hand, equity is a residual claim which can be paid only if both tranches of debt were repaid, but the equity holders capture all the profits generated by the bank that exceed the previous two claims. From these different payoff structures, there arises key difference between BSD and equity. Figure 1 depicts the payoff structure of the contingent claims.

[14] Definition of BSD taken from Caldwell (2005).

Figure 1: Bank's capital structure and payoff of particular claims



Source: Authors's depiction based on Levonian (2000)

3.2 Mandatory subordinated debt policy

In the context of banking, literature discusses channels through which BSD can contribute to increase MD. The concept which tries to incorporate the positive effects of BSD into one framework is called *bank subordinated debt policy (BSDP).* BSDP is thus a set of measures that attempt to discipline bank risk-taking under the deposit insurance framework and in this sense, it can be percieved as a supplement tool for bank regulation and supervision.[15] The policy is based on the *bank mandatory subordinated debt (BMSD)* which is a requirement that compels large banks to issue and maintain a minimum level of this debt.

To continue, we follow up with the section 2.2.1 from the previous chapter where we concluded that the problem bloated with the introduction of the explicit deposit insurance system.[16,17] Bank depositors know that their deposits are guaranteed and have little incentive to demand a higher return that would cover the actual risk undertaken by the bank. Thus insurance deposit system effectively decreases bank's exposure to the market pressure and leave the room for moral hazard. The proponents of BSDP argue that, under certain prerequisites, there exist market machanisms through which this policy can augment the allocation efficiency of the investors, banks and supervisors in the banking sector.[18] For example Haubrich (1998) argues that, if there was BMSD issue and the financial market priced BSD according to the bank risk profile reflected in the size of the credit spread (calculated as difference between the yield on a bank subordinated bond and risk-free bond of the same maturity), increasing cost of capital could prevent the bank from taking unappropriate risk and in the same time inform bank's supervisors about the risikness of the banking company and trigger corrective measures. In other words, he believes that BMSD would stimulate both, DMD and IMR.

On the other hand, functioning of the above decribed mechanism is dependent on the quite demanding prerequisites. In BGFRS (1999) there are summarized important ones. First, BSD must constitute a minimum proportion of total assests in order to have impact on the cost of rising capital and thus influence managerial decisions. Second, all relevant

[15] The topics originates and has been developed in the US regulatory environment and thus ‚deposit insurance framework' is to be understood as a policy of Federal Deposit Insurance Corporation (FDIC). In the European context, the main concern of this policy is limited to the discussions about the enhancement of the third tier of Basel II, i.e. enhancement of market discipline. The European discussion about BSDP is powered mainly by the European Shadow Financial Regulatory Committee.
[16] See e.g. Haubrich (1998) or Osterberg and Thompson (1999).
[17] From now on, we use term ‚deposit insurance' with the meaning of explicit deposit insurance.
[18] Particular BMSD proposals are discussed in chapter 6.

information must be available without excessive costs so the investors can gather necessary data for their analysis. Third, BSD holders must be able to evaluate this information with sufficient accuracy. Fourth, BSD holders must believe that the probability of repayment depends only on the bank performance and there is no bail out guarantee from the third party because then the spread reflects bank's true risk. Fifth, the primary and secondary markets must be thick enough bacause then they are more resistent to individual movements (there is a risk, that in case of thin market, when one holder sells his stake, the price drops and this could trigger a bank run by uninsured depositors).

To better understand the role that bank subordinated debtholders have in enhancing MD, it is necessary to confront them with other important bank market monitors. There are two such monitors that should come directly to our mind: shareholders and large depositors. To start with shareholders, opponents of BMSD may argue that the price of equity capital and equity returns already contain the information about bank's financial stability. But the problem of this view is in the payoff profile of shareholders. Haubrich and Thompson (2007) argue, that shareholders get paid for bearing higher risk so they have incentive to take greater risks than debtholders with perspective of increased profits. On the other hand debtholders don't benefit from these increased profits and thus have incentive to limit the risk. Futhermore, greater risk taking increases the downside costs to the debtholders (mainly to the BSD holders), because it increases the probability of default which again limits their willingness to accept higher risk.

Now, let's have a look at large depositors. McCoy (2007) highlaights, that due to the provisions such as coverage limits or coinsurance, substantial part of their deposits may be unsecured and hence, they have incentives to monitor the bank and demand adequate risk premiums.[19] On the other hand, provided they have deposits on demand accounts, they may exit in large number and trigger a bank run.

There are of course other market indicators of bank's financial stability that can be taken into account. One of them is for example credit default swap whose spreads are a measure of default risk (Blanco, Brennan and Marsh, 2003) or implied volatility measure, derived from the price of a call or put option on firm's equity that measures bank risk (Swidler and Wilcox, 2001). Besides the market indicators, there are also other approaches (rocommended by the BCBS) such as evaluating individual banks' loans by credit rating agencies or internal bank ratings procedures.

[19] He detaches from cost of monitoring and collective action problem.

3.3 Voluntary subordinated debt issue

Despite quite vast research on BSD, mandatory subordinated debt arrangement still remains questionable. The final decision wheather to issue BSD or not thus remains under the consideration of a bank.[20] This decision depends on several factors. One of the crucial is bank regulatory environment, which is significantly influenced by the Basel II. As already mention in the section 2.2.3, the new capital accord has declared MD to be one of its three pillars for capital adequacy. This is so, because monitoring of large banks is too comlex to be monitored effectively solely by the regulators. According to the Basel II, the solution is to develop better disclosure methods and improve the ability of markets to monitor the banks' activities. MD is also essential condition for introduction of the internal ratings based approach. This approach gives the opportunity to larger banks to determine risk-based credit capital requirements internally. McCoy (2007) points out that without MD, there is potential for moral hazard (adjusting of the parameters in order to gain some time and avert crisis of a bank by taking excessive risk).

While the Basel II emphasises the role of MD, it doesn's interconnect its enhancement with the mandatory issue of subordinary debt. BSD is rather an instrument for strenghtening minimal capital requirements. BSBC revised framework identifies Subordinated term debt as a part of suplementary capital (Tier 2) and Short-term subordinated debt covering market risk (Tier 3):

‚... subordinated term debt instruments with a minimum original term to maturity of over five years may be included within the supplementary elements of capital, but only to a maximum of 50% of the core capital element and subject to adequate amortisation arrangements (49 (xii), BCBS, 2006).'

‚For short-term subordinated debt to be eligible as Tier 3 capital…It must, at a minimum:
- be unsecured, subordinated and fully paid up;
- have an original maturity of at least two years;
- not be repayable before the agreed repayment date unless the supervisory authority agrees;

[20] In the USA, under Gramm-Leach-Bliley Act, there exist requirement for large U.S. national banks to have outstanding (but not necessarily subordinated) highly rated debt to be able to engage in defined financial activities (Evanoff, Wall, 2000). Europe follows, in this regard, recommendations by the Basel Committee which rejected BSDP (despite suggestions of BSDP by European Shadow Financial Regulatory Commitee).

- be subject to a lock-in clause which stipulates that neither interest nor principal may be paid (even at maturity) if such payment means that the bank falls below or remains below its minimum capital requirement (49 (xiv), BCBS, 2006).'

The bank issue decision is influenced by the given regulatory rules and also by the amount of supervisory pressure on the bank's management to raise its regulatory capital ratio (Covitz, Hancock, Kwast, 2000).

Besides regulatory environment, there are other factors that are likely to influence bank issue decision. One important cluster of factors are current and prospective financial conditions of a bank. These indicators are based on the ratios of debt, equity and assets (in both book and market value), thus taking into account capital structure and approximate for bank credit risks. Among frequently mentioned default risk indicators belong:

- ratio of non-accruing loans to total assets
- ratio of loan loss reserves to total assets
- ratio of total assets to equity.[21]

In the presence of the MD, these indicators should have negative effect on the bank issue decision. On the other hand, indicators of profitability, e.g. return on assets or return on equity, should have positive effects (Caldwell, 2005).

Third important group of factors are general business conditions which describe prevailing climate in the economy, i.e. state of the business cycle, global risk or market liquidity. First, poor current macroeconomic conditions reduce the growth prospects of many firms and thus may curtail BSD issue decision (often with lag). Second, there is evidence of the correlation between stock market returns and investment. Lamont (2000) found that stock market returns have been negatively correlated with contemporaneus investment and Barro (1990) found that stock market returns have been positively correlated with subsequent corporate investment. Third, bond market stress may make it more difficult to issue debt because it tends to increase underwriting costs of a company (Covitz, Hancock, Kwast, 2001).

Besides these broader categories of factors that influence bank's issue decision, there are also more bank specific ones. Such important factor is bank's expected tax rate and the tax deductibility of interest which creates tax shield. The higher the marginal tax rate, the

[21] See e.g. Sironi (2000), Caldwell (2005) or Naohiko, Masakazu and Yasuo (2007).

greater benefit from deduction of the interest paid to SD holders. Also ‚name recognition' may play an important role because when the bank issues SD regularly and is recognized at the market, it may reduce its issue costs and increase market demand and liquidity for its debt (Covitz, Hancock, Kwast, 2001). Sironi (2000) remarks that the ownership matters because European public banks benefit from a significant governmental subsidy in the form of a lower cost of BSD issues. Last but not least determinant of issue decision is a size of a bank. Bacause information is costly to analyze, main buyers of BSD tend to purchase large amounts of debt of a small number of large banks, which reduces issue costs for larger banks (BGFRS, 1999). Tables 3 and 4 show the available information about the past concentration of BSD issues with respect to its number and amount (based on BCBS report from 2003).

Table 3: Concentration of BSD issues in number of issues in selected countries

	Belgium 1992-2001	**France** 1997-2001	**Germany** 1990-2001	**Spain** 1990-2001	**UK** 1990-2001	**EU** 1990-2001	**Japan** 1991-2001	**USA** 1997-2001
3 most issuing banks	85%	37%	8%	43%	51%	17%	69%	60%
5 most issuing banks	97%	60%	11%	48%	79%	22%	89%	70%
10 most issuing banks	100%	80%	17%	69%	100%	31%	98%	82%

Source: Basel Committee on Banking Supervision, Working Paper No. 12, 2003

Table 4: Concentration of BSD issues in amounts of issus in selected countries

	Belgium 1992-2001	**France** 1997-2001	**Germany** 1990-2001	**Spain** 1990-2001	**UK** 1990-2001	**EU** 1990-2001	**Japan** 1991-2001	**USA** 1997-2001
3 most issuing banks	90%	50%	36%	77%	51%	48%	68%	49%
5 most issuing banks	98%	69%	51%	85%	78%	63%	88%	58%
10 most issuing banks	100%	78%	70%	90%	100%	82%	97%	76%

Source: Basel Committee on Banking Supervision, Working Paper No. 12, 2003

3.4 Empirical evidence from the historical perspective

The first empirical and theoretical studies concerning BSDP emerged during the 70s and 80s in the USA. It was a reaction to the fear of then situation in the US banking sector characterised by rising number of banks's closings due to bankruptcy and concerns about increasing burden for the former US deposit insurance system - Osterberg and Thomson (1999) state, that it was a period of ‚virtually unlimited federal deposit guarantees and regulatory discretion'.

The early studies focused on the estimation of the BSD spread as a function of several bank risk measures to verify the presence of IMD. The results of different studies were inconsistent, some confirming while other disproving the presence of IMD. The positive evidence was presented in the work of Beighley (1977) who estimated the spread as a function of several measures of risk, including a loss ratio and a leverage ratio. The coefficients on the loss and leverage ratios were found positive and significant. Gorton and Santomero (1988) chose as their dependent variable the variance of bank assets which was estimated as a function of the risk measures derived from the balance sheets and income statements. They pointed out that some of the risk measures had significant coefficients. On the other hand there were studies which didn't find any significant relationship between spread and bank specific risk measures. One of these was work of Pettway (1976) who estimated the spread as a function of the capital ratio of banks and other independent variables. The coefficient on the capital ratio was not signifcant. Fraser and Fraser and McCormack (1978) or Avery, Belton and Goldberg (1988) didn't detect any significant coefficient either.

The US Savings and Loan crisis of the late 80s' and early 90's brought a wave of bank closings. These bank failures and the role of then deposit insurance system in the losses forced Congress to pass the Federal Deposit Insurance Corporation Improvement Act of 1991 (FDICIA) which was the first among many corrective measures taken to shore up the deposit insurance system (Osterberg and Thomson, 1999). This also reinforced further research on BSD. The work on empirical evidence continued and begun to be more supportive. Hassan and Karels (1993) showed that the bank-specific accounting risk measures are correlated with implied variances that were calculated by incorporating default risk-premium into the BSD pricing model. Flannery and Sorescu (1996) focused on

bank holding companies (BHC)[22] and also found correlation between their specific risk measures and BSD rates. Jagtiani, Kaufman and Lemieux (1999) covered in their sample both banks and bank holding companies. BHC bonds and bank bonds were priced by the market in relation to their underlying risk, where the relation was stronger for BHC bonds.

The results prepared the ground for the first seriously taken policy recommendations and its discussion while further empirical research was on the schedule. In 2000 Board of Governors of the Federal Reserve System and the Secretary of the U.S. Department of the Treasury released a report called ‚The Feasibility and Desirability of Mandatory Subordinated debt,' mandated by the Financial Services Modernization Act of 1999.[23] This report concluded (p.57):

‚…the evidence supporting a fairly straightforward mandatory subordinated debt policy with modest objectives is sufficiently strong that continued research and evaluation seem warranted. In addition, future policy and other developments may help to clarify both the need and the potential for achieving substantial benefits from a subordinated debt policy.'

So far we refered to the studies which tested for MD on US data. There is also evidence on European data in Sironi (2000) where empirical results support the hypothesis that BSD investors are sensitive to bank risk, with exception of BSD of public banks. Sironi (2001) then describes the main characteristics of European banks' BSD issues and discusses implications of empirical evidence for the design of a BSDP. He also comments (p.26):

‚…given many similarities between major European and U.S. banks' SND[24] issuance practices and security structures, an internationally coordinated effort to harmonize the characterstics of an BSDP is considered both feasible and important.'

Recent research addresses quantitative evaluation of several proposals for mandatory bank issue of subordinated debt (for example Fan, Haubrich, Ritchken, Thomson, 2003). It is also worth mentioning that large portion of the research is done at the Federal Reserve

[22] Bank holding company is company that owns or controls two or more banks or other bank holding companies.
[23] This is the official name for the Gramm-Leach-Bliley Act.
[24] Subordinated notes and debentures (author's note).

Banks or through U.S. Shadow Financial Regulatry Committeee.[25] The European Shadow Financial Regulatory Committee follows up the US research and recommends to implement the BSDP into the capital regulation framework (e.g. statements No. 11, 16 and 19).

Table 5 summarizes important empirical works on BSD. Nevertheless it seems, that introduction of FDICIA in 1991 enhanced MD, it should be interpreted with caution. For example, Covitz, Hancock and Kwast (2004) argue, that when controlled for risk-sensitive BSD issue decisions, the strength of MD was about the same in both periods.

Table 5: Overview of empirical evidence on BSD

		FDICIA (FDIC Improvement Act), 1991	
		BEFORE	**AFTER**
Evidence of market discipline	YES	1977, Beighley	1999, DeYoung et al. (1986-1995)
		1993, Hassan et al. (1984-88)	1999, Morgan et al. (1993, 1998)
		1996, Flannery et al. (1983-1991)	2000, Covitz et al. (1986-1997)
			2000, Jagtigliani et al. (1980-1995)
			2003, Fan et al.
		1976, Pettway (1971-75)	2001, Bliss et al. (1986-1997)
	NO	1979, Herzig-Marx	2003, Krishnan (1994-99)
		1988, Avery et al. (1983-84)	
		1990, Gorton et al. (1983-84)	

Source: Author's summary based on BGFRS (1999)

[25] U.S. Shadow Financial Regulatry Committeee is an independent body of academicians and other independent experts in the fields of banking, finance and the regulation of financial institutions and markets while affiliated to American Enterprise Institute. Its aim is to give qualified opinion on the efficiency and safe operation of the financial services industry sector (from official website).

4. Bank Subordinated Debt and Market Discipline

4.1 Objective of bank subordinated debt policy

The research concerning subordinated debt issued by banks has been quite fruitful and almost three decades of academic inquiries have brought many interesting insights concering theretical, empirical and policy-making issues.[26] Despite existence of early theoretical and empirical studies, the important turning point came in a work of Gorton and Santomero (1990) who suggested valuation of subordinated debt based on the option pricing theory. Since then, there has been a boom of empirical studies. The studies became to be more supportive, arriving to similar conclusions, i.e. prooving there exist a link between bank's risk profile and the price of its subordinated debt.[27] Taking this into account, the BSD started to be viewed as a potential tool to fulfill certain goals.[28]

When simplified, we can state that BSDP has one key objective – to increase MD in banking. However, from the section 2.3 we know, that there are two types of MD to be distinguished, direct and indirect. They both are build upon several prerequisites and comprise a number of channels through which they operate. First, it is necessary to tackle pricing of BSD since it is a cornerstone of the analysis. The pricing of BSD will be performed in two variants, i.e. basic model without bankrupty costs (based on Levonian, 2000) and model with bankruptcy costs (based on Nivorozhkin, 2001). Next, we consider the DMD, which is at heart of this thesis and develop hypothesis which is to be tested in chapter 5 on the sample of European banks and their BSD issues. Then, we move on to the IMD, which is perhaps more complex, however the discusssion remains within the bounds of theory because the empirical testing is out of the scope of this thesis. Nevertheless, understanding to the mechanisms through with both types of MD are exercised, is essential to depict the essence of BMSD.

[26] See e.g. BGFRS (2000) or BSBS working paper No. 12 (2003).
[27] There are several reasons, why the empirical studies started to arrive to similar conclusions, the application of the similar methodology based on the option pricing theory is just one of them.
[28] To be specified later in the text.

4.2 Pricing bank subordinated debt

The common practice, pinoneer by Gorton and Santomero (1990), is that BSD is modeled as a risk-neutral contingent-claim.[29] The original approach of the contingent-claim valuation was developed by Black and Scholes (1973). Merton (1974) used it to price liabilities in the case of a single issue of nonconvertible debt. The model with multiple debt claims was derived by Black and Cox (1976). The particular contingent-claim model of BSD that we discuss here in built upon the work of Gorton and Santomero (1990) and follows Levonian (2000) and Nivorozhkin (2001). I decided to pursue these models because they focus directly on pricing SD in banking environment. Further, the approach of Nivorozhkin (2001) expands the basic model by introduction of the bankruptcy costs into the framework and analyses its impact on the extent of MD exercised by BSD. The organization of this subchapter is first to analyze the basic model without bankruptcy costs and then to move on towards the extended model with bankruptcy costs.

4.2.1 Model without bankuptcy costs

The model is based upon the following assumptions: (1) the value of assets is random, and evolves over time as a martingale,[30] (2) the bank operates for T periods and there are no bankruptcy costs, (3) the debt claims are single-payment instruments that earn continuously compounded rates of return and they all have the same maturity.[31] The structure of the model is as follows: there is one representative bank whose assets (A_0) are financed by senior debt (D_0) which is insured and thus riskless, by bank subordinated debt (BSD_0) which is not insured, thus risk-sensitive and by equity (E_0) as a residual claim. The balance sheet of the representative bank is depicted in table 6. To start, the model shows the difference between promised payments and payoffs at termination (t=T). Then it models current value of the claims (t=0) which is later used to analyse the impact of the BSD on bank's risk-taking incentives.

[29] A risk-neutral measure is a probability measure (risk adusted density) that results when one assumes that the future expected value of all financial assets are equal to the future payoff of the asset discounted at the risk-free rate (McCulloch, 2004).
A contingent-claim is a claim that can be made only if one or more specified outcomes occur (trading glossary).
[30] Martingale models situation where there may be lots of randomness (or unpredactibility), but no tendency to drift one way or another. Rather, there is a tendency towards stability, in that the chance influnces tend to cancel each other out on average (Bingham and Kiesel, 2000, p. 70).
[31] See Levonian, 2000.

Table 6: Balance sheet of the representative bank at t=0

Total Assets	Total Liabilities
A_0	D_0
	BSD_0
	E_0

Source: Author's depiction

4.2.1.1 Claimholders' promised payments versus realized payoffs at the maturity date

The payments that the bank promises to its claimholders at t=0 to be paid off at t=T are D_T to senior debt holders, BSD_T to bank subordinated debt holders and residual claim to shareholders. Since D_T is insured, it is risk-free. On the other hand, BSD and E are risky because they are paid out of assets and the value of assets is uncertain. At time t=T, the payoff structure is a function of A_T and can be represented by the table 7.

Table 7: Payoff structure of the bank's liabilities at t=T

	$D_T + D_T < A_T$	$D_T < A_T < D_T + BSD_T$	$A_T < D_T$
Senior debt	D_T	D_T	A_T
Bank subordinated debt	BSD_T	$A_T - D_T$	0
Equity	$A_T - D_T - BSD_T$	0	0

Source: Levonian (2000)

The first column of the table 7 corresponds to the situation where the bank is solvent and meets all its liabilities. The second column depicts the situation where the bank is able to pay off the senior debt from its assets and the subordinated debt holders are the residual claimants. The last column represents the case where only senior debt holders get paid and at least part of these costs are transfered on the deposit insurer.

4.2.1.2 Current value of the bank subordinated debt

Black and Cox (1976) showed that BSD may be composed of a written call option with exercise price $D_T + BSD_T$, and purchased call option with exercise price D_T. This important insight facilitates the modelling of subordinated debt because it enables to use Black-Scholes and Black-Cox framework. Under these assumptions it is possible to show that the market value of BSD (BSD_{MV}) can be expressed as:

$$BSD_{MV} = A_T\left[N(d_1) - N\left(\hat{d}_1\right)\right] - D_T \exp(-rT) N(d_2) + (D_T + BSD_T)\exp(-rT) N\left(\hat{d}_2\right) \quad (1)$$

where

$$d_1 \equiv \left[\ln(A_T/D_T) + \left(r + \sigma^2/2\right)T\right] / \sigma T^{1/2}$$

$$d_2 \equiv d_1 - \sigma T^{1/2}$$

$$\hat{d}_1 \equiv \left[\ln\left(A_T/\left(D_T + BSD_T\right)\right) + \left(r + \sigma^2/2\right)T\right] / \sigma T^{1/2}$$

$$\hat{d}_2 \equiv d_1' - \sigma T^{1/2}$$

N(·) is the univariate cummulative normal distribution, σ is the volatility of the logarithm of the value of the bank, T is time to maturity and r is riskless rate. After modification, the equation (1) can be expressed as the spread between the yield on BSD (r_{BSD}) and riskles rate:

$$r_{BSD} - r = -\ln\left\{A_T/BSD_T \exp(rT)\left[N(d_1) - N\left(\hat{d}_1\right)\right] - (D_T/BSD_T) N(d_2) + \left((D_T + BSD_T)/BSD_T\right) N\left(\hat{d}_2\right)\right\}/T \quad (2)$$

The risk premium is a function of bank's leverage terms A/BSD_T and $(D_T + BSD_T)/ BSD_T$, bank's volatility σ and time to maturity T.

Let's assume that the bank has only senior debt and didn't issue any BSD. Then the present value of this claim can be expressed as:

$$r_D - r = -\ln\left\{A_T/D_T \exp(rT) N(-d_1) + N(d_2)\right\}/T \quad (3)$$

Now, when comparing equation (2) with equation (3), it is visible that BSD acts in a different manner that senior debt with respect to T, σ and r. In a situation where the value of the bank's assets is close to the promised payment to the senior debtholders, the BSD is a residual claim and acts much like equity. In a situation where the value of the bank's assets is sufficiently higher, the subordinated debt acts like debt. Black and Cox (1976) pointed out that the risk premium of SD, unlike senior debt, is a decreasing function of σ^2 (approximatting bank risk) when $A_T < D_T$ and increasing function of σ^2 when $A_T > D_T$.[32]

[32] See also Gorton and Santomero (1990) and Nivorozhkin (2001) for banking environment.

4.2.2 Model with bankuptcy costs

Now, we release the assumption (2) and allow for bankruptcy costs, which shall be denoted as C. For the sake of simplicity, Nivorozhkin (2001) assumes[33] that bankrupcy costs reduce the value of bank's assets linearly and occure when total value of bank's assets at maturity are less then total value of debt (senior plus subordinated). The rest of the model is unchanged.

4.2.2.1 Claimholders' promised payments versus realized payoffs at the maturity date

Here, it is valuable to distinguish two cases - the case when the bankruptcy costs are smaller than the promised payoff of BSD and the case when the bankrupcy costs are greater or equal to the promised payoff of BSD. Following two tables 8 and 9 summarize the possible realized outcomes for both cases.

Table 8: Payoff structure of the bank's liabilities at t=T provided that $BSD_T > C_T$

	$D_T + BSD_T < A_T$	$D_T + C_T < A_T < D_T + BSD_T$	$A_T < D_T + C_T$
Senior debt	D_T	D_T	$Max[Min[A_T-C_T, D_T],0]$
BSD	BSD_T	$A_T - D_T - C$	0
Equity	$A_T - D_T - BSD_T$	0	0

Source: Nivorozhkin (2001)

Table 9: Payoff structure of the bank's liabilities at t=T provided that $BSD_T \leq C_T$

	$D_T + BSD_T < A_T$	$A_T < D_T + C_T$
Senior debt	D_T	$Max[Min[A_T-C_T, D_T],0]$
BSD	BSD_T	0
Equity	$A_T - D_T - BSD_T$	0

Source: Nivorozhkin (2001)

From these two tables, it is possible to conclude, that in a situation where the bank is not solvent, the claim of BSD holders effectively transforms into the financial cushion to cover for the bankruptcy costs. Thus the greater the bankruptcy costs the greater the loss of BSD holders.

[33] Inspired by Anderson, R.W. and Sundaresan, S.M. (1996): *'Design and Valuation of Debt Contracts,'* Review of Financial Studies 9(1), 37-68.

4.2.2.2 Current value of the bank subordinated debt

In case, where it holds $BSD_T > C_T$, the equation (1) is to be modified in the following fashion:

$$BSD_{MV}^{C1} = A_T\left[N(b_1) - N\left(\hat{d}_1\right)\right] - (D_T + C_T)\exp(-rT)N(b_2) + (D_T + BSD_T)\exp(-rT)N\left(\hat{d}_2\right) + C_T\exp(-rT)N\left(\hat{d}_2\right) \quad (4)$$

where

$$b_1 \equiv \left[\ln\left(A_T/(D_T + C_T) + \left(r + \sigma^2/2\right)T\right)\right]/\sigma T^{1/2}$$

$$b_2 \equiv d_1 - \sigma T^{1/2}$$

$$\hat{d}_1 \equiv \left[\ln\left(A_T/(D_T + BSD_T)\right) + \left(r + \sigma^2/2\right)T\right]/\sigma T^{1/2}$$

$$\hat{d}_2 \equiv \hat{d}_2 - \sigma T^{1/2}.$$

In case, where it holds $BSD_T \leq C_T$, the equation (1) is to be simplified (based on the fact that BSD holder gets paid only in a situation where $D_T + BSD_T < A_T$) in the following manner:

$$BSD_{MV}^{C2} = BSD_T\exp(-rT)N\left(d_2^{'}\right) \quad (5)$$

Both equations (4) and (5), when compared with equation (1), demonstrate that introduction of bankruptcy costs into the model lowers the market value of BSD.

4.3 Direct market discipline

Based on the general definition of DMD from the section 2.3, we can reformulate it and infer, that DMD is exerted through subordinated debt when a bank's expected cost of issuing this instrument increases substantially with an increase in its risk profile. This definition is built upon two important assumptions. First, expected cost of issuing BSD must be risk sensitive. Second, this cost must be significant enough to influence managerial actions (BGFRS, 1999). Thus, in order to test for the presence of DMD, it is neccessary to respond successively two questions: Is the bank's risk profile a significant explanatory variable which determines the bank's issuing cost? If so, is the issuing cost a significant variable which influence the managerial decision to issue or not to issue the subordinated debt?

To examine theoretically DMD exerted by BSD, we have at hand the pricing model. Levonian (2000) analysed the DMD of the BSD in the framework without bankruptcy costs. Nivorozhkin (2001) went futher and analysed the problem in the setting with bankruptcy costs. Here, we follow their methodology.

To examine empirical approach to test for the presence of DMD, we discuss first the empirical model that test for the sensitivity of the price of BSD on bank's risk profile and then empirical model that discusses the factors that may play a role in bank's issue decision. The second model is performed later, in chapter 5 on European data.

4.3.1 Direct market discipline – theoretical treatment

The basic mechanism of BSD to exercise DMD is that the bank's risk is reflected in the BSD price. Thus, due to the limited supply of senior debt and risk-sensitivity of subordinated debt, increasing bank's risk-taking is accompanied with increasing cost of capital. Hence the incentives to participate in the projects with higher risk in search of higher profits (initiated by shareholders) are disciplined through the increasing cost of their financing.

4.3.1.1 Direct market discipline in the setting without bankruptcy costs

To analyse the BSD with respect to the DMD in the setting without bankruptcy costs, we recall equation (1):

$$BSD_{MV} = A_T\left[N(d_1) - N\left(\hat{d}_1\right)\right] - D_T \exp(-rT) N(d_2) + (D_T + BSD_T)\exp(-rT) N\left(\hat{d}_2\right) \quad (1)$$

The function contains the variable σ (the volatility of the logarithm of the value of the bank) which approximates for the bank's risk. Under the assumption of DMD, the BSD_T is a growing function of σ, keeping BSD_{MV} the same thorough the holding period. When differentiating BSD_{MV} with respect to σ, we get:

$$\frac{dBSD_{MV}}{d\sigma} = D_T \exp(-rT) N'(d_2) - \left(D_T + BSD_T(\sigma)\right)\exp(-rT)\frac{\partial N\left(\hat{d}_2\right)}{\partial \hat{d}_2}\cdot\frac{\partial \hat{d}_2}{\partial \sigma} - BSD_T'(\sigma) N\hat{d}_2 \quad (6)$$

Now let's turn to the market value of equity, which is represented by the equation (7) and its derivative with respect to σ as described by equation (8):

$$E = A_T N\left(\hat{d}_1\right) - \left(D_T + BSD_T(\sigma)\right)\exp(-rT) N\left(\hat{d}_2\right) \quad (7)$$

$$\frac{dE}{d\sigma} = \left(D_T + BSD_T(\sigma)\right)\exp(-rT)\frac{\partial N\left(\hat{d}_2\right)}{\partial \hat{d}_2}\cdot\frac{\partial \hat{d}_2}{\partial \sigma} + BSD_T(\sigma) N\left(\hat{d}_2\right) \quad (8)$$

In the presence of DMD, derivative (6) should be equal to zero because the change in σ is always reflected in the change of BSD_T so the BSD_{MV} remains unchanged. However, Levonian (2000) pointed out that if we set derivative (6) equal to zero and plug in derivative (8), we obtain:

$$\frac{dE}{d\sigma} = D_T \exp(-rT) N'(d_2) \quad (9)$$

which is always positive. In other words, under the presence of DMD exercised by BSD and in the setting without bankruptcy costs, there still exist (though lower) icentives for shareholders to endorse higher risk.

4.3.1.2 Direct market discipline in the setting with bankruptcy costs

The conclusion of Levonian (2000) might be rather dissapointing in the eyes of those, who hoped for stronger theoretical poof of the effect of BSD in disciplinig banks' risk taking. However, Nivorozhkin (2001) continued to walk the path by introduction of the bankruptcy costs into the analysis. Again, we shall distinguish the case where $BSD_T > C_T$ and the case where $BSD_T \leq C_T$ and then proceed similarly as in the setting without bankruptcy costs.

Let's have a look at the first case and differentiate equation (4) with respect to σ to obtain:

$$\frac{dBSD_{mV}^{BC1}}{d\sigma} = \left(D_T + C\right)\exp\left(-rT\right)N'\left(b_2\right) - \left(D_T + BSD_T\left(\sigma\right)\right)\frac{\partial N\left(\hat{d}_2\right)}{\partial \hat{d}_2}\cdot\frac{\partial \hat{d}_2}{\partial \sigma} + C\exp\left(-rT\right)\frac{\partial N\left(\hat{d}_2\right)}{\partial \hat{d}_2}\cdot\frac{\partial \hat{d}_2}{\partial \sigma} - \tag{10}$$
$$-BSD_T\left(\sigma\right)\exp\left(-rT\right)N\left(\hat{d}_2\right)$$

The equation describing market value of equity remains the same and hence its derivative doesn't change either. However, if we plug derivative (9) into the derivative (10) under the condition that (10) equals to zero, we get:

$$\frac{dE}{d\sigma} = \left(D_T + C\right)\exp\left(-rT\right)N'\left(b_2\right) + C\exp\left(-rT\right)\frac{\partial N\left(\hat{d}_2\right)}{\partial \hat{d}_2}\cdot\frac{\partial \hat{d}_2}{\partial \sigma} \tag{11}$$

Derivative (11) is composed of two terms. The first term is positive, however the second may be either positive or negative. Nivorozhkin (2001) argues that the second term is positive when the value of bank's assets is low and negative for higher value and adds that the larger the ratio of BSD to senior debt, the larger the region where the derivative (11) is negative. Similarly, the larger the bankruptcy costs, the larger the negative region.

Now, let's turn attention to the second case where it holds $BSD_T \leq C_T$. We differentiate equation (5) with respect to σ and obtain:

$$\frac{dBSD_{MV}^{C2}}{d\sigma} = BSD_T(\sigma)\exp(-rT)\frac{\partial N(\hat{d}_2)}{\partial \hat{d}_2}\cdot\frac{\partial \hat{d}_2}{\partial \sigma} + BSD_T'(\sigma)\exp(-rT)N(\hat{d}_2) \tag{12}$$

If we set derivative (12) equal to zero and plug in derivative (8), we get:

$$\frac{dE}{d\sigma} = D_T(\sigma)\exp(-rT)\frac{\partial N(\hat{d}_2)}{\partial \hat{d}_2}\cdot\frac{\partial \hat{d}_2}{\partial \sigma} \tag{13}$$

The sign of this derivative differs based on the value of parameters which are the same as in the previous case. Hence the argumentation about the sign of the derivative (13) is similar to the derivative (11).

From these two cases we can infer that in the setting with bankruptcy costs the efficiency of BSD in providing DMD grows as the ratio of BSD to senior debt grows and as the bankruptcy costs grow because under above described circumstances it may eliminate the incentive of shareholders to take on higher risks.

4.3.2 Direct market discipline – empirical treatment

Common practice how to test for the presence of DMD is to construct two empirical models. The first, let's call it spread model, is designed to verify wheather the individual bank's risk is reflected in the price of its BSD, i.e. wheather the BSD price is risk sensitive. The second, let's call it issue model, examines wheather the actual decision of a bank to issue or not to issue BSD is significantly influenced by the bank's risk profile, i.e. wheather BSD issue decision is risk sensitive.

4.3.2.1 Spread model[34]

This empirical model presumes that the issue spreads of BSD over the corresponding Treasury bonds can be explained by the bank's risk. Since the risk is not directly observable, it is approximated by several variables. Here belong balance sheet variables

[34] This model can be recently found e.g. in empirical studies of Sironi (2000), Covitz, Hancock, Kwast (2004) or Evanoff, Jagtigliani and Nakata (2007).

such as ratio of non-performing loans, loan loss reserves, leverage ratio, return on assests, return on equity as well as the opinion of informed market participants such as credit rating agencies, analysts and equity holders. Futhermore, the spread is supposed to be ralated to other set of explanatory variables such as BSD issue characteristics, regulatory environment or overall macroeconomic conditions.

There are quite a lot of empirical studies where the authors accomplished to perform the spread model. The results of important studies written prior to the year 2000 are recorded in several studies.[35] The summary of more recent studies are documented e.g. in Evanoff, Jagtiani and Nakata (2007). However, it must be noted, that these empirical studies are almost exceptionally devoted to US data and focused on US regulatory environment. To my best knowledge, there is one empirical study on European data in Sironi (2000). He gathered dataset for European banking sector for the period 1991-2000 and concluded that the BSD spreads were risk-sensitive and this sensitivity was increasing during the whole period. Futhermore, he noted that European public banks benefited from a significant government subsidy in the form of smaller BSD spread.

4.3.2.2 Issue model

This empirical model examines factors of BSD issue and assumes that in the presence of DMD, the banks that are too risky, would find it difficult to issue BSD. The model is to be performed in this thesis (on the sample of European banks in 2001-2006) and the hypohesis that BSD issue decision was subject to DMD in European banking sector is to be tested. Literature review and description of the model as well as presentation and discussion of own results are subject of chapter 5.

Table 10: Hypothesis to be tested in chapter 5

Decision of large European banks to issue bank subordinated debt was subject to the direct market discipline in 2001-2006.

Source: Author

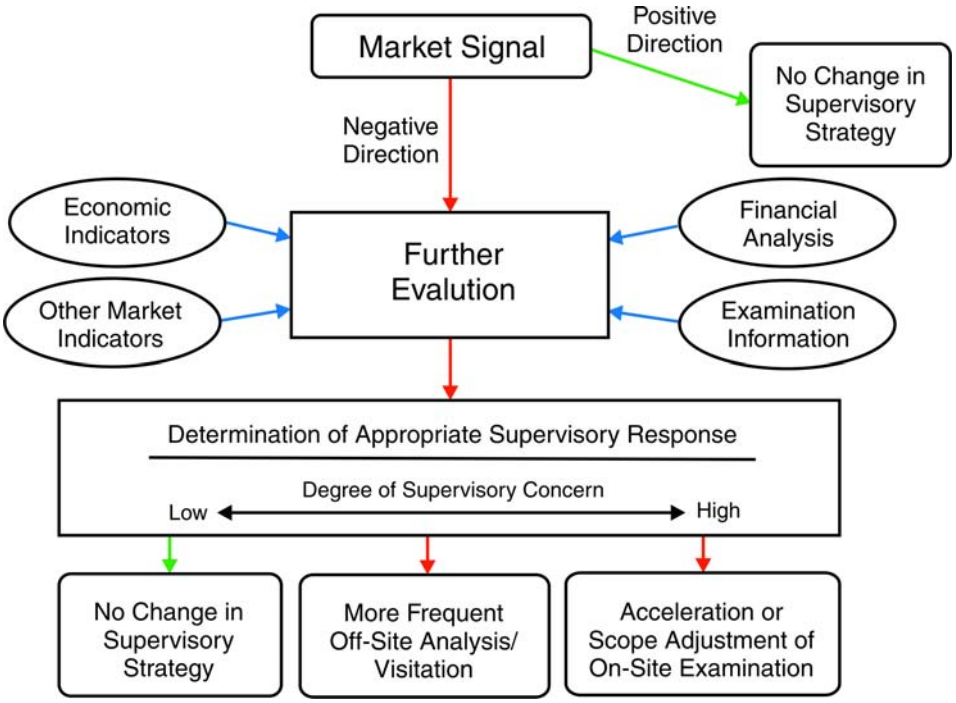
[35] E.g. BGFRS (2000) or BCBS (2003).

4.4 Indirect market discipline

IMD is exerted through BSD if its price on the primary or secondary market is risk-sensitive and thus the price and change in the price, or spread, provide information of the bank's risk which serves as a signal for market participants and bank supervisors to take measures corresponding to the evaluated situation.[36] Again, we can identify two conditions of indirect IMD in this definition. First, market participants and bank supervisors monitor continuously the prices of BSD to assess current and future anticipated bank's risk. Second, they take prompt and adequate measures reflecting the bank's situation.[37] Figure 2 describes the mechanism of the evaluation of BSD market signal in the case that the monitor is bank's supervisor.

In the following text, we focus on the pitfall of the interpretation of the BSD secondary market signals and then on discussion about the possible application of this information.

Figure 2: Evaluation of BSD market signal by bank's supervisor



Source: FDIC Banking Review, 2005

[36] Here, it is important to distinguish between private and public placements of BSD. While direct market dicipline could be, in principle, exercised through both private and public placements, the indirect market discipline is available only through public placements (BCBS, 2003).
[37] Conditions reformulated from BGFRS (1999).

4.4.1 Interpretation of BSD spreads on secondary markets

When the bank comes to the debt market with its BSD, it has to provide quite complex information concerning the issue. This includes assesment of the current bank's conditions and the prognosis of the future development which helps to the investors to price the BSD accuratly. On the other hand, the investors on the secondary market usually don't have at hand such complex information about BSD provided by the bank. As Evanoff, Jagtiani and Nakata (2007) remarks, the secondary market may suffer from the insufficient quality of disclosure by the banks which may create noise in BSD spreads.

Another important factor that may create the noise in the spreads is the insufficient liquidity of the secondary market. The liquidity on the secondary market is rather lower than on the primary market, because first, some of the issues are private placements which are not traded on the secondary market and second, the public issues tend to be large in volume offered by the large banks and traded among few investors (BCBS, 2003). Thus, due to the low liquidity, it may happen that relatively high demand for particular BSD may shoot up its price and the spread will not reflect the true risk of the bank any more.

Important point concerning the interpretation of BSD spreads was made by Covitz, Hancock and Kwast (2004). They showed that in case the managerial decision to issue BSD is not risk-sensitive, it creates biased liquidity premiums. They argue: ‚Debt of *both* risky and safe firms that continued to issue had relatively low liquidity premiums, while debt of *both* risky and safe firms that delayed issuing built up relatively large liquidity premiums (Covitz, Hancock, Kwast, 2004).'

All the reasoning mentioned here implies, that interpreting of the secondary market BSD spreads might be quite challenging task and should be done carefuly in order to avoid incorrect conslusions.

4.4.2 Application of the information contained in BSD spreads

There exist vast literature on the possible applications of the information contained in BSD spreads. For the purpose of this thesis, we devide the research into two clusters. At the heart of the first cluster of the research is strenghtening of bank regulation and supervision. The second cluster of literature devotes to the deposit insurance. However, the research in the deposit insurance is mainly US-oriented and assumes the particular US setting of deposit insurance, thus we touch it only very briefly.

4.4.2.1 Strenghtening bank regulation and supervision

The most important tool in the hands of bank's regulators and supervisors, with respect to monitoring of the bank, is on-site examination. This enables them to take a deep look into the bank's affaires, evaluate it properly and, if needed, take corrective measures. During the time between on-site examinations, they monitor the bank off-site. At this stage, supervisors often find usefel market indicators (i.e. the prices of securities issued by the banks). This is the point where BSD spread signals may come into the consideration. If extracted properly, the information contained in BSD spread may serve as an additional input into the supervisor's model of bank risk and increase its accuracy and reliability.

To get particular ideas how the BSD spread information may be used, we can refer to the Banking Review of the Federal Deposit Insurance Corporation (FDIC, 2003), and summarize some of already applied:

- Monitoring overall banking climat: besides monitoring BSD spreads of individual banks, supervisors may look for similar patterns in the spreads and thus assess general conditions in banking, identify potential risks and eventually take preventive measures. In this sence, it provides additional information to the banking stock indexes or credit ratings by the credit rating agencies.
- Monitoring bank's liquidity risk: the logic behind this is, that the changes in credit rating of debt instruments are among the sympthoms of the upcoming liquidity stress faced by the bank. Thus close monitoring of bank's debt instruments, including BSD spreads, may signal the liquidity problem on time to handle it.
- Refining supervisor's ratings: to classify bank's risk, supervisors developed the scale of quite detailed risk ratings. However, when supervisor has to set his priorities, it is useful to differantiate even among the banks within the same rating group. FDIC assumes that market data provide the additional information.

To look at BSD spreads from the EU perspective, we can mention work of Gropp, Vesala and Vulpes (2004) who tested the ability of BSD spreads to predict downgrades of banks' ratings on the sample of 59 EU banks during 1990-2001. They showed that BSD spreads are not very exact indicator when the bank is far from failure or the bank is implicitly covered by the public safety net. Futhermore, they argue that the BSD spreads have little additional predictive power over accounting data. On the other hand, if combined with other market indicators (e.g. distance to default), the predictive power over accounting data increases.

4.4.2.2 Deposit insurance

The US literature connects BSD with deposit insurance. For example, BGFRS (1999) sees the BSD as an instrument which, under certain conditions, could increase financial cushion for FDIC as an deposit insurer in case of bank failure. There is also vast literature that advocates using BSD for insurance pricing. The general theoretical background for risk-based insurance pricing was given in chapter 2. The basic idea is that extracting information about bank's risk from the BSD spread (and other market indicators) may help to set deposit insurance premiums. The particular policy recommendations come under US Deposit Insurance Reform and are beyond the scope of this thesis.

From the European point of view, since the number of EU countries introduced explicit deposit insurance systems during the 90s, the question wheather this promotes financial stability in banking (and under which conditions) arised. Gropp and Vesala (2004), as already mentioned in the section 2.2.2.1, analysed the relationship between deposit insurance and risk taking of European banks and arrived to the conclusion that the introduction of the explicit deposit system may have significantly reduced banks' risk taking. They argued that without the explicit deposit insurance, there might be higher expectations of implicit guarantees which are even greater source of moral hazard and also, the explicit deposit insurance enables credible exclusion of the non-deposit creditors (e.g. subordinated debtholders) who may enhance MD in banking. Nevertheless, any strong recommendations for the use of BSD in the deposit insurance system were not made in the European context.

5. Market for bank subordinated debt and Issue model

5.1 Market for bank subordinated debt in Europe

Despite quite vast literature concerning BSD and MSDP, the market for subordinated debt in Europe itself hadn't been fully examined until work of Sironi (2001) and BCBS (2003). Sironi (2001) gathered information about 1,803 BSD issues by 225 European banks during the period 1988-2000. BCBS (2001) gathered data on 5,600 BSD issued by European, Japan and US banks during the period 1990-2001. Here, I summarize their key findings concerning issuing banks, BSD investors and both primary and secondary market in Europe during the 90s. Then I attempt to charecterize the main developments that took place during the study period 2001-2006. I would also like to point out that Sironi (2001) and BCBS (2003) used for their analysis databases such as Bondware or and Bloomberg. Unfortunatelly, I didn't have access to these data sources and thus (1) my analysis is limited to the information contained in BankScope and banks' annual reports and (2) several graphs and tables in the thesis date back to 90s to demonstrate at least the patterns at that time since I don't have current data at my disposal.

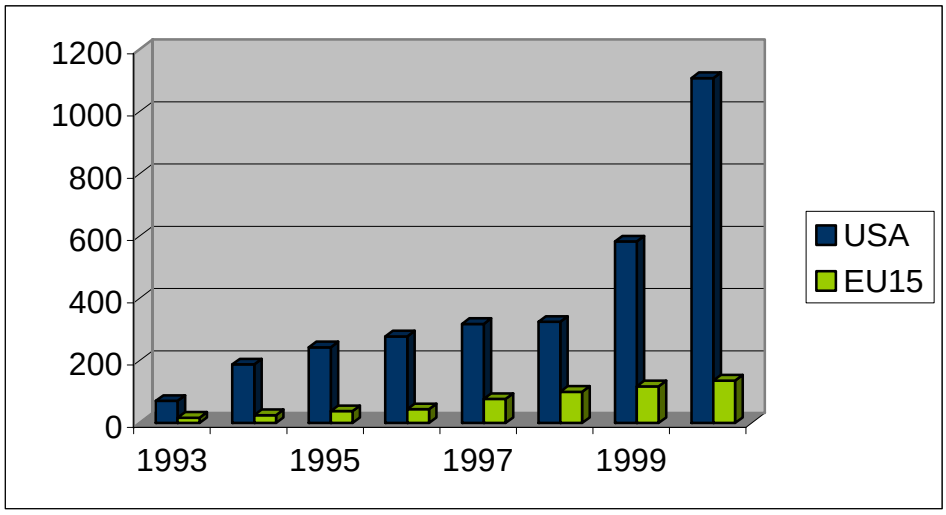
5.2.1 Issuing banks in the 90s

Since publishing of Basel I in 1988, the European banks percieved BSD mainly as a tool to increase their regulatory capital ratio (Sironi, 2001).[38] Volume of outstanding BSD of large EU15 banks has grown significantly during the 90s (as well as the volume of outstanding BSD of large USA banks, see figure 3).[39]

[38] In Basel I, the subordinated term debt (with original term to maturity of over five years) was part of tier 2 capital and was subject to two conditions. First, total tier 2 capital could be at maximum 100% of tier 2 capital. Second, subordinated term debt could be at maximum 50% of total tier 1 capital (BCBS, 1988). Tier 3 which consists entirely from SD was introduced in 1997.

[39] Here, large banks are defined as banks that had total assets in excess of 1 bn USD in 2000. The figure 4 aggregates 192 large European banks and 188 large US banks.

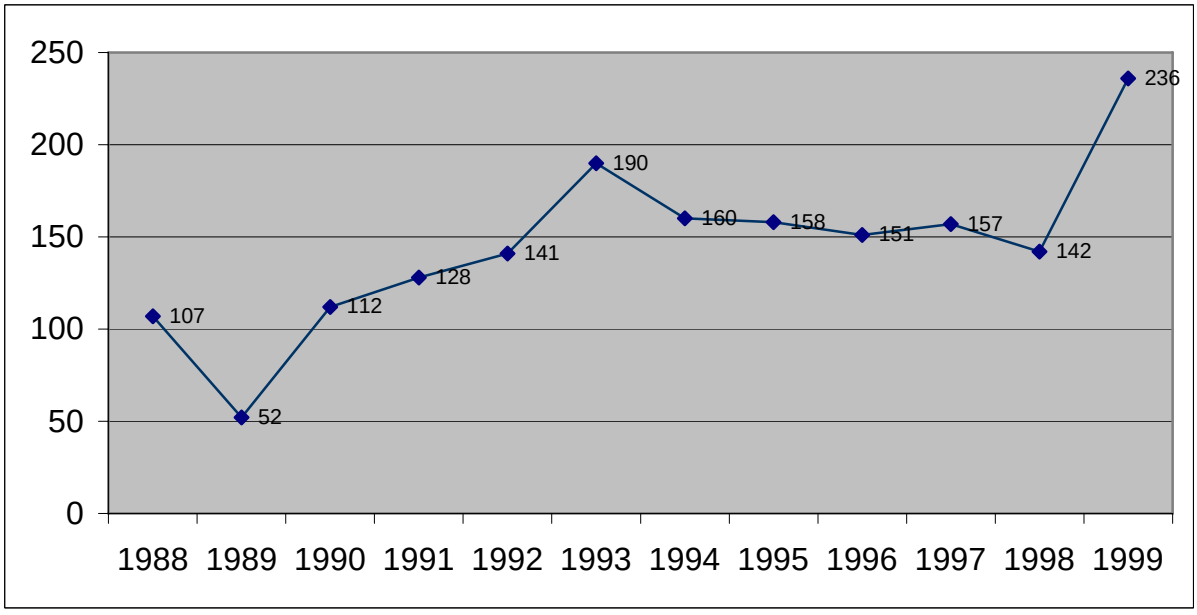
Figure 3: Total BSD outstanding of large banks (bn USD), 1993-2000



Source: BankScope, March 2008 edition

The number of new issues also increased, which is documented on figure 4 (depicts yearly distribution of BSD issues examined by Sironi, 2001).

Figure 4: Number of European BSD issues between 1988-1999



Source: Sironi (2001)

Another point is that BSD were issued predominantly by large banks (with total assets more than 50 bn USD). The average of BSD to total assets for the 50 largest issuers was 1.65% and average frequency of the issue was twice a year (Sironi, 2001). The most active European issuers were German banks, followed by UK and Spanish banks (BCBS, 2003).

5.2.2 Characteristics of BSD securities in the 90s

There are several characteristics of BSD securities, to start with currency, the most important currency were European national currencies, especially LUF. The USD was also common issue currency, especially in case of perpetual and callable BSD issues (Sironi, 2001). There were also issues in JPY, but in Europe, accounting rather for minority (BCBS, 2003).

Both Sironi (2001) and BCBS (2003) concluded that BSD issued in Europe were mostly ‚plain vanilla' fixed rate notes. Features such as callability, put options, convertibility into floating rate or warrants for equity or senior debt were quite rare and the ‚popularity' of these particular set-ups differed across countries.

With respect to the maturity, the BSD typically ranged from 5 to 15 years with average of 10 years (Sironi, 2001).[40] It reflected the Basel I rules for BSD to qualify for tier II capital, because BSD had to be of minimal maturity of five years. After introduction of tier III in 1997, also BSD with maturity of two years were frequently issued (Sironi, 2001).

The last point to be made here concerns the BSD placements. Based on BCBS (2003), 42% of the issues were publicly placed and 53% privately placed (unknown for the rest of the issues). When looking at the market value, 69% were public placements and 24% private placements.[41]

5.2.3 BSD investors and market in the 90s

Sironi (2001) pointed out that there were two groups of BSD investors, i.e. retail and institutional investors (insurance companies, mutual and pension funds).[42] Retail investors usually bought the BSD through bank's own distribution network while institutional investors bought through public issues. The institutional investors were key to the banks. The public issues were great in a size, they were typically eurobonds, listed simultaneously on several European stock exchanges.

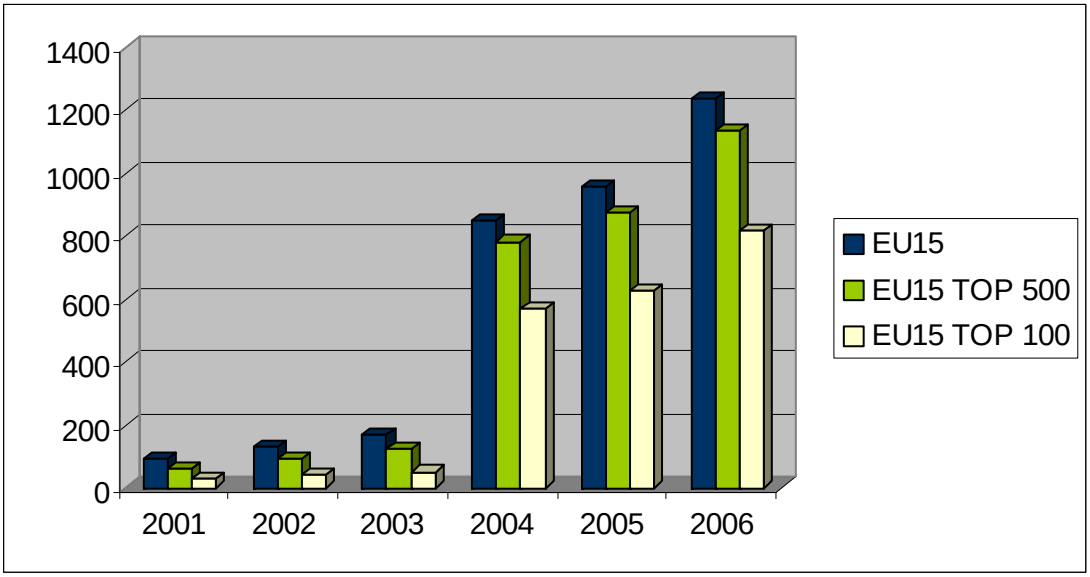
The secondary market was constituted from large European banks and institutional investors and this, based on BCBS (2003), accounted for about 25% of all European issues. Furthemore, the operations that took place were rather infrequent large scale transactions and thus, it was unreasonable to assume that it would provide indirect market discipline.

[40] BCBS (2003) arrived to the similar conclusion but declared UK to be an exception, since 40% of their BSD isseues were perpetuals.
[41] This includes also US and Japanese issues.
[42] Banks do not usually invest into BSD of their peers because of the regulatory limits.

5.2.4 European market for bank subordinated debt in 2001-2006

Figure 5 shows the **outstanding amount** of BSD of EU15 banks differentiated by their size measured by total assets in 2006.[43] Thus, it is visible that the trend from the 90s continued during the study period. The amount of BSD outstanding was increasing during the period and large banks remained the most frequent issuers. While the banks with total assets in excess of 1 bn USD create almost the whole market, the largest banks (in excess of 200 bn USD) create about two thirds of it.

Figure 5: Total BSD outstanding of large EU15 banks (bn USD), 2001-2006



Source: BankScope, March 2008 edition

Table 11 shows the **average ratio** of BSD to total assets in selected EU15 countries. The average ratio was quite stable during the 2004-2006 period in all countries and thus the increase of total BSD was driven by the increase of bank's size rather than change in capital structure which is largely determined by Basel II.

[43] Figure 6 aggregates all EU15 banks with available data (2317 banks), EU15 banks in TOP 500 with total assets in excess of 1.4 bn USD (239 banks) and EU15 top 100 banks with total assets in excess of 200 bn USD (banks 51).

Table 11: Average ratio of BSD to total assets

Country	2006	2005	2004
Belgium	1.5	1.5	1.6
Denmark	1.5	1.6	1.4
France	1.4	1.5	1.7
Germany	1.2	1.3	1.2
Netherlands	1.0	1.0	1.1
Spain	2.2	2.2	2.5
UK	2.1	2	2.4
EU15	1.7	1.6	1.7

Source: BankScope, March 2008 edition and author's calculation

Now to the BSD characteristics. I gathered sample of 227 BSD issues from the sample period 2001-2006, issued by 29 large banks from the EU15 countries. The data come from the banks' annual reports which are available to the public via banks' official websites. More specifically, the particular information about BSD issues are provided in the notes to the financial statements usually under the comment devoted to the subordinated liabilities. Based on this sample, the main **currency** of issue was euro which accounted for 72%, second frequent currency was USD with 14%, followed by GBP of 5%. Other currencies of minor importance were SEK and JPY. The USD was frequently used by English banks as an alternative to EUR. On the other hand, the issues in GBP were quite popular in the Netherlands, Denmark and Sweeden.

With respect to the technical features of BSD, most of the issues appeared to be ‚plain vanilla' issues which cannot be redeemed. On the other hand one-third of the issues were furnished with a call provision or might be redeemed after the consent of the national regulator. Average **maturity** of dated BSD was 10.9 years, 13.7% of the issues were perpetuals which were issued mainly in Great Britain and the Netherlands. The average **amount** of BSD issue was 400 mil. EUR, however this number is probably very specific for my sample bacause first, the sample consists from large banks which tend to issue rather larger amounts and second, the data about BSD issues come from banks' annual reports and it is reasonable to suppose that they don't report all small issues. Also, most BSD issues had variable **rate**, often linked to three month Euribor or Libor. The average **number of issues** per year was 1.4 which may be again influenced by the fact that the banks don't publish all realized issues in the annual reports. The following table 12 compares the results of the study carried out by Sironi (2001) and my results.

Table 12: Comparison of BSD issues between periods 1988-2000 and 2001-2006

BSD issue		Sample 2001-2006	Sample 1988-2000
No. of issues		227	1803
Sample banks		29 large EU15 banks	225 large EU15
Issuers	Who?	2/3 of BSD supplied by the banks with TA in excess of 200bn USD	Banks with TA in excess of 50 bn USD
	How much?	1.7% (BSD/TA) in 2006	1.65% (BSD/TA) in 1999
	How often?	1.4	2.1
BSD features	Currency	EUR (72%)	EUR (70%)
	Redeemable?	33.4%	17%
	Maturity?	10.9 years	10.1 years
	Interest rate?	Mostly variable (3 months Euribor)	Mostly fixed rate
	Average amount?	400 mil EUR	240 mil USD

Source: Sironi (2001), Bankscope, March 2008 edition and author (based on individual banks' annual reports)

5.2 Issue Model

Now, we introduce and perfrom the issue model to verify the hypothesis from chapter 4 which states: ‚Decision of large European banks to issue BSD was subject to the direct market discipline in 2001-2006.‘

Our issue model follows the methodology of several authors. They are (1) Covitz, Hancock and Kwast (2000), (2) Bliss and Flannery (2001), (3) Caldwell (2005), (4) Evanoff, Jagtiani and Nakata (2007) and (5) Naohiku, Masakazu and Yasuo (2007). The basic overview is presented in table 13. The studies focused on US, Canadian and Japanese data about the issues of BSD and, except for Bliss and Flannery (2001), were able to detect some statistical evidence that BSD issue decision were, to some extent, subject to the direct market discipline.

Table 13: Overview of the empirical studies containing the issue model

Authors	Sample[44]	Model	Is banks' BSD issue decision subject to DMD?
Covitz, et al. (2000)	1986-1999,USA	Probit	evidence present after passing FDICIA
Bliss, at al. (2001)	1986-1998, USA	Linear	no strong evidence present
Caldwell (2005)	1994-1998, Canada	Tobit	stronger evidence for smaller domestic banks
Evanoff, et al. (2007)	1990-1999, USA	Probit	some evidence present
Naohiku, at al. (2007)	2000-2005, Japan	Probit	stronger evidence present during time of instability

Source: Author's summary

5.2.1 Description of the model and variables

The empirical model developed here, is to analyse the decisions of large European banks to issue BSD within the time period 2001-2006. We are particularly interested in the factors approximating for banks' credit risk because if they are significant (i.e. higher risk implies less likelihood to issue BSD and vice versa), it provides statistical evidence of direct market discipline in action.

[44] With exception for Naohiku, at al. (2007), the authors use consolidated data for bank holding companies.

We use a probit model,[45] where a binary outcome variable takes 1 if bank i decides to issue BSD or 0 if the bank decides not to issue BSD at time t. Thus, the model can be written as:

$$\text{Prob}(\text{Issue}_{it} = 1) = \Phi[\beta X_{it}] \quad \text{and} \quad \text{Prob}(\text{Issue}_{it} = 0) = 1 - \Phi[\beta X_{it}],$$

where Φ is the cumulative distribution function of the standard normal distribution, X_{it} is the vector of explanatory variables for bank i at time t and β is the vector of parameters to be estimated by the method of maximum likelihood.

Now, let's describe the particular form of the empirical model. As noted above, the issue decision is supposed to be sensitive to the banks' credit risk measures, let's denote them *BCR*. Other bank specific variables that are assumed to impact the issue decision will be denoted as *BSM*. Lastly, since the bank is not an isolated entity, the model considers general economic conditions, let's denote them GEC. Thus, the decision of bank i at time t to issue BSD can be described by the following relation:

$$ISSUE_{it} = f(BCR_{it}, BSM_{it}, GEC_{it}).$$

To depict each bank's credit risk profile, external credit ratings (*ECR*) and book variables (*BV*) are used as an approximation. Since ECR and BV are highly correlated, we divide the model into two specifications: (1) based on long-term *ECR*, where I use Standard & Poor's (CR^{SP}), Moody's (CR^{M}) and Fitch ratings (CR^{F}) respectively[46] and (2) based on BV, where I use ratio of loan loss reserves to gross loans (*LLRGL*), ratio of equity to net loans (*EQNL*) and cross term of bank's return on average assets and leverage (*ROAALEV*).[47]

The definition of *ECR* and the conversion of the original grading scales into unifying numerical scale is provided in annex A and B respectively. The rule was to assign to the poorer ratings higher numerical value. The higher the numerical value of the credit rating, the higher the likelihood of default which should be reflected in a higher price of BSD and, under the null hypothesis, lower expected likelihood to issue new BSD.

[45] Based on Covitz, Hancock and Kwast (2000), Evanoff, Jagtiani and Nakata (2007) and Naohiku, Masakazu and Yasuo (2007).
[46] Also used in Evanoff, Jagtiani and Nakata (2007).
[47] Based on Sironi (2000).

Book variable *LLRGL* is computed as a percentage of bank's loan loss reserves to total gross loans. This ratio indicates how much of the total portfolio has been set aside to cover possible future losses. Provided that the banks follow similar loan loss reserve strategy, the higher the ratio, the poorer the quality of bank's loan portfolio which should translate into the higher price of BSD and again, under the null hypothesis, lower the likelihood of new BSD issue. Variable *EQNL* is computed as bank's total book equity to total net loans. It gives information about bank's cushion for loan losses which can be absorbed by equity. The higher the ratio, the higher the portion of loan losses absorbed by equity rather than by BSD. This should be reflected in lower price paid for BSD and, under the null hypothesis, it should translate into the higher likelihood to issue BSD. Next term *ROAALEV* is a product of two variables. The first is bank's return on average assets (*ROAA*) which is computed as net income over average total assets and measures the profitability of the assets financed by the bank. The second is bank's leverage (*LEV*) computed as total liabilities over bank's equity. Variable *LEV* has two interpretations in the previous studies. Here, based on Covitz, Hancock and Kwast (2000) we assume that higher leverage implies higher default risk. Now, based on Sironi (2001), the term *ROALEV* should have, under the null hypothesis, positive impact on issue decision because the profitability becomes more important for more leveraged banks.

With respect to these two specifications, it should be noted, that generally *BV* were prefered by the authors to depict banks' credit risk. However, I decided to add specifications with *ECR* for several reasons. First, it is assumed that the counterparty credit ratings already contain the balance sheet information concerning the quality of loans. Second, the individual balance sheet information differs with respect to the depth of information and the methodology used. Third, since the majority of banks in the sample introduced IFRS accounting standard in 2005, the methodology used for computing individual items on the balance sheet differs even within the bank's annual reports. The expected signs of the regression coefficients for *CR* variables are presented in table 14.

Table 14: Summary of expected signs of the *BCR* regression coefficients

Variable	Description	Expected sign
CR	External credit rating	Minus
LLRGL	Ratio of loan loss reserves to gross loans	Minus
EQNL	Ratio of equity to net loans	Plus
ROAALEV	Product of return on average assets and leverage	Plus

Source: Author

In BSM, I include five control variables. The first is a dummy for public banks (*PUBLIC*), i.e. variable that equals 1 if the issuing bank is either government owned bank or a bank that benefits from explicit government guarantees, and 0 otherwise.[48] The public banks thus may have benefit of achieving lower issuing costs because of the perceived guarantee. The second variable (*LNTA*) is for the natural logarithm of bank's total assets. This variable is usually explained in two different manners. Either it represents too-big-to-fail principle, e.i. the largest banks are percived to have implicit government guarantee and thus benefit from lower issuing costs (Sironi, 2000) or it presumes that larger banks have cheaper underwriting costs per unit of capital and better access to subordinated debt market (Covitz, Hancock, Kwast, 2000). In either case, the higher the total assets, the lower the issuing costs. Third variable (*PPISSUE*) is a dummy variable that equals 1if there was an issue of BSD in the previous period and 0 otherwise. The argumentation behind this variable is that the bank which issues quite frequently is quickly recognized at the market which reduces its underwriting costs and it is likely to issue again in the next period (Covitz, Hancock, Kwast, 2000). Fourth variable (*TAX*) portrays bank's tax expenditures and it is measured as a ratio of foreign and domestic income taxes to net income. The higher this variable, the higher the incentive for a bank to create tax shield by issuing BSD and deducting the interest (BGFRS, 1999). The fifth variable (*BSDRWA*) constitutes the approximation for a bank's need to issue BSD as a part of supplementary capital to enhance its regulatory capital. Variable *BSDRWA* is measured as the ratio of bank's outstanding termed subordinated debt with original maturity higher than five years to risk weighted assets (*RWA*). Since there exists limits on BSD beeing part of regulatory capital, I expect, that the lower the ratio, the higher the incentive to issue BSD. Table 15 shows the expected signs of the regression coefficients of BSM variables.

[48] Based on Sironi (2001). The public banks are highlighted blue in annex C.

Table 15: Summary of expected signs of the *BSM* regression coefficients

Variable	Description	**Expected sign**
PUBLIC	Dummy for public banks	Plus
LNTA	Natural logarithm of total assets	Plus
PISSUE	Dummy for issues in previous period	Plus
TAX	Tax expenditures to net income	Plus
BSDRWA	Termed BSD to RWA	Minus

Source: Author

In the last category *GEC*, I include two variables. These variables should control for the generall business conditions in EU15 countries and USA. First variable (*EU15GAP*) is a measure of GDP gap in EU15 countries. It is computed from the indexed annual GDP time series (year 2000 = 100) over the available period 1995-2007, using Hodrick-Prescott filter. The assumption is, that the banks prefer to realize their investments rather during the favorable overall economic climat. If approximated by GDP gap, which is positive when the economy is above its potential and negative if bolow its potential, the expected sign of the coefficient is positive. Second variable (*USAGAP*) is a measure of GDP gap in the USA. It is computed based on the indexed annual GDP time series (year 2000 = 100) over the available period (1929 – 2009), using Hodrick-Prescott filter. This variable is included as a control variable for USA overall business conditions because since the banks in the sample are parent or major banks of large banking groups operating internationally, it is assumed that part of their securities is also listed on the USA markets. The expected sign is also positive. Table 16 shows the expected signs of the regression coefficients of *BSM* variables.

Table 16: Summary of expected signs of the *GEC* regression coefficients

Variable	Description	Expected sign
EU15GAP	GDP gap in EU15 countries	Plus
USAGAP	GDP gap in the USA	Plus

Source: Author

The two specifications of the model to be estimated are as follows:

(1) *ECR* based specification:

$$ISSUE_{it} = \beta_0 + \beta_1(CR_{it}) + \beta_2(PUBLIC_{it}) + \beta_3(LNTA_{it}) + \beta_4(PISSUE_{it}) + \beta_5(TAX_{it}) + \beta_6(BSDRWA_{it}) + \beta_7(EU15GAP_{it}) + \beta_8(USAGAP_{it}),$$

where bank's credit risk $BCR = f(CR_{it})$.

(2) *BV* based specification:

$$ISSUE_{it} = \beta_0 + \beta_1(LLRGL_{it}) + \beta_2(EQNL_{it}) + \beta_3(ROAALEV_{it}) + \beta_4(PUBLIC_{it}) + \beta_5(LNTA_{it}) + \beta_6(PISSUE_{it}) + \beta_7(TAX_{it}) + \beta_8(BSDRWA_{it}) + \beta_9(EU15GAP_{it}) + \beta_{10}(USAGAP_{it}),$$

where bank's credit risk $BCR = f(LLRGL_{it}, EQNL_{it}, ROALEV_{it})$.

5.2.2 Description of the sample and data

To estimate the model in its two specifications (1) and (2), I use yearly data from 2001 to 2006. The sample is formed by 29 large banks from EU15 countries. Banks in the sample are parent or main banks of the internationally active banking groups whose assets range from 24,196 to 1,444,209.98 mil. EUR in year end 2006. I focused on large banks because we considered two assumptions. First, the assuption that the largest European banks are the largest issuers (Sironi, 2001) and second, that most of MSD proposals concerns only large banks.[49] The overview of sample banking groups is provided in annex C.

The data come from three sources. First and key source were the bank's annual reports, particularly notes to the consolidated financial statementes,[50] from which I gathered information about the BSD issues.[51] It should be noted, that in few cases (generally german public banks), the data about BSD issues cover only issues that exceeded 10% of bank's subordinated liabilities where subordinated liabilities were defined as the sum of

[49] See e.g. BGFRS (2000).

[50] Consolidated data are used because the banks in the sample are large banks with financial subsidiaries, which may issue BSD not only for their own purpose but also for their affiliates. Consolidated statements then give better picture of the group's financial situation because the intra-goup transactions such as e.g. transfers of bad loans should be eliminated (Mejstřík, 2nd lecture on Banking 2008).

[51] While banks usually report subordinated debt under ‚subordinated liabilities,' I included only subordinated debt (subordinated bonds and notes) and excluded preffered shares and other hybrid capital (i.e. debt with convertible provision).

subordinated debt, preffered shares and other subordinated hybrid capital. I'm aware that this may cause a bias in the data, however I included the data since timing of big BSD issues is of particular interest when DMD is under question.

The second data source was BankScope, March 2008 edition. All book variables comes from this database, so do all three external credit ratings.[52] Here, I would like to make two comments. The first is towards the sample size. All three mentioned long term external credit ratings were not available for all observations. Thus I divide the total sample into three subsamples according to the specifications based on Standard & Poor's (CR^{SP}) with 134 observations, Moody's (CR^{M}) with 142 observations and Fitch (CR^{F}) credit ratings with 147. The inequality between the subsamples impairs the comparability of the results, however thanks to the similar size of all three samples and high correlation between the credit rating (see table 17), it is presumed not to be grave. The book based specification includes 150 observations.

Table 17: Correlation between CR^{SP}, CR^{M}, CR^{F}

	CR^{SP}	CR^{M}	CR^{F}
CR^{SP}	1.000		
CR^{M}	0.8266	1.000	
CR^{F}	0.8686	0.8744	1.000

Note: Based on 129 observations
Source: Author

Second, folllowing work of Naohiko, Masakazu and Yasuo (2007), I use two variants of *BV*, the varibles based on the lagged values from previous fiscal year, denoted by lower index *L* and varaibles based on the averaged values from current and previous fiscal year, denoted by lower *index A*. The reasoning for this arrangement is to avoid endogenity problem (lagged data) but to maintain information about current banks' financial situation (averaged data). The results are then compared.

The third data source was the eurostat databasis. This provided information about the indexed annual EU15 and USA time series from which I computed corresponding GDP gaps. The following table 18 provides summary statistics for the sample variables:

[52] Where necessary, the data in original currencies were converted into EUR using historical (end-of-year) exchange rates obtained on Eurostat website.

Table 18: Summary statistics of the variables

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
ISSUE	150	0.647		0	1
CR^M	142	3.598	1.705	1	9
CR^{SP}	134	4.485	1.653	1	9
CR^F	147	4.259		1	9
$LLRGL_L$	150	2.186	1.572	0.25	8.28
$LLRGL_A$	150	2.125	1.543	0.215	7.975
$EQNL_L$	150	8.878	3.771	2.49	27.95
$EQNL_A$	150	8.891	3.627	3.49	25.155
$ROAALEV_L$	150	12.103	11.105	-92.0	30.624
$ROAALEV_A$	150	12.763	7.723	-33.702	28.941
PUBLIC	150	0.113		0	1
$LNTA_L$	150	12.177	1.195	9.306	14.088
$LNTA_A$	150	12.229	1.197	9.364	14.137
PISSUE	150	0.653		0	1
TAX_L	150	0.447	0.601	-0.473	6.016
TAX_A	150	0.428	0.488	-0.296	4.233
$BSDRWA_L$	150	0.034	0.139	0	0.074
$BSDRWA_A$	150	0.034	0.013	0	0.071
EU15GAP	150	-0.002	0.007	-0.008	0.012
USAGAP	150	0	0.008	-0.01	0.011

Note: For dummy variables, the mean represents the ratio of all observations with the given characteristis.
Source: Author

5.2.3 Discussion of the results

I have described two group of specifications to be estimated. ECR based specifications further differ in the external rating used as an approximation for default risk (CR^M, CR^{SP} or CR^F). In addition, all specifications were estimated with lagged book variables and averaged book variables. Table 19 reports all external rating based specifications and table 18 reports all book based specifications. All specifications were estimated as pooled probit model. The random effects probit model was also run but was significantly rejected by the log-likelihood test. The correlation matrices are to be find in annex D.

Table 19: Results of pooled probit model using *ECR* as an approximation for credit risk

	Using lagged variables						Using averaged variables					
Specification	**(1)**	**Exp. sign?**	**(2)**	**Exp. sign?**	**(3)**	**Exp. sign?**	**(4)**	**Exp. sign?**	**(5)**	**Exp. sign?**	**(6)**	**Exp. sign?**
CR^F	-0.138* [0.083]	x					-0.141* [0.076]	x				
CR^M			-0.053 [0.071]	x					-0.048 [0.065]	x		
CR^{SP}					-0.095 [0.079]	x					-0.092 [0.062]	x
PUBLIC	-0.564 [0.4]		-0.769* [0.412]		-0.188 [0.343]		-0.546 [0.43]		-0.75* [0.435]		-0.127 [0.368]	
LNTA	-0.001 [0.085]		0.057 [0.105]	x	0.054 [0.086]	x	-0.019 [0.075]		0.049 [0.096]	x	0.035 [0.073]	x
PISSUE	0.68*** [0.22]	x	0.85*** [0.209]	x	0.58*** [0.208]	x	0.64*** [0.225]	x	0.8*** [0.216]	x	0.53** [0.215]	x
TAX	-0.023 [0.177]		-0.002 [0.173]		-0.029 [0.161]		0.041 [0.246]	x	0.083 [0.243]	x	0.008 [0.21]	x
BSDRWA	-9.484 [8.558]	x	-11.752 [8.829]	x	-7.915 [9.691]	x	-0.219 [8.49]	x	-2.676 [8.977]	x	2.933 [9.835]	
EU15GAP	15.638 [-4.613]	x	27.197 [17.833]	x	20.266 [17.764]	x	14.484 [16.714]	x	25.79 [17.34]	x	19.38 [17.43]	x
USAGAP	-4.613 [15.541]		-7.283 [14.77]		-5.401 [15.562]		-4.269 [15.391]		-6.756 [14.72]		-5.481 [15.61]	
CONSTANT	1.006 [1.155]		-0.072 [1.324]		0.195 [1.127]		0.903 [1.028]		-0.332 [1.214]		0.053 [0.891]	
Num. of obs.	147		142		134		147		142		134	
Corr. predict.	69.69%		70.42%		69.4%		71.43%		71.83%		71.64%	
Log likelihood	-84.143		-79.283		-78.831		-84.822		-80.115		-79.177	
Pseudo R^2	11.33%		13.94%		6.26%		10.61%		13.03%		5.84%	

*Notes: *,** and *** mark the 1, 5 and 10% confidence level, respectively.*
Figures in square brackets are robust stand. errors corrected for heteroskedasticity clustering for each bank.
Source: Author's calculation

Table 20: Results of pooled probit model using *BV* as an approximation for credit risk

	Using lagged variables		Using averaged variables	
Specification	**(7)**	**Exp. sign?**	**(8)**	**Exp. sign?**
LRGL	-0.12** [0.0546]	x	-0.118** [0.053]	x
EQNL	0.017 [0.024]	x	0.005 [0.022]	x
ROAALEV	0.013 [0.014]	x	0.022 [0.022]	x
PUBLIC	-0.409 [0.431]		-0.403 [0.421]	
LNTA	0.0761 [0.086]	x	0.072 [0.083]	x
PISSUE	0.714*** [0.206]	x	0.639*** [0.199]	x
TAX	-0.01 [-0.167]		0.021 [0.226]	x
BSDRWA	-9.593 [8.437]	x	-0.061 [8.355]	x
EU15GAP	16.144 [16.669]	x	18.198 [17.087]	x
USAGAP	-9.537 [15.514]		-13.887 [16.593]	
CONSTANT	-0.623 [1.051]		-0.908 [1.195]	
Num. of obs.	150		150	
Correct predictions	70.67%		72%	
Log likelihood	-84.15		-84.3832	
Pseudo R^2	13.62%		13.38%	
Wald test for BCR coefficients jointly equalling zero	Chi2 (2) = 6.14 Prob > chi2 = 0.0464		Chi2 (2) = 7.86 Prob > chi2 = 0.0197	

*Notes: *,** and *** mark the 1, 5 and 10% confidence level, respectively.*
Figures in square brackets are robust standard errors corrected for heteroskedasticity clustering for each bank.
Source: Author's calculation

Based on the results presented in tables 19 and 20, we can draw a conclusion concerning the hypothesis. The results of pooled probit model using *ECR* as an approximation for credit risk have showed a consistent negative impact of higher default risk on banks' issue decision, no matter what *ECR* was used. Further, if using the Fitch rating, the coefficients were significant on 10% confidence level. The results of pooled probit model using BV as an approximation for credit risk have also showed consistent and expected signs for all three coefficients and both lagged and averaged variables. Further,

the coefficient of *LRGL* was in both specifications (8) and (9) significant and 5% confidence level. Also the results of Wald test for the book based *BCR* coefficients jointly equal zero indicates, that we cannot reject the null hypothesis on 5% confidence level.

Besides the main conclusion, the model reveals other interesting insights. First, the variable *PUBLIC* was consistently negative in all specification, though generally not significant. This contrasts to findings of Sironi (2001), who showed that investors were not sensitive to the risk of public banks in the 90s and these banks could benefit from the lower issue costs. The explanation may be, that the public banks accounts only for about 10% of the sample which is small representation to draw any general conclusion. Further, these banks report rather big issues of BSD exceeding 10% of all subordinated liabilities which might have biased the results.

Second, variable *PISSUE*, which stands for the ‚name recognition' of the bank on the BSD market has been significant at 1% confidence level in all specifications. This implies that the banks which issued BSD in the past are likely to follow this strategy and issue again in the future.

Third, three variables *LNTA*, *BSDRWA* and *EU15GAP* has showed consistent and expected sign of its coefficients in all specifications (though not significant). This may indicate, that bank's size, rules on regulatory capital and favorable domestic business climat play a role in the final decision.

Finally and importantly, it should be noted that, mainly because of the small size of the sample, it is necessary to be careful with drawing genaral conclusions regarding the hypothesis and thus our results may serve merely as an interesting observation that would deserve greater investigation based on larger sample.

6. Mandatory Subordinated Debt Policy in Europe

6.1 Review of past proposals

The first proposals concerning MSDP were drafted during the mid 80s and were aimed at reforming then US regulatory framework. The main issue was to discipline the banks via increasing their costs of funding. This first-generation proposals (as called in literature)[53] recommended that the banks would issue BSD with shorter maturities (but long enough not to induce the risk of bank run). The idea was that the riskier banks would have to pay more for raising the funds and thus DMD would be reinforced. The issues should be frequent but not necessarily on regular basis. The mandatory amount of BSD was usually derived from total liabilities (2%), total deposits (3-5%) or risk weighted assets (4%). The authors generally didn't mention any particular technicalities such as rate caps on the issue spreads or the provision of put option included in the BSD contract. Among these studies belong Benston et al. (1986) and Litan and Rauch (1997).

Next wave of proposals, emerged during the late 80s and early 90s as a reaction to the US Savings and Loan crises and were driven by the concerns from the overgrown US safety net. These second-generation proposals were also aimed at strenghtening DMD, but this time via the ability of individual banks to issue BSD. The idea behind was to supplement the former proposals with the stress on the banks' ability to issue BSD and the contracts would generally have to contain put option that would enable the repurchase of the BSD by the bank initiated by the BSD holders. If a bank found itself not capable to issue this BSD, it was a signal of its financial weakness and it would serve as a trigger for corrective measures from the regulator's side. These proposals called for more frequent issues (several times a year) but with longer maturities (at least 5 years). The required amount of BSD would be deduced from deposits (around 3%) or RWA (around 4%). The authors of these studies were Cooper and Fraser (1988), Keehn (1988) and Wall (1989).

The third-generation proposals of late 90s are the most connected with the work of Calomiris (1997 and 1999). Calomiris proposed to implement cap in spread over T-bill rate. The banks would have to issue BSD frequently (monthly) with maturity of 2 years and in amount of 2% of RWA. If the banks didn't succeed to issue its BSD under this cap, it would be penalized by the requirement to reduce their assets by 1/24 during the next month. This proposal is also inetersting in the aspects that all banks (even small ones)

[53] See BGFRS (1999).

would be subject to this policy. This contrasts to the previous proposals that would generally exempt small banks.[54]

I believe, that from today's perspective, we can talk about fourth-generation proposals. These proposals have in common that they prioritize the BSD as an instrument that enhance IMD rather than DMD. This is to be understood that the gains of increased risk sensitivity of funding costs are perceived to be minimal.[55] Rather, the potential of BSD is seen in providing market signals about banks' financial situation. Among these studies, we can rank e.g. Lang and Robertson (2000). They damand that the banks would hold 2% of their assets in BSD and the BSD should have ralatively high maturity but they don't call for frequent issues. They argue that the BSD spreads should be complementary to other (accounting) triggers of regulatory action. They also recommend to exempt small bank from the policy. Similar standpoint may be found in a work of Evanoff and Wall (2000) who futher offer a phased implementation framework which leaves room for future modification. On the other hand, there have emerged more reformist proposals that advocate alternative approach to Basel II and its regulatory capital framework. For example Herring (2004) argues that MSDP would be more effective regulatory tool than current Basel II capital rules in disciplining banks' risk-taking.

While the above mentioned studies are based on ‚Basel-FDICIA' experience and try to amend its specific drawbacks, MSDP is far-reaching. For example, Shadow Financial Regulatory Committees of Europe, Japan, and the United States continuous to recommend the BSDP to supplement the existing regulatory framework to ‚bring market discipline to bear on bank risk and capital management (AEB, 1999).' They also believe that the definition of capital should be revised and the distinction between core capital and supplementary capital should be removed. Based on their recommendation, the policy should be implemented in phases and befall only large banks whose debt is actively traded.

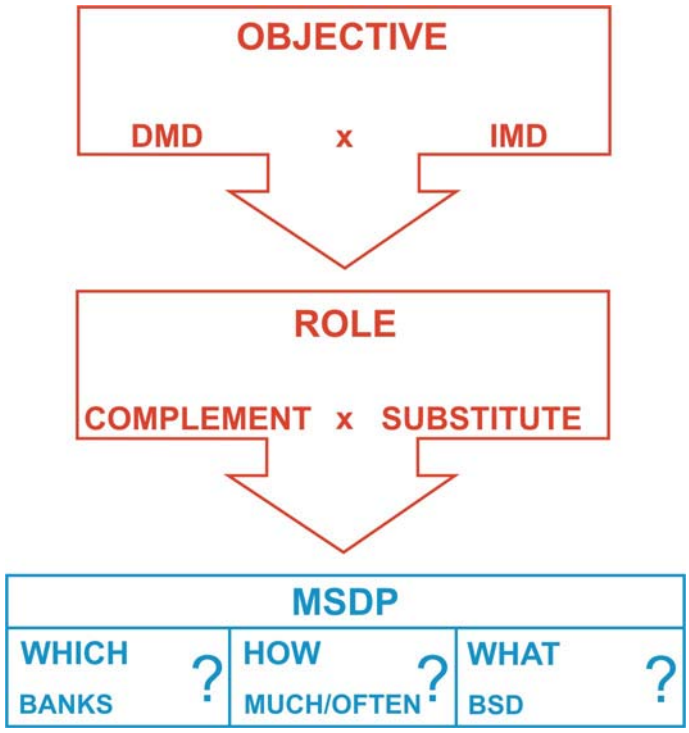
[54] Definition of small banks differed, the uper limit was around $2-10 billion in assets (Haubrich, 1998).
[55] See Lang and Robertson (2000).

6.2 MSDP in Europe – design setting strategy

The previous subchapter outlined that designing of the MSDP has been quite challenging task. This stems from the complexity of the issue and results in a wide range of heterogenous approaches which haven't yet converged to any unifying proposal. While the diversity of the proposals belongs to its key drawbacks and leave it aside from the actual implementation, the advantage is that it still gives wide space for discussion. I take this opportunity and try to contribute towards the debate by my opinion. To do so, it is necessary to specify the design setting strategy that I will follow. Based on this strategy, I will develop arguments for the particular form of the MSDP that would, in my opinion, be suitable for European banks.

Now to the design setting strategy. The following figure 6 demonstrates the simple strategy I have chosen.

Figure 6: Design setting strategy for MSDP



Source: Author

The chart explains that the first key element is to decide about the primary objective, i.e. enhancing DMD or IMD. Generally, it is argued that MSDP is aimed at increasing both, DMD as well as IMD.[56] However, once the debate arrives to the particular policy

[56] See e.g. BGFRS (2000).

designs, it emerges that there exists certain tradeoff between these two objectives (Sironi, 2001). Based on this, it seems that it is reasonable to take initial assumption wheather the policy is aimed rather on DMD or IDM. This, of course, doesn't mean that the second is completaly omited but rather that there should not be any excessive expectations about fullfilling the ‚secondary' goal.

The second element concerns the role of MSDP which should play in the framework of the bank regulation. If simplified, there are two approaches. MSDP can be either complement, i.e. designed to fine-tune the current regulatory framework or substitute some of their functions. To give illustrative example, there is difference between proposals prefering improving banks' monitoring by including BSD market signals but without any particular priority over other factors such as signals from the equity market or accounting variables (Lang, Robertson, 2000). On the other hand, there are proposals calling for an automatic link between BSD spreads and regulator's corrective action. Thus, the BSD would gain the priority over other indicators of bank's financial situation. This kind of proposal may by found in Calomiris (1999) or Evanoff and Wall (2000).

The last element of the figure summarizes the key aspects of the MSDP with respect to the cathegory of banks that would be subject to the policy, with respect to the demanded volume and frequency and with respect to the type of BSD to be issued, i.e. the technical requirements on BSD instrument.

6.3 MSDP in Europe – proposal

As follows from figure 6, it is necessary to address the question wheather the MSDP should be primary focused on enhancing DMD or IMD. Both these objectives have different prior requirements. DMD refers to the situation when market participants have influence over the bank's actions via pricing and holding risk-sensitive instrument and they can consequently force the bank to reduce or restructure its assets (BGFRS, 1999). In order for DMD to be effective and prevent the banks' from excessive risk-taking, it is necessary that the banks enter the market on frequent basis and they offer quite a large volume of BSD. This procedure reveales the true bank's risk profile to the market and the market is capable to price the BSD accordingly. Further, it is necessary that this market feedback is strong enough to influence the actual bank's risk behaviour (Distinguin, 2008).

IMD is exercised if the market provides adequate signals of banks' risk which may serve as an important inputs for further evaluation of bank's current financial stability and future development. Here, the stress is placed on accurate, continuous and easy extraction of the information from BSD spreads. Habrich and Thomson (2007) argue that in order to enhance IMD, the banks should (1) enter the market regularly, so the wide range of maturities is available at one point in time, i.e. it is possible to create information-rich yield curve, (2) enter the market quite frequently, so the bank's are forced to update the information about their risk available to the broad market. Both these conditions should also increase the liquidity of the secondary market which is crucial. Also high degree of standardization seems reasonable because than it facilitates comparison of BSD issued by different banks (BGFRS, 2000).

Now, let's focus on European setting. First, Sironi (2000) showed that BSD issue spreads are sensitive to banks' risk (with exception of spreads of BSD issued by public banks) and the sensitivity has increased over time. Second, Sironi (2001) and BCBS (2003) give evidence that the secondary market for subordinated debt is quite illiquid. Further, Gropp and Richards (2001) and Gropp, Vesala and Vulpes (2004) add that risk signals in European secondary market BSD spreads are rather low when default is far away and provide little or no additional information relative to accounting data. Third, based on the results of the issue model, the null hypothesis that bank's actual BSD issue decision has been sensitive to the bank's credit risk cannot be rejected. Here, I follow up with on work of Sironi (2001), who argued, that there were two advisable strategies in European context – either to focus on DMD or to focus on IMD built upon issue spreads. While IMD is

rather designed to fine-tune supervisor's insight into bank's business, MSDP aimed at DMD discipline has advantage, that it is ‚purely' market oriented solution. In my opinion, based on the results of the issue model, I would favor DMD.[57] In addition, I believe that IMD built upon issue spreads could be also beneficial and further, provided that the mandatory issues would be public, frequent and with quite standardised technical features, that the secondary market could benefit from the policy and its liquidity would increase.

Even if the choice is made and MSDP would be primarily focus on IMD, there is still one concern. FRBSF (2002-36) argues that profit-maximizing banks trade off risk and return at the margin. Thus, higher BSD costs would not necessarily limit risk-taking per se if these costs could be fully compensated by a higher risk-adjusted return. While the market is satisfied because the risk is properly priced, the supervisors may have objections that this doesn't give them any powerful tool to constraint the bank from high risk-taking. I believe that this problem could be, at least partly, solved by introducing the maximum spread (rate cap) on issue spreads, which should prevent the banks from risk-taking beyond certain limit and force them to restructure their assets.[58]

Second arrow in figure 6 concerns the role that should be ascribed to the MSDP in the broad spectrum of regulatory and supersisory measures, i.e. how it fits and modifies current framework. Presumably, the key issue would be the **definition of capital**. The current definition of capital distorts the issue of BSD in two important ways. First, it sets limit which equal 50% of bank's core capital. Second, the minimal original maturity of BSD to be caunted as supplementary capital is 5 years and BSD is amortized after 5 years. This leads to the issues with longer maturities (as noted earlier, the maturities tend to be around 10 years). In order for MSDP to increase IMD, it is inevitable to accomodate the current rules so the banks issue more often, regularly and with shorter maturities. One way is to still count MBSD into regulatory capital but both increase adequatly the volume limits and shorten the required minimal maturities. Another approach is to eliminate the difference between the core capital and supplementary capital. The banks would have to operate below specified leverage ratio that could be satisfied by both equity and BSD (Evanoff and Wall, 2000).

[57] Sironi (2001) leaves this question opened, however he suggested, provided that issue decision was sensitive on bank's risk, that DMD would be preferable.
[58] Nevertheless, this provision has large practical problems. The most common argument against it is that it can be procyclical. The rate cap is advocated e.g. by Calomiris (1997, 1999).

Now towards the **role** of MSDP. Here, I percieve two possible directions. The first is to look at BSD as a certain substitute of bank's equity. As already discussed in previous chapters, BSD (due to its payoff profile) has certain advantage over the equity. By the advantage, we mean the risk aversion of debtholders who consequently impose more restrictions on bank's risk taking and demand various covenants which can ultimately ensure them the control over the bank. However, many authors argue, that while BSD may have positive impact on bank's risk taking, the equity is irreplaceable in the bank's capital structure (this is also official opinion of BCBS). There is strong argument that since the interest on BSD cannot be deffered (unlike the dividends), the extensive BSD financing may trigger grave problems whenever otherwise healthy banks goes through difficult period (Evanoff, Wall, 2000). Based on this, I believe that BSD should remain a complementary source of bank's capital and MSDP should be designed accordingly. To set the ground, the main concern should be to ensure that BSD investors have timely and adequate information about the bank, so they can price the instrument correctly (the disclousure requirement is in line with Basel II) and futher, it should be generally believed that there is no implicit guarantee provided to the bank in case of its failure (Maclachlan, 2008).

The last step is to determine the specifications of MSDP with respect to the banks, that should be subject of the policy, with respect to the frequency and volume of the issues and technical features of BSD.

Most of the proposals argue that only the **large banks** should be subject to the MSDP. There are three important reasons for it. First, Haubrich (1998) argues that the costs of issuing BSD would be too big for small banks and would impose a heavy burden on them. The burden would be in terms of the direct costs of issue, e.g. underwritting costs and also in terms of meeting quite demanding criteria such as the frequency and the prescribed amount. Second, since the European BSD market is formed mainly by the large banks, there are doubts wheather the liquid secondary market for BSD issued by smaller banks would be created and consequently, the information in BSD spreads would be noisy (even though this not the key problem in case of MSDP focused on increasing DMD). Third, the Basel II enables to the banks to implement ‚interal model approach' to determine its capital adequacy. This approach is expected to be chosen by large banks and should be ‚checked' by the market (Sironi, 2001). This provides third reason why MSDP is more justifiable in case of large banks.

Now, we shall address the amount and frequency of BSD issues. Past proposal usually derived total required **amount** of BSD from total assets, total deposits and since introduction of Basel I concept, from RWA. To fix required amount of BSD to RWA seems the most appropriete because (1) the concept of RWA is based on the notion of banks' credit risk and (2) it fits into the current regulatory capital rules (Sironi, 2001). On the other hand, Sironi (2001) also makes a remark that when some banks transfer to IMA, the required amount of BSD could be linked to regulatory capital based on the banks' global portfolio risk. Then he rejects this possibility since MSDP should primarily counterbalance the risk of moral hazard which stems from relying on banks' own models.

Next step is to determine the **required ratio** of BSD to RWA. While some proposals advocate 2% of RWA (e.g. Calomiris, 1997 or Evanoff and Wall, 2000) other autors call for higher ratio around 4-6% (e.g. Keehn, 1988 or Wall, 1989). It seems that the key difference is wheather the proposals are aimed at DMD or IMD. While the main focus is on DMD, the ratio is higher so BSD can actually exercise discipline on banks. On the other hand, when IMD is at heart, ratio of around 2% is recommended. Table 21 provides information about averaged ratio of BSD to RWA of European banks diffferentiated by their size during the period 2003-2006, the current ratio ranges from 2 to 3% (always higher for larger banks). Thus, if we take all this into account, it seems reasonable, in order to enhance DMD in Europe, to require more than current up to 3% of RWA for large banks. Further, this ratio should be set at a level where the marginal costs of additional issue of BSD equal to marginal benefit from increasing DMD so the banks would't have to bear superfluous burden.[59]

Table 21: Ratio of BSD to RWA of European banks, 2003-2006 (%)

	2006	2005	2004	2003
EU15 TOP 100	2.62	2.51	2.70	2.10
EU15 TO5 500	2.44	2.36	2.45	1.93
EU15	2.36	2.28	2.37	1.81

Source: BankScope March 2008 edition and author's calculation

Let's focus on **frequency**. It is an important element since the key condition of MSDP focused on DMD is to expose the banks continuously to the market pressure. Thus, the policy should requiry quite frequent issues. On the other hand, the policy should be flexible

[59] Or, based on Sironi (2001), where the marginal social benefits of increased MD equal to the marginal additional regulatory costs for the banking system.

enough not to force the banks to issue during the unfavorable macroeconomic conditions since it can harm the banks (Sironi, 2001). Further, setting the freqency has also implications for the face value of BSD per issue and its maturity. Provided, that higher frequency was desirable, either the face value of BSD issue would have to drop or the maturity would shorten. The smaller face values per issue would be probably more costly and the secondary market (however it is not the key issue here) would be less liquid (BGFRS, 1999). On the other hand, shorter maturities elevates the risk of bank run bacause bank has to repay its debt quite often. Thus, there always exists tradeoff between higher costs of new issues because of lower nominal value of BSD and risk of bank run due to shorter maturity (BCBS, 2003). Based on the sample data, the average number of issues per year is around 2, presumably higher for the largest banks. Thus, I believe that imposing requirement of 2-3 issues per year wouldn't probably solve much and the required frequency should be higher. For example, provided that the required volume was around 5% (double as current average state) with constant face value per issue and the average maturity dropped (let's say by half of current quite long 10 years), there could be around 12 issues per year, i.e. the banks would be required to issue on monthly basis.[60]

Last important question is, what **type of BSD** should be required. While the standardization of BSD instrument seems reasonable if the primary aim of MSDP is to enhance IMD (because, as argued in BCBS (2003), it enables fast and accurate comparison among BSD issue spreads of many banks), the impact of standardization, if DMD is under question, is rather unclear. On the one hand, the standardized instrument would unable to decipher the spread information more easily and compare it. This could be usefull in case of rate cap provision or the aspiration to also enhance IMD. On the other hand, as Sironi (2001) argues, the standardization reduces the flexibility of bank managements' decision – and as argued in chapter 2, the flexibility of BSD is its key advantage. Despite this objection, I believe that the banks would be still left with large window of other ‚tailored to needs' financing opportunities and the burden of standardization wouldn't be too heavy in comparison to its gains.[61]

Standardization is one thing but in order to deliver coveted outcome, crucial task is to choose the most suitable characteristics for BSD. This means to determine the technical

[60] Issues on monthly basis are suggested by Calomiris (1999).
[61] This is just my personal view and futher research in this field would be necessary.

features such as put or call provision, convertibility, interest rate type or other type of special covenants attached to the instrument.

The **put provision** was especially favourite in second-generation proposals. The argumentation behind it was, that the BSD investors would gain a strong voice in deciding wheather or not to close the bank in case of its failure. Further, multiple exercise of such put would send a strong signal to the supervisors and they could take promt corrective measures. On the other hand, this feature was often subject to the criticism because the multiple exercise of put option could give a start to bank run. This is especially dangerous during the economic downturn when otherwise healthy bank can temporarily show worse numbers.

The **call provision** is a feature which is freaquently attached to BSD. It allows to the issuing bank to buy back the debt at a previously determined price. This is also reflected in the interest rate which should by higher than for the otherwise same instrument but without this possibility. Since this provision concerns rather long-run BSD (so the bank could react on the future change of interest rates), there is no particular reason why to require call provision in MSDP which operates with shorter-run BSD and roll over so the bank can more easily accomodate to the new conditions.

Convertible BSD is considered a hybrid capital instrument. It means that the bank exchanges BSD for common or perpetual preffered stock before or at the maturity date. This instrument qualifies as tier 2. It is attractive in a way that bank's debt converts to the equity but the provision elevates the costs of the instrument.

Towards the **interest rates**. Many proposals prefer fixed interest rates. However, Fan, Haubrich, Ritchken and Thompson (2003) point out that BSD with fixed and BSD with variable interest rate behaves almost identically. While there is no special reason why to prefer fixed over variable interest rate, the final decision may be reserved to the issuing banks.

There may also arise question wheather BSD should be **publicely placed**. The advantage of publicaly traded BSD is that they provide information of secondary prices, which may be also used to enhance IMD. On the other hand, while I argued for DMD, the public placement is not necessity since both private and public markets should discipline the banks.

To conclude, MSDP aiming at DMD doesn't have to prescribe to the banks to issue standardized instrument. On the other hand, if it does, there are benefits such as increasing

IMD. Such standardized instrument could be publicaly placed plain vanilla BSD with either fixed or variable interest rate.

6.4 Costs of MSDP

So far, we have talked about the benefits of MSDP. However, there are still some potential costs that should be addressed now. So the question is, how big are the costs paid by the banks when they have to comply with the requirements of MSDP?

Presumably, the first on our mind would be the direct costs of the issue in terms of transaction of the instrument and yield paid. The concerns about increased issue costs stems from the requirement of relatively frequent issues in lower nominal value. For example in BGFRS (1999), it is argued that the issues in lower nominal value would have to carry a higher yield that the issues in high nominal value. On the other hand, other authors maintain that the increase of these costs would be minimal. Sironi (2001) states that the size of BSD issue is not statistically significant in explaining the variability of issue spreads compared to a corresponding T-bond.

Another problem may arise when banks are forced to issue the standardized BSD instrument and thus their are deprived of the flexibility to tailor financing decisions on their current needs. While, on the one hand, this may seem as a strong argument against MSDP, on the other hand, the current BSD qualifying for supplementary capital has been already homogenized to large extent across wide scale of banks.

Further concern is that MSDP may increase procyclical behaviour of banks, i.e. increased lending during economic expansion and reduced lending during recession (Evanoff and Wall, 2000). On the other hand, as e.g. Kwast (1999) argues, the procyclical bahavior is inherent to any regulatory measure since the banks always desire to fulfill the minimum requirement. Evanoff and Wall (2000) further argue that the way out of it is, if the banks maintain some cushion above the minimal capital requirements. This is supported by empirical anylises from 80s and 90s.[62]

There are other common worries about MSDP which are rather focused on IMD, such as the quality of information contained in BSD spreads, the question of superiority of BSD over other market signals or the extent of contribution to supervisors. I believe that these issues have been already discussed in the previous chapters.

[62] See e.g. Wall and Peterson (1987, 1995).

7. Conclusion

Discussion about the potential ability of bank subordinated debt (BSD) to increase market discipline (MD) of large European banks was at heart of the paper. Our starting point was the problem of moral hazard elevated by the bank's safety net. We focused on the explicit deposit insurance and argued that while, on one hand, this arrangement is to decrease the systemic risk in banking by reducing the likelihood of bank run, on the other hand, it impairs MD which is necessary for effective allocation of resources of all involved, i.e. banks, depositors, investors, bank supervisors and regulators etc. Then, we turned our attention to the concept of BSD and identified it as a potential tool to increase MD in banking. We explored the characteristicts of BSD and study the channels through which it may impose more MD on banks. In the rest of the paper we concentrated on direct market discipline (DMD) exerted via BSD which was defined as a situation when bank's expected cost of issuing BSD increases substantially with an increase in its risk profile and bank's issue decision reflects these increased costs.

The main concern of the paper was to verify the null hypothesis that the large European banks were subject to DMD during the period 2001-2006. First, we described the market for BSD in Europe. To do so, the data about 227 BSD issues of 29 large EU15 banks was gathered from the bank's annual reports. Since for the 90s, there exist two empirical studies of Sironi (2001) and BCBS (2003), the features of all these samples were presented and compared in order to point out key trends on the market. The main conclusion was that BSD was issued predominantly by large banks in total valume of approximately 1.7% of total assets with average maturity above 10 years and often without any special covenants such as conversion into equity, put or call provisions (however differed across countries). The sample of 2001-2006 also revealed that the most common currency of issue was EUR and the interest rate was both fixed and flexible (3 months Euribor).

Next, the pooled probit model was performed to analyse the decisions of large EU15 banks to issue BSD within the study period. We were particularly interested in the factors approximating for banks' credit risk because if significant, DMD would be manifested. Two specifications were estimated, first based on external credit ratings (using Standard & Poor's, Moody's and Fitch long term credit ratings) and second based on book variables (using ratio of loan loss reserves to gross loans, ratio of equity to net loans and product of return on average assets and leverage). The results of pooled probit model using external credit ratings as an approximation for credit risk showed a consistent negative impact of

higher default risk on bank's issue decision and further, if Fitch rating was used, the coefficients were significant at 10% confidence level. The results of pooled probit model using book variables as an approximation for credit risk also showed consistent and expected signs for all three coefficients, further the coefficient of ratio of loan loss reserves to gross loans was significant at 5% confidence level. Also the results of Wald test for the book based bank credit risk coefficients jointly equalling zero indicated that we couldn't reject the null hypothesis on 5% confidence level. On the other hand, mainly because of the small size of the sample, it is necessary to be careful with drawing genaral conclusions regarding the hypothesis and thus our results may serve merely as an insight that would deserve greater investigation based on larger sample.

In the last part of the paper, we attempted to design possible mandatory subordinated debt policy (MSDP) for European banking. First, because we argued that BSD investors were sensitive to bank risk, the European secondary market for BSD was quite illiquid and the results of the issue model didn't reject the presence of DMD, we suggested policy oriented to increase DMD (rather then on indirect market discipline which was defined in the text). Further, we argued that BSD should remain a complementary source of bank's capital and MSDP should be designed accordingly. We also pointed out that the standardization and the simplicity of the BSD instrument would be preferable. Finally, we summarized expected costs of MSDP which comprise direct cost of BSD issues, the costs of bank's reduced financing flexibility or the costs of improperly applied BSD signals and presented arguments that these costs might not be dramatically large.

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http://www.lloyds.com/Lloyds_Market/Financial_performance/Financial_reports/
http://www.investors.rbs.com/investor_relations/financial_info/results.cfm

Software used for calculations

StataSE8
http://www.hec.unil.ch/mbrulhar/SEA2/KS_Stataguide_310.pdf (A Quick Guide to Stata 8 for Windows)

List of Abbreviations

AEB	American Enterprise Institute for Public Policy Research
BCBS	Basel Committee on Banking Supervision
BCR	Bank credit risk
BFGRS	Board of Governors of the Federal Reserve Systém
BHC	Bank holding ompany
BSD	Bank subordinated debt
BSDP	Bank subordinated debt policy
BSM	Bank specific measures
BV	Book variables
DMD	Direct market discipline
ECR	external credit rating
EU15	15 former European Union countries before the enlargement in 1 May 2004
FDICIA	Federal Deposit Insurance Corporation Improvement Act
FRBSF	Federal Reserve Bank of San Francisco
GDP	Gross Domestic Product
GEC	General economic conditions
IADI	International Association of Deposit Insurers
IDD	Indirect market discipline
MSDP	Mandatory subordinated debt policy
MD	Market discipline
SD	subordinated debt
TA	Total assets
RWA	Risk weighted assets
SND	Subordinated notes and debentures

Annex A: Definition of External Credit Ratings (long-term)

Standard & Poor's		
AAA	An obligor rated 'AAA' has extremely strong capacity to meet its financial commitments. 'AAA' is the highest issuer credit rating assigned by Standard & Poor's.	**Investment grade**
AA	An obligor rated 'AA' has very strong capacity to meet its financial commitments. It differs from the highest-rated obligors only to a small degree.	
A	An obligor rated 'A' has strong capacity to meet its financial commitments but is somewhat more susceptible to the adverse effects of changes in circumstances and economic conditions than obligors in higher-rated categories.	
BBB	An obligor rated 'BBB' has adequate capacity to meet its financial commitments. However, adverse economic conditions or changing circumstances are more likely to lead to a weakened capacity of the obligor to meet its financial commitments.	
BB	An obligor rated 'BB' is less vulnerable in the near term than other lower-rated obligors. However, it faces major ongoing uncertainties and exposure to adverse business, financial, or economic conditions which could lead to the obligor's inadequate capacity to meet its financial commitments.	**Speculatice grade**
B	An obligor rated 'B' is more vulnerable than the obligors rated 'BB', but the obligor currently has the capacity to meet its financial commitments. Adverse business, financial, or economic conditions will likely impair the obligor's capacity or willingness to meet its financial commitments.	
CCC	An obligor rated 'CCC' is currently vulnerable, and is dependent upon favorable business, financial, and economic conditions to meet its financial commitments.	
CC	An obligor rated 'CC' is currently highly vulnerable.	
SD	An 'SD' rating is assigned when Standard & Poor's believes that the obligor has selectively defaulted on a specific issue or class of obligations but it will continue to meet its payment obligations on other issues or classes of obligations in a timely manner.	**Default**
D	A 'D' rating is assigned when Standard & Poor's believes that the default will be a general default and that the obligor will fail to pay all or substantially all of its obligations as they come due.	
Moody's		
Aaa	Obligations rated Aaa are judged to be of the highest quality, with minimal credit risk.	**Investmen**
Aa	Obligations rated Aa are judged to be of high quality and are subject to very low credit risk.	
A	Obligations rated A are considered upper-medium grade and are subject to low credit risk.	
Bbb	Obligations rated Baa are subject to moderate credit risk. They are considered medium-grade and as such may possess certain speculative characteristics.	
Bb	Obligations rated Ba are judged to have speculative elements and are subject to substantial credit risk.	**Speculative**
B	Obligations rated B are considered speculative and are subject to high credit risk.	
Caa	Obligations rated Caa are judged to be of poor standing and are subject to very high credit risk.	
Ca	Obligations rated Ca are highly speculative and are likely in, or very near, default, with some prospect of recovery of principal and interest.	
C	Obligations rated C are the lowest rated class of bonds and are typically in default, with little prospect for recovery of principal or interest.	**Default**
Fitch		
AAA	Highest credit quality. 'AAA' ratings denote the lowest expectation of credit risk. They are assigned only in case of exceptionally strong capacity for payment of financial commitments. This capacity is highly unlikely to be adversely affected by foreseeable events.	**Investment grade**
AA	Very high credit quality. 'AA' ratings denote expectations of very low credit risk. They indicate very strong capacity for payment of financial commitments. This capacity is not significantly vulnerable to foreseeable events.	
A	High credit quality. 'A' ratings denote expectations of low credit risk. The capacity for payment of financial commitments is considered strong. This capacity may, nevertheless, be more vulnerable to changes in circumstances or in economic conditions than is the case for higher ratings.	

BBB	Good credit quality. 'BBB' ratings indicate that there are currently expectations of low credit risk. The capacity for payment of financial commitments is considered adequate but adverse changes in circumstances and economic conditions are more likely to impair this capacity. This is the lowest investment grade category.	
AAA	Highest credit quality. 'AAA' ratings denote the lowest expectation of credit risk. They are assigned only in case of exceptionally strong capacity for payment of financial commitments. This capacity is highly unlikely to be adversely affected by foreseeable events.	
BB	Speculative. 'BB' ratings indicate that there is a possibility of credit risk developing, particularly as the result of adverse economic change over time; however, business or financial alternatives may be available to allow financial commitments to be met. Securities rated in this category are not investment grade.	**Speculative grade**
B	Highly speculative. 'B' ratings indicate that significant credit risk is present, but a limited margin of safety remains. Financial commitments are currently being met; however, capacity for continued payment is contingent upon a sustained, favorable business and economic environment.	
CCC	For issuers and performing obligations, default is a real possibility. Capacity for meeting financial commitments is solely reliant upon sustained, favorable business or economic conditions.	
CC	For issuers and performing obligations, default of some kind appears probable.	
RD	Indicates an entity that has failed to make due payments (within the applicable grace period) on some but not all material financial obligations, but continues to honor other classes of obligations.	**Default**
D	Indicates an entity or sovereign that has defaulted on all of its financial obligations.	

Note: For Standard & Poor'sand Fitch it applies that the ratings from 'AA' to 'CCC' may be modified by the addition of a plus (+) or minus (-) sign to show relative standing within the major rating categories, for Moody's, it applies that it may append numerical modifiers 1, 2, and 3 to each generic rating classification from Aa through Caa.

Source: Standard & Poor's, Fitch, Moody's

Annex B: Conversion of the Grades into the Numerical Scale

Moody's	Standard & Poor's	Fitch	Numerical
AAA	AAA	AAA	1
Aa1	AA+	AA+	2
Aa2	AA	AA	3
Aa3	AA-	AA-	4
A1	A+	A+	5
A2	A	A	6
A3	A-	A-	7
Baa1	BBB+	BBB+	8
Baa2	BBB	BBB	9
Baa3	BBB-	BBB-	10
Ba1	BB+	BB+	11
Ba2	BB	BB	12
Ba3	BB-	BB-	13
B1	B+	B+	14
B2	B	B	15
B3	B-	B-	16
Caa1	CCC+	CCC+	17
Caa2	CCC	CCC	18
Ca	CCC-	CCC-	19
C	CC	CC	20
	C	C	21
	SD	DDD	22
	D	DD	23
		D	24

Source: BankScope, March 2008 edition

Annex C: Sample Banks

Banking group		Chief bank	TA[63]	Rank[64]
DEN	Danske Bank Group	Danske Bank A/S	367,403.6	1
FIN	OKO Bank Group	OKO Bank plc	24,196.0	4
FRA	Banque Populaire Group	Banque Fédérale des banques Populaires	305.307.0	16
	Crédit du Nord Group	Crédit du Nord	32,840,1	28
	Crédit Mutuel Group	Crédit Mutuel	482,676.0	7
GER	Commerzbank Group	Commerzbank AG	608,339.0	2
	Deutsche Bank Group	Deutsche Bank AG	1,126,230.0	1
	Nord/LB Group	Norddeutsche Landesbank Girozentrale	203,093.0	N/A
	Bayerische Landesbank Group	Bayerische Landesbank	353,218.0	N/A
	HELABA Group	Landesbank Hessen –Thueringen Girozentrale	164,421.7	N/A
	Bankgesellschaft Berlin Group	Bankgesellschaft Berlin AG	141,619.0	10
GRE	Piraeus Bank Group	Piraeus Bank SA	46,427.0	4
IRE	Allied Irish Banks Group	Allied Irish Banks plc	158,526.0	2
ITA	Gruppo Intesa	Banca Intesa S.p.A.	576,784.0	2
	MPS Banking Group	Monte dei Paschi di Siena S.p.A.	158,556.0	40
NET	ABN AMRO Group	ABN AMRO Holding N.V.	987,064.0	1
	ING Group	ING Bank N.V.	994,113.0	2
	Rabobank Group	Rabobank Nederland	556,455.0	3
POR	BCP Group	Banco Comercial Portugues	79,258.7	2
SPA	BBVA Group	Banco Bilbao Vizcaya Argenaria S.A.	411,916.4	2
	La CAIXA Group	Caja de Ahorros y Pensiones de Barcelona	209,123.2	3
	Unijaca Group	Unicaja	28,267,7	15
SWE	Swedbank Group	Swedbank AB	149,660.303	3
	Handelsbanken Group	Handelsbanken	198,001.0	1
UK	Barclays Plc Group	Barclays Bank plc	1,444,209.9	1
	HBOS Plc Group	HBOS plc	880,162.3	N/A
	HSBC Holdings plc Group	HSBC Holdings plc	1,412,876.2	4
	Lloyds TSB Group plc	Lloyds TSB Bank plc	511,687.3	5
	The Royal Bank of Scotland Group	The Royal Bank of Scotland Plc	848,227.0	2

Note: Banks marked blue are public banks
Source: Author, annual reports and Bankscope, March 2008 edition

[63] Total assets in year end 2006, mil EUR.
[64] Country rank in year end 2006.

Annex D: Correlation Matrices

Specification with Standard & Poor's credit rating (lagged)

	CR^{SP}	PUBLIC	LNTA	PISSUE	TAX	BSDRWA	EU15GAP	USAGAP
CR^{SP}	1							
PUBLIC	0.1744	1						
LNTA	-0.3825	0.0989	1					
PISSUE	-0.0984	-0.0710	0.1794	1				
TAX	-0.1168	-0.0514	0.1067	0.0051	1			
BSDRWA	-0.1188	-0.0929	0.2058	0.1731	0.0855	1		
EU15GAP	0.0392	-0.0852	-0.0975	-0.0412	0.0164	0.0208	1	
USAGAP	-0.0653	0.0900	0.0813	-0.0215	-0.1578	0.0556	0.1304	1

Note: based on 134 observations

Specification with Moody's credit rating (lagged)

	CR^{M}	PUBLIC	LNTA	PISSUE	TAX	BSDRWA	EU15GAP	USAGAP
CR^{M}	1							
PUBLIC	0.0999	1						
LNTA	-0.4233	0.0684	1					
PISSUE	-0.1191	-0.2799	0.1422	1				
TAX	-0.1774	-0.1781	0.1632	0.0632	1			
BSDRWA	0.0443	0.0481	0.1033	0.1100	0.0311	1		
EU15GAP	0.0597	-0.0424	-0.0761	-0.0888	0.0268	-0.0038	1	
USAGAP	-0.0437	0.0113	0.0486	-0.0419	-0.1352	0.0618	0.1247	1

Note: Based on 142 observations.

Specification with Fitch credit rating (lagged)

	CR^{F}	PUBLIC	LNTA	PISSUE	TAX	BSDRWA	EU15GAP	USAGAP
CR^{F}	1							
PUBLIC	0.2709	1						
LNTA	0.4885	0.0716	1					
PISSUE	-0.2586	-0.2323	0.1298	1				
TAX	-0.2312	-0.1604	0.1415	0.0528	1			
BSDRWA	0.0561	0.0561	0.1618	0.1007	0.0210	1		
EU15GAP	0.0074	-0.0434	-0.0673	-0.0704	0.0243	0.0031	1	
USAGAP	0.0060	0.0646	0.0482	-0.0330	-0.1433	0.0659	0.1187	1

Note: Based on 147 observations.

Specification with Standard & Poor's credit rating (averaged)

	CR^{SP}	PUBLIC	LNTA	PISSUE	TAX	BSDRWA	EU15GAP	USAGAP
CR^{SP}	1							
PUBLIC	0.1744	1						
LNTA	-0.3878	0.0934	1					
PISSUE	-0.0984	-0.0710	0.1857	1				
TAX	-0.1572	-0.0538	0.1094	-0.0883	1			
BSDRWA	-0.1188	-0.0929	0.2020	0.1731	0.0761	1		
EU15GAP	0.0392	-0.0852	-0.1044	-0.0412	0.0763	0.0208	1	
USAGAP	-0.0653	0.0900	0.1004	-0.0215	-0.1682	0.0556	0.1304	1

Note: based on 134 observations

Specification with Moody's credit rating (averaged)

	CR^{M}	PUBLIC	LNTA	PISSUE	TAX	BSDRWA	EU15GAP	USAGAP
CR^{M}	1							
PUBLIC	0.0999	1						
LNTA	-0.4320	0.0531	1					
PISSUE	-0.1191	-0.2799	0.1540	1				
TAX	-0.2362	-0.2021	0.1782	-0.0097	1			
BSDRWA	0.0443	0.0481	0.0964	0.1100	0.0177	1		
EU15GAP	0.0597	-0.0424	-0.0761	-0.0888	0.0791	-0.0038	1	
USAGAP	-0.0437	0.0113	0.0486	-0.0419	-0.1413	0.0618	0.1247	1

Note: Based on 142 observations

Specification with Fitch credit rating (averaged)

	CR^{F}	PUBLIC	LNTA	PISSUE	TAX	BSDRWA	EU15GAP	USAGAP
CR^{F}	1							
PUBLIC	0.2709	1						
LNTA	-0.4972	0.0591	1					
PISSUE	-0.2586	-0.2323	0.1397	1				
TAX	-0.2948	-0.1818	0.1505	-0.0230	1			
BSDRWA	0.0561	0.0561	0.1556	0.1007	0.0062	1		
EU15GAP	0.0074	-0.0434	-0.0673	-0.0704	0.0743	0.0031	1	
USAGAP	0.0060	0.0646	0.0482	-0.0330	-0.1514	0.0659	0.1187	1

Note: Based on 147 observations.

.

Specification with book variables (lagged)

	LRGL	EQNL	ROAALEV	PUBLIC	LNTA	PISSUE	TAX	BSDRWA	EU15GAP	USAGAP
LRGL	1									
EQNL	-0.0509	1								
ROAALEV	-0.4265	0.0448	1							
PUBLIC	0.4789	-0.2365	-0.4266	1						
LNTA	-0.0950	-0.1282	-0.0587	0.0832	1					
PISSUE	-0.2262	-0.0124	0.2388	-0.2699	0.1223	1				
TAX	-0.1061	0.0629	0.1659	-0.1785	0.1359	0.0651	1			
BSDRWA	0.1636	0.0737	-0.0718	0.0533	0.1593	0.0975	0.0212	1		
EU15GAP	-0.0379	0.0737	-0.0122	-0.0491	-0.0570	-0.0555	0.0242	-0.0020	1	
USAGAP	-0.1036	0.0783	0.1312	0.0127	0.0417	-0.0072	-0.1291	0.0645	0.1243	1

Note: Based on 150 observations.

Specification with book variables (averaged)

	LRGL	EQNL	ROAALEV	PUBLIC	LNTA	PISSUE	TAX	BSDRWA	EU15GAP	USAGAP
LRGL	1									
EQNL	-0.0474	1								
ROAALEV	-0.5235	0.0441	1							
PUBLIC	0.4582	-0.2184	-0.4404	1						
LNTA	-0.1176	-0.1343	-0.1210	0.0694	1					
PISSUE	-0.2210	0.0148	0.2708	-0.2699	0.1331	1				
TAX	-0.1236	0.0656	0.2511	-0.2032	0.1446	-0.0069	1			
BSDRWA	0.1558	0.1153	-0.1159	0.0714	0.1360	0.0659	0.0138	1		
EU15GAP	-0.0101	-0.0255	-0.0185	-0.0491	-0.0638	-0.0555	0.0732	-0.0045	1	
USAGAP	-0.1658	0.0758	0.2388	0.0127	0.0615	-0.0072	-0.1348	0.0612	0.1243	1

Note: Based on 150 observations.

Annex E: Master's Thesis Draft

Subject:	**Subordinated Debt Policy – Is Mandatory Subordinated Debt Requirement Advisable? The Case of European Banking Sector.**
Author:	**Bc. Jana Havlínová**
Supervisor:	**Mgr. Magda Pečená, Ph.D.**
Academic Year:	**2007/2008**
Thesis Draft:	Subordinated debt policy is a set of measures that attempt to discipline bank risk taking under the deposit insurance framework. The policy is based on the mandatory subordinated debt requirement that compels large banks to issue and maintain a minimum level of this debt. Under the insurance deposit framework, bank depositors know that their deposits are guaranteed and have little incentive to demand a higher return that would cover the actual risk undertaken by the bank. If the financial market priced subordinated debt according to the bank risk profile, it could prevent the bank from taking unappropriate risk and in the same time inform bank supervisors about the risikness of the banking company and trigger corrective measures. In my thesis I will describe the concept of mandatory subordinated debt, analyse its objectives, ask wheather it is advisible arrangement for European banks and discuss the regulatory reform proposals.
Main hypothesis:	Mandatory subordinated debt requirement (MSDR) disciplines bank risk taking.
Auxiliary hypotheses:	MSDR improves direct market discipline; improves indirect market discipline; advances bank transparency and disclosure; augments the capital cushion for the deposit insurer; accelerates failure resolution process.
Research Methods:	examination of present research, analysis of the subordinated debt data, discussion of the existing evidence
Expected Contents:	1. Introduction 2. Concept of Subordinated Debt *2.1 Definition of Subordinated Debt* *2.2 Voluntary Subordinated Debt Issuance* *2.3 Mandatory Subordinated Debt Policy*

	3. Mandatory Subordinated Debt Objectives *3.1 Market Discipline* *3.2 Bank Transparency and Disclosure* *3.3 Capital Cushion for Deposit Insurer* *3.4 Failure Resulution Process* 4. European Banks Subordinated Debt Market *4.1 Characteristics of the Market* *4.2 Pricing of Subordinated Debt* *4.3 Achievability of the Subordinated Debt Objectives* 5. Regulatory Reform Proposals *5.1 Current Regulatory Framework* *5.2 Review of Existing Proposals* *5.3 Discussion of Different Reform Approaches* 6. Conclusion
Bibliography:	(1) Basel Committee on Banking Supervision: *"International Convergence of Capital Measurement and Capital Standars. A Revised Framework. Comprehensive Version"*, Bank for International Settlements, 2006; (2) Board and Treasury: "*The Feasibility and Desirability of Mandatory Subordinated Debt"*, Board of Governors of the Federal Reserve System and United States Department of the Treasury, 2000; (3) Kool, C.: *"An Analysis of Financial Stability Indicators in European Banking: The Role of Common Factors"*, Tjalling C. Koopmans Research Institute, Discussion Paper Series no.: 06-12; (4) Krishnan, C.N.V., Ritchken, P.H., Thomson, J.B.: *"Monitoring and Controlling Bank Risk: Does Risky Debt Serve any Purpose?"*, Federal Bank of Clevelend, 2003; (5) Sironi, A.*:"Testing for Market Discipline in the European Banking Industry: Evidence from subordinated debt issues"*, SSRN, 2000; (6) Svec, J.: *"The Effects of Issuing Subordinated Debt on the Banking Industry"*, Honors Thesis, Stanford University, 2003.

In Prague, October 10th, 2007

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Mgr. Magda Pečená, Ph.D. Bc. Jana Havlínová