Basel II, External Ratings and Adverse Selection

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30. September 2008

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30.09.2008

BSc in Management and Economics

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Abstract

This paper will describe and analyse the development of Basel II Capital Accord and will focus on the use of external ratings in the Standardized Approach in Basel II. Furthermore it will examine the problem of adverse selection which appears in Basel II as a result from the proposal for the use of external ratings in determining the risk weights in the standardized approach. The paper will also attempt to find possible solutions to the adverse selection problem by discussing two similar models, and derive implications from them.

Keywords: Basel II, external ratings, adverse selection, rating agencies, standardized approach

1. Introduction.

The introduction of the New Basel Capital Accord has been widely discussed across the financial community. The opinions about the New Accord are controversial. On the one hand, it has been approved as a necessary step towards more sound financial regulation considering the entrance of more technologically advanced financial services, instruments and techniques in the last decades, along with the trend towards globalization of the financial markets. The approval of Basel II has been based mainly on the introduction of the three mutually reinforcing pillars which complement each other to form an overarching risk-management structure for the promotion of financial stability.

On the other hand, the New Accord has been criticized for posing some opportunities and challenges for the financial institutions around the world. Firstly, the Basel II Accord implementation strongly depends on good and reliable data and information. Basel II also requires banks to develop well-functioning, efficient and integrated risk-management systems which for a large portion of banks will be slow and costly process. It has also been argued that Basel II is related to pro-cyclicality, because it could generate more pronounced business cycles in an economy especially in a recessionary period when banks will curtail lending as a result of the increase of borrowers' credit risk. Other challenges like cross-border capital flow decrease, risk-sensitivity to the corporate sector and the introduction of the operational costs are also seen as a potential threat to economic and financial stability. Last but not least is the problem of adverse selection.

The main purpose of this paper is to attempt to answer the question of whether there is a conceptual problem in Basel II leading to adverse selection and how can it be fixed. Firstly, the paper discusses how the need for new capital accord has arisen and what are the main differences between the 1988 Capital Accord and the New Capital Accord. Then the paper continues with an analysis of the use of external credit ratings in the standardized approach of the New Capital Accord and discusses the role of the external credit assessment institutions as a conductor of a private information between lender and borrower, and what

potential impact their ratings might have on the relationship between the two counterparties.

The problem of adverse selection is discussed from the perspectives of two models which serve as a benchmark of the adverse selection problem which arises in Basel II and important implications are drawn from the two models for the dynamics of an asymmetric information problem and how it can be solved from banking and regulatory perspective.

2. From Basel I to Basel II.

In this section I am going to explain briefly the evolution of Basel Capital Accord, and the main characteristics of the two important steps made by the Basel Committee for Banking Supervision, namely Basel I and the New Basel Capital Accord (Basel II).

2.1 Basel I – the first step towards financial stability.

In the past 20 years, there has been a formalized introduction of capital requirements by a wide range of countries. This development was initiated by the adoption of minimal capital requirements in particular countries (for example, the UK and the USA in 1981) but in 1988 with the introduction of the Basel Accord, common minimum capital requirements were adopted by the G-10. Nowadays, the accord has been implemented by around 100 countries world-wide.[1] Basel I, the framework of minimum capital standards introduced in 1988 by the Basel Committee on Banking Supervision (BCBS) was designed to increase the safety and soundness of the international banking system and to set a level playing field for banking regulation.

The Basel Committee had two main objectives by adopting the 1988 Capital Accord. The first objective was related to strengthening the soundness and stability of the international banking system by encouraging international banking organizations to improve their capital

[1] See Basle Committee on Banking Supervision (April 1999), p.1
[2] See loc. cit.

positions. The second objective was to reduce the competitive inequalities among internationally active banks by applying a standard approach to all of them. Thus, the structure of the framework intended to:

- increase the sensitivity of the regulatory capital to differences in risk profiles among banking organizations;
- take off-balance-sheet exposures explicitly into account in assessing capital adequacy; and
- lower the disincentives to holding liquid, low risk assets.[2]

For the above objectives Basel I was equipped with only a minimum capital requirements rule. It has been praised for achieving its initial goals, but also criticized because of the low risk sensitivity of the capital requirements which may lead to greater risk taking and regulatory capital arbitrage practices by banks.[3]

In brief, the Basel Capital Accord requires that a bank have available as "regulatory capital" at least 8 percent of the value of its risk-weighted assets and asset-equivalent off-balance-sheet exposures. The different types of assets are weighted according to the level of perceived risk that each type represents and each off-balance-sheet exposure is converted to its equivalent amount of assets and weighted as that type of asset would be weighted. For example commercial loans are weighted at 100 percent and residential housing which are considered to be less risky are weighted at 50 percent. Total risk-weighted assets are multiplied by 8 percent to determine the bank's minimum capital requirement. An important indicator of an institution's financial strength is whether bank's capital ratio - its regulatory capital as a proportion of its risk-weighted assets - meets or exceeds the 8 percent minimum.[4]

As mentioned above, Basel I is considered to have met its main objectives of promoting financial stability and providing an equitable basis for competition among internationally

[3] See Elizalde, A. (2007), p.1
[4] See Federal Reserve Bulletin (2003), p.396

active banks. It has also become an adequate capital framework for most of the banks in the USA. On the other hand it has also been noticed that Basel I has lost its relevance at least for the larger banking organizations. The three main reasons for this are:

- it has serious shortcomings when applied to larger entities;
- there has been an evolution in the art of risk management at the largest banks;
- the banking industry has become increasingly concentrated.[5]

With regard to the internationally active banks Basel I provides a limited differentiation in the degrees of risk which may lead to a misleading information about banks' capital adequacy. Moreover, the limited differentiation may also create incentives for the banks to pursue exposures for which the capital requirement is lower and avoid exposures with higher capital requirement. As a result of capital arbitrage, the regulatory minimum capital ratios of the larger banking institutions can become less meaningful. Thus, for those banks Basel I is inadequate in terms of risk measurement and banks' capital strength evaluation.

2.2 The New Basel Capital Accord.

"Addressing the perceived shortcomings and structural weaknesses of Basel I, the Basel II Accord – a landmark regulatory framework – offers a newer and comprehensive approach and methodology for financial sector regulatory capital calculation which recognizes well the advancements and innovations in banks' businesses, policies and structures and the accompanying financial engineering and innovation."[6].

Basel II has some distinct characteristics worth to be mentioned:

- it aligns banks' capital with their basic risk profiles;
- it is more detailed and superior in terms of coverage and details;
- it has the ability to exploit effectively new frontiers of risk management and gives impetus to the development of sound risk management systems, which are expected to promote efficiency and more prudent allocation of resources;

[5] See Federal Reserve Bulletin (2003), p.396
[6] Akhtar (2006), p.1

- it is perceived to be a basic step for future disposition of banking supervision and the evolutionary path on which the banking industry would thread; and
- it is designed to make risk management systems more robust and flexible with regard to complexities arising out of a host of new risks.[7]

The above characteristics make Basel II much more sophisticated and are perceived to be an adequate response to the increasing complexity of banking industries and financial markets as a whole.

In contrast to Basel I, the New Basel Capital Accord consists of three pillars:

(1) *minimum capital requirements;*

(2) *supervisory review process;*

(3) *market discipline.*

All three pillars are interlinked and mutually reinforce each other. The capital requirements rule, contained both in Basel I and in Pillar I of Basel II, requires banks to hold a minimum capital level as a function of their risk level. In a risk sensitive capital rule the higher the assets risk the higher the fraction of those assets that has to be funded with capital.

Although Basel I already incorporates some limited degree of risk sensitivity, Pillar 1 of Basel II significantly increases the risk sensitivity of the capital rule. Pillar 1 presents the calculation of the total minimum capital requirements for credit, market and operational risk. Pillar 2 supervisory review process validates banks' internal assessments by ensuring that the whole array of risks has been taken care of. Pillar 3 serves as a complement to the other two pillars by requiring financial reporting transparency to promote market discipline.

The capital ratio in Pillar 1 is calculated using the definition of regulatory capital and risk weighted assets and must be no lower than 8 percent (Tier 2 capital is limited to 100% of Tier 1 capital).[8] While this is consistent with Basel I, the new framework gives recognition to new risk mitigation techniques thus shifting the emphasis from regulatory to economic capital framework. Therefore, Basel II does not promote higher capital requirements but

[7] See Akhtar (2006), p.1
[8] See Basel Committee on Banking Supervision (2004), p.12
[9] See Akhtar (2006), p.2

instead focuses on efficient and effective capital allocation, which in case of sharpened risk articulation will lead to reduced capital requirements, but in case of bad risk management may result in punitive capital requirements.[9]

Basel II is flexible in different aspects of its implementation. For example, depending on their "level of advancement" banks may choose from different alternatives with regard to credit risk. The Standardised Approach is the simplest level, which is similar to Basel I, but contains more risk weights which are fixed by the authorities. In addition, banks may increase the range of risk weights by using credit risk assessments from rating agencies like Moody's, Standard & Poor's and Fitch. The more advanced approach for calculation is the "Internal Ratings Based"(IRB). Under the foundation IRB approach the risk weights and therefore capital requirements are based partly on the individual bank's internal estimates. There is an advanced version in which even greater parts of the capital requirements is determined by bank's own calculations. There are also basic and advanced levels for market and operational risks. But in any case banks have an incentive to move to a more advanced level because of the closer alignment of required capital and bank's actual risk.[10]

The IRB approach is to be used by biggest and most complex internationally active institutions. This approach and especially the advanced version of it gives the bigger banking institutions an advantage with respect to the calculation of capital requirements since in the Standardised Approach the risk weights are exactly stated and cannot be "flexible" as in the IRB approach. Thus, with more precise calculations the international active banks can use lower capital requirements.

[10] See Lind (2005), p. 28

3. External ratings in Basel II.

The Basel II capital framework envisions a three-pillar approach to enhancing a safe and sound financial institutions:

(i) *minimum capital requirements*;
(ii) *enhanced supervision*; and
(iii) *market discipline through additional public disclosures.*

With the three pillars complementing and supporting each other, the first pillar has received most of the attention because of its direct effect on banks' risk management and financial activities. As mentioned in the previous section, Pillar 1 lays the calculation of the total minimum capital requirements for credit, market and operational risk. This section is focused on credit risk and will summarize and discuss the standardized approach to credit risk and the important role of the External Credit Assessment Institutions (ECAIs). [11]

3.1 Standardized Approach to Credit Risk in Basel II.

One of the two alternatives proposed to the banks by the Basel Committee for calculating their capital requirements for credit risk was to measure credit risk in a standardized manner, supported by external credit assessments.[12] The Standardized Approach increases the risk sensitivity of the capital framework by recognizing that different counterparties within the same loan category present different risks to the lender, therefore, instead of putting all commercial loans in the 100% risk weight basket, the approach takes into account the credit rating of the borrower. For example, assets representing claims against corporations (including insurance companies) are risk-weighted according to the credit rating assigned to the corporation or the asset. The table below shows the risk weights for corporate claims:

[11] The examples related to ECAIs and the Standardized Approach will be focused mainly on the Claims on Corporates and the notations follow the methodology used by Standard & Poor's as stated in Basel II Accord
[12] See Basel Committee on Banking Supervision (2004), p.15

Table 1

Credit assessment	AAA to AA-	A+ to A-	BBB+ to BB-	Below BB-	Unrated
Risk weight	20%	50%	100%	150%	100%

Source: BCBS (June 2004), "International Convergence of Capital Measurement and Capital Standards"

The credit assessments above must be assigned by an external rating agency that satisfies criteria which are described in the Capital Accord. As can be seen above, the capital framework provides a standard 100% risk weight for unrated claims on corporates (including insurance companies). In addition to this, the framework states that no claim on an unrated corporate may be given a risk weight which is preferential to that assigned to its sovereign of incorporation.[13]

The minimum capital requirements for credit risk in Basel II (and Basel I as well) are set according to the following formulas:

$$\sum_{i=1}^{n} RW_i \times A_i = RWA \qquad (1)$$

$$RWA \times 0.08 = RC \qquad (2)$$

where: RW_i = risk weight attached to asset "i" A_i = asset "i" (i=1,….n)

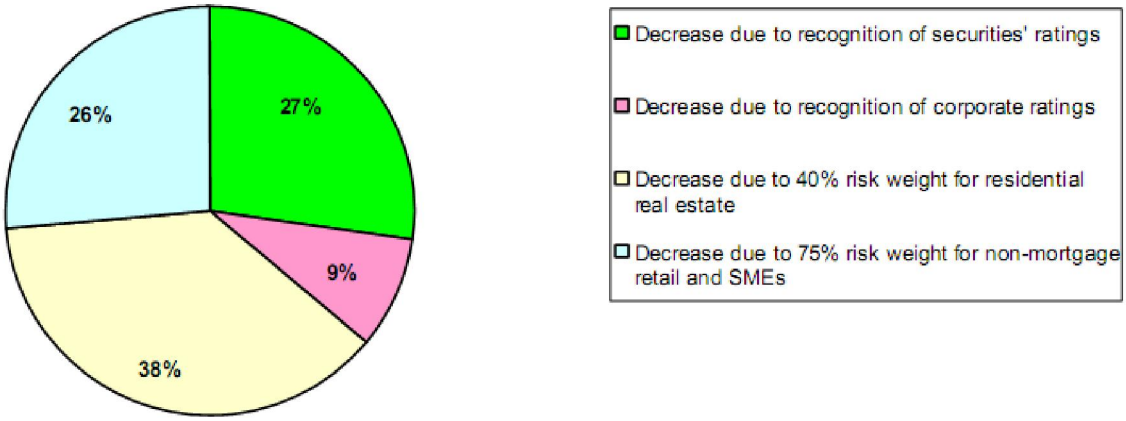
RWA = risk-weighted assets RC = regulatory capital

As can be seen in formula (2) above, the minimum capital requirement for a bank is 8 percent of its risk-weighted assets. The difference between Basel I and the standardized approach to credit risk is the choice of risk weights (RW_i) involved in the calculations in formula (1). "While Basel I only recognizes a simple OECD/non-OECD distinction to set risk-weights for corporate, interbank and sovereign clams, the standardized approach aims

[13] See loc. cit., p.18

at providing a greater sensitivity to credit risk by linking risk-weights to the assessments provided by ECAIs".[14] This means that banks will rely on the assessments made by ECAIs recognized by supervisors in calculating their regulatory capital.

In general, the use of the standardized approach has different effects for different banking institutions and cannot provide us with a clear overall conclusion of whether it leads to an increase or decrease of the capital requirements. For example, in the U.S., "According to Banking Department estimates, the revised Standardized Approach to credit risk could lead to a decrease on average of 7% in minimum capital requirements".[15] Moreover, a relatively small part of this decrease is accounted for due to recognition of corporate ratings:



Source: Wyatt (2003), New York State Banking Department (NYSBD), "Basel II's New Standardized Approach: Possible Effects of Implementation"

The above chart depicts the drivers of decrease in aggregate required capital for 27 depository institutions. As it is shown in this chart, the recognition of corporate ratings accounts for only 9 percent of the decrease in capital requirements. This shows that the introduction of external ratings for corporations in the calculation of banks' regulatory capital may play a small role in the decrease of capital requirements in general.

[14] Van Roy (2005), p.11
[15] Wyatt (2003), p.14

3.2 ECAIs and their role in Basel II.

Credit rating agencies (also called CRAs) or ECAIs in Basel II, provide investors, lenders and others with opinions on the future creditworthiness of a particular company, security or obligation as of a given date. Issuers and corporate borrowers pay for these opinions issued by CRAs to help them raise capital. The general view about rating agencies is that they are information specialists who obtain information that is not in the public domain. Therefore, their importance comes from the fact that obtaining non-public specific information is expensive and rating agencies are low-cost information providers. The standardized approach relies on credit ratings of borrowers assigned by ECAIs to compute banks' required capital for credit risk.

Although there has been a substantial amount of research on the activities of the CRAs, their role in the financial markets is still ambiguous. On the one hand, the secrecy of rating agencies makes the rating process unclear to the market observers, on the other hand, these observers are struggling to understand how the market perceives this process and how the ratings influence the rated firms and their outstanding debt. A credit rating agency has strong incentives to provide credible ratings. In addition to maximizing her reputation, the CRA has to take into account the competitive pressures from other agencies or from institutions selling similar products. Additionally, the rating agency may consider potential feedback effects that the rating will have on the rated firm from the perspective of securing future business with this firm.[16]

This section will concentrate on the activities of the external credit assessment institutions, some criticisms on these activities and their importance for regulation purposes in Basel II capital accord. Since this paper's main idea is concerned with discussing the adverse selection problem in lender-borrower relationship under Basel II, it is important to mention that credit rating agencies play a significant role in this relationship because, on the one hand, their rating evaluation of the borrower serves as an input into the risk weights which determine the amount of regulatory capital the bank must hold and, on the other hand, it is

[16] See Bannier/Tyrell (2005), p.1

the borrower who pays the rating agency to evaluate his creditworthiness and therefore the actions of the borrower (to purchase a rating or not) are influenced by his beliefs about what the rating will be vis-à-vis no rating.

An important issue concerning ECAIs in Basel II is the difference between solicited and unsolicited ratings. Solicited and unsolicited ratings differ from each other in that the rating agency is not compensated by the firm for an unsolicited rating. As a general rule Basel II states that banks should use solicited ratings from eligible ECAIs. However, national supervisory authorities may allow banks to use unsolicited ratings in the same way as the solicited ratings.[17]

There exists a certain controversy about the use of unsolicited ratings since rating agencies can use them to put pressure on firms to pay for a solicited rating. "Rating agencies argue that they are responsible for the protection of investors and that they inform investors of the risk of a firm. According to their argument, when an issuer has not applied for a rating but there is sufficient information to make a judgment and investors would find the opinion valuable, rating agencies may assign a rating regardless of remuneration.".[18] Furthermore, Bannier and Tyrell (2005) find that the main difference between solicited and unsolicited ratings is contingent on the gap between the rating agency's private information about the firm's credit quality and the quality a priori expected by the market. An important observation about solicited ratings is that they are strongly influenced by the different components of the agency's utility function. Bannier and Tyrell (2006) find that for sufficiently good private information, a solicited rating will be the higher the more emphasis is put on the reputational aim and the less weight is attached to competitive and feedback concerns.[19] Therefore, we can expect that the evaluations of the different credit rating agencies may turn out to be quite different from each other.

The purpose of all said above is to emphasize that the rating of a corporate borrower may differ with regard to the choice of a rating agency to issue the rating. This may not only be

[17] See Basel Committee on Banking Supervision (2004), p.26
[18] See Byoun/Shin (2002), p.4
[19] See Bannier/Tyrell (2005), p.2

a result of the different emphasis on the components of the agency's utility function, but also of differences in opinion, rating scale, methodology etc. Those differences in credit ratings are likely to create also differences in regulatory risk weights and therefore in capital requirements for the lending institution. From the point of view of banks, the regulatory capital requirements in Basel II incurs costs in the form of equity capital which should be kept against loans with different risk. From the point of view of borrowers, their riskiness also is costly for them because the more risky they appear through their rating to the bank, the more costly will the loan be for them or they may not be approved for the loan. Therefore, the borrower has the choice to remain unrated or to buy a rating from a rating agency.

4. The Adverse Selection Problem.

The problem of adverse selection arises from precontractual ex-ante asymmetric information. A bank is facing adverse selection if the profitability of a loan depends on the type of a borrower and if a higher price for the loan (i.e. interest rate), not only attracts less borrowers but also attracts less desirable borrowers. This is a type of borrowers who invest in high-risk projects and face a higher probability of default. Closely related to the adverse selection models are the signaling models. In these models the informed agent may reveal his private information through the signal which he sends to the principal.[20]

Under Basel regulation, banks are required to fund their loans with equity. Under Basel II Capital Accord, the equity ratio depends on the credit risk of the borrower, which has to be determined by a rating agency and the credit assessment by the agency is mapped into a risk weights which are exogenously determined by the Basel Committee.[21]

As we can see in Table 1, high-risk corporate borrowers rated below BB- (Standard & Poor's) will receive a risk weight of 150%, while unrated borrowers and borrowers with rating BBB+ to BB-, will be risk-weighted at 100%.

[20] See Janda (2006), p.2
[21] See Table 1

Obviously, there is an adverse selection problem which arises because of the higher risk weights assigned to borrowers who are rated below BB- compared to the risk weights assigned to unrated borrowers. The adverse selection problem stems from the fact that risky borrowers (risk-weighted at 150%) will cost more equity to the bank and therefore will bear higher costs of borrowing from it. Therefore, a logical consequence from this event will be that a risky borrower would rather remain unrated (risk-weighted at 100% according to Basel II), than pay for a rating which will most likely reveal his quality which will translate into a 150% risk weight for the bank and will increase cost of borrowing money from the bank for the borrower. We should also pay attention that there is an issue of signaling where low-ability borrowers will possibly alter their behavior to secure a lower capital requirement for their borrowing. Therefore, in the case of a bank using the Basel II Standardized Approach, the only credible signal for the bank about the quality of the borrower is if the borrower purchased a rating or remains unrated.

From the point of view of the borrower there are three main scenarios:

a) if the borrower is risky and believes that if rated he will fall into the lowest rating (below BB-, corresponding to 150% risk weight), then he will remain unrated;

b) if the borrower believes that his credit quality falls into the BBB+ to BB- bucket (corresponding to 100% risk weight), he will remain unrated unless the benefits from purchasing a rating are higher than the costs of purchasing it;.[22]

c) if the borrower is of "good" type (better than BBB+) then he will purchase a rating, because he will enjoy better price of borrowing (since bank's risk weight will be lower than 100%).

[22] Another possibility may be that he will remain unrated because he believes that the rating agency will assign a rating which is lower that he believes he deserves

Therefore, from the point of view of the bank, the uncertainty arises only in cases a) and b) since in case c) the bank will be informed about the quality of the borrower through the signal that he sends by purchasing a rating.

From the above comments, an interesting question will be, to be able to find out in what conditions the borrower in case b) will purchase a rating and when he is going to remain unrated because of higher costs compared to benefits from getting a rating. In general, the costs of getting a rating can be measured as the price that borrower pays to receive a rating by a CRA. In some cases where the borrower has doubts about receiving the rating that he expects the costs can become bigger because of the uncertainty about getting the rating that the borrower expects, which depends on how stable are his arguments about getting the expected rating. If the arguments are not stable enough then there will be greater uncertainty about getting the expected rating.

The benefits of getting rated by an external credit assessment institution can be:

- an increase in the probability of accessing credit and a potential lower cost of borrowing (depending on the bank);
- reputational gains;
- more transparency (and therefore more trust by counterparties).

As the above entries are difficult to measure and require deeper insight into the prcess of weighting the potential benefits, and as it is not this paper's main purpose to provide this deeper insight, I will leave it as a topic of further research.

The main purpose of this paper is to provide a general insight into the actions of the high-risk borrower who faces adverse selection and the consequences of the adverse selection problem for the implementation of Basel II and, if there are any problems arising from the adverse selection, how they can be fixed.

In the following subsection I will present a model which can serve as a milestone for the perspective from which we can approach the adverse selection problem discussed by this paper. This model will serve as a benchmark according to which we can develop implications about the decision to buy a credit rating serving as a signaling device or the quality of the borrower.

4.1 Models of adverse selection.

In this section I will introduce two main models that can serve as benchmarks for describing and analyzing the adverse selection problem which arises from the use of external ratings in Basel II. These models are selected as benchmarks because of the common features that they share with the case of adverse selection discussed in this paper.

4.1.1 Lender and Borrower as Principal and Agent . [23]

We start out by describing a simple principal-agent adverse selection problem discussed in Janda (2006) where the principal hires the agent to perform some activity. The result of this activity will be the monetary value x. We consider a risk neutral principal who is able to observe and verify the effort exercised by the agent. Since the effort is verifiable, it may enter directly as an argument into the utility function of the principal. The ex-ante asymmetric information is captured by the assumption that the agent may be of two types which cannot be distinguished by the principal observationally. The principal only knows that the agent can be "good" (type G) and "bad" (type B), with probabilities p and $(1-p)$ respectively. The difference between the two types is only in their disutility of effort, which is $v(e)$ for type G, and $k.v(e)$ for type B, with $k>1$. Since the principal is not able to distinguish the observationally equivalent agents ex-ante, he may be able to distinguish them through the offer of menu of contracts $\{(e^G, w^G),(e^B, w^B)\}$, designed in a way that type G will choose the contract with the (effort, payment) combination (e^G, w^G) and type B will choose the (effort, payment) combination (e^B, w^B). According to the revelation

[23] This section is following the example of adverse selection problem described in Janda (2006)

principle presented in Myerson (1979), the menu of contracts, which principal optimally offers to the agent, contains the same number of contracts as is the number of types of agents and each agent chooses the contract which is designed for his type. The equilibrium is separating if these optimal contracts for different types of agents are different and if the same contracts are chosen by all types then the pooling equilibrium takes place.[24] The optimization model connected with this adverse selection problem can be seen in Appendix-1.

The model described above is a general case of a principal-agent adverse selection problem. Later in the paper I will draw some further implications from it that will serve us for deriving conclusions about the possible solution of the adverse selection problem.

The next part in the discussion will move the focus from a generalized principal-agent adverse selection problem to its use in describing a lender-borrower relationship. In his continuation of the above model, Janda (2006) introduces the use of collateral as a means of signaling the borrower quality.

He starts out by considering a risk neutral agent who wants to undertake a project. The project has two outcomes: $\overset{\circ}{X} = 1$ (failure) and $\overset{\circ}{X} = X$ (success). The investment required for the project is $I \in (1, X)$. Again the agent can be of two types L or H, with probabilities of success $0 < p_L < p_H < 1$ for the "low" and "high" type respectively. The agent has a collaterizable wealth W and he borrows the investment finance I from a risk-neutral principal. Again as in the previous case the principal does not know the type of the borrower. He knows only that the proportion of type L borrowers in the population is θ, and he doesn't know the return realization of the project and he is able to learn the realization only if he imposes bankruptcy upon a borrower and takes over the project. If the principal takes over the project or the collateral $C \le W$, he valuates them as $\alpha \overset{\circ}{X}$ and αC, respectively, with $0 < \alpha < 1$. The model continues with introducing a debt contract (R, C), that requires the agent to pay the amount R upon completion of the project. If the amount is

[24] See Janda (2006), p.3

not paid by the agent, the principal has the right to force him into a bankruptcy, which means taking over the project along with the collateral amount C. The principal's maximization problem is given in Appendix 2.

The more interesting part of the model for us is the equilibrium solution given by the following separating contracts for each type of borrower:

$$C_L^* = 0,$$
$$R_L^* = \frac{I - (1 - p_L)\alpha}{p_L},$$

for a low type borrower and

$$C_H^* = \frac{(p_H - p_L)(I - \alpha)}{p_H(1 - p_L) - \alpha p_L(1 - p_H)},$$
$$R_H^* = \frac{I - (1 - p_H)\alpha(1 + C_{H,NR}^*)}{p_H},$$

for a high type borrower.

By showing the above results, Janda (2006) concludes that the high (good) type agent distinguishes himself from the low (bad) type by pledging the collateral C_H^*. Janda (2006) continues that "since the high (good) type of agent has a lower probability of default, he is more willing to pledge a given level of collateral, because the same absolute level of collateral means for him lower expected transfer to the principal than would be the case for low (bad) type of agent with low probability of success."[25]

[25] Janda (2006), p.7

From the above model, we can deduct implications for a similar case by replacing the investor with a bank. We can infer that a "bad" type borrower signals for his quality by not pledging a collateral, $C_L^* = 0$, while the "good" type borrower pledges collateral C_H^*.

Since the collateral in the "good" case is determined mainly by the probabilities of success of the two types of borrowers and the amount of investment I, we can admit that there is a similarity between the pledging of collateral and purchasing a credit rating which also constitutes a certain amount as a cost to the borrower and which also is linked to the costs of borrowing money from the bank. Therefore, from the point of view of the bank (investor), there exists a certain similarity in the signaling functions of the collateral and the credit rating, because as I showed in the beginning of section 4, a risky (bad) borrower will also abstain from purchasing a rating similarly to the "bad" borrower in the above case who will abstain from pledging a collateral.

4.1.2 Solicited and Unsolicited Ratings.[26]

In Section 3 the differences between solicited and unsolicited ratings were mentioned in connection with the roles of ECAIs. A model developed by Bannier and Tyrell (2005) explores this area more deeply and we can derive some implications about the adverse selection problem discussed in the present paper.

The model starts out with the assumption that the firm's quality is a normally distributed random variable $\theta : N(y,1/a)$. It is also assumes that the distribution is common knowledge in the market and can be referred to as public information. The lower a, the higher is the firm's fundamental risk, since the firm quality θ may deviate strongly from the ex-ante expected value y. The investor's private interpretation of the public information about firm's quality is expressed as $x_i|\theta : N(\theta,1/b)$. The higher b, the more closely are investors' private signals distributed around the unknown firm quality θ or

[26] The model shown in this subsection is a shortened version of the adverse selection model developed in Bannier/Tyrell (2005), only these parts of the model are presented which lead to important implications for the issues concerned in this paper

b simply denotes the precision of investors' private information. Similarly, the agency's private signal about the firm quality is $x_A|\theta : N(\theta,1/c)$. The model also points out that the signals are independent of each other.

The model continues by outlining a time line consisting of three periods:

- In $t=0$, the firm has an outstanding debt that has to be repaid at a rate of R per unit of debt at maturity $(t=2)$
- In $t=1$, the investors and the rating agency observe their private signals x_i and x_A respectively. The agency publicly announces the rating z, according to which investors update their beliefs and decide on whether to prolong the credit or withdraw early. An early withdrawal means a payment of 1 per unit of capital.
- In $t=2$ the firm's project matures successfully, if a proportion of less than θ of outstanding debt has been withdrawn prematurely. Consequently the firm repays debt out of the realized project payoff equal to V, otherwise the firm defaults.

Then the model continues with two opposite cases – with and without the participation of a credit rating agency.

Firstly, the model considers a case without a rating agency. In this case investors are left to base their decisions of whether to prolong the credit or withdraw, solely on the common prior information about θ and on their private signals x_i. Provided that private information is sufficiently precise, a unique equilibrium can be derived, which is characterized by trigger strategies so that each investor extends his loan whenever he obtains a private signal x_i higher than a trigger equilibrium value x_W^* and withdraws credit otherwise. Similarly, the firm defaults if a quality value lower than θ_W^* is realized. The project will be successful only if the firm's fundamental value θ is sufficiently high, i.e. $\theta > \theta_W^*$. Thus, the marginal investor will be indifferent between foreclosing and extending credit if both actions deliver the same expected payoff:

$$1 = R \cdot prob(\theta \geq \theta_W^* \,|\, x_i, z)\,. \qquad (1)$$

If there is no credit rating agency on the market, investors' posterior beliefs about θ are given by:

$$\theta | x_i \;:\; N(\frac{ay + bx_i}{a+b}, \frac{1}{a+b}) \qquad (2)$$

Plugging this equation into (1) gives us the indifference condition for the individual investor:

$$x_W^* = \frac{a+b}{b}\theta_W^* - \frac{a}{b}y - \frac{\sqrt{a+b}}{b}\Phi^{-1}\left(\frac{R-1}{R}\right). \qquad (3)$$

The firm's projects, however, need a critical mass of investment in order to proceed successfully. This condition also can be interpreted as the firm's ability to refinance internally a certain amount of withdrawn debt. This amount that the firm can refinance is translated into firm's quality. For simplicity the model assumes that the firm has to default whenever the proportion of withdrawn debt, denoted by l is higher than the firm quality θ. Therefore, the firm will be on the brink of default if:

$$\theta = l = prob(x \leq x_W^* \,|\, \theta)$$

$$\theta = \Phi(\sqrt{b}(x_i - \theta))\,. \qquad (4)$$

The model continues with the introduction of an equilibrium threshold value θ_W^* derived from (3) and (4) below which firm's projects will be abandoned since the proportion of withdrawn capital is too high for the firm to be warranted further internal refinancing. For values $\theta > \theta_W^*$ the project will be continued. The withdrawal of capital is yet sufficiently small for the firm to avoid a default. The value θ_W^* is given by:

$$\theta_W^* = \Phi\left(\frac{a}{\sqrt{b}}(\theta_W^* - y) - \sqrt{\frac{a+b}{b}}\Phi^{-1}\left(\frac{R-1}{R}\right)\right).$$

The model seeks a unique equilibrium for which to take place, the indifference conditions (3) and (4) should not cross more than once. The model concludes that the sufficient condition for unique equilibrium requires that behavioral uncertainty represented by the variance of investors private signals, $1/b$, does not become too big as compared to fundamental uncertainty represented by the variance of the firm's quality value θ.

Now we move to the case in which there exists a rating agency which announces rating z which brings additional information to the market and investors update their beliefs to:

$$\theta \left| x_i, z \right. : N\left(\frac{ay + bx_i + dz}{a+b+d}, \frac{1}{a+b+d} \right)$$

Thus the unique equilibrium value for the firm's quality with the presence of a rating agency becomes:

$$\theta^* = \Phi\left(\frac{1}{\sqrt{b}} \left(a(\theta^* - y) + d(\theta^* - z) - \sqrt{a+b+d}\,\Phi^{-1}\left(\frac{R-1}{R} \right) \right) \right)$$

An assumption for simplicity is that the rating z is exogenously given and is normally distributed with variance $1/d$.

Then the model states the equilibrium value for private signals given by:

$$x^* = \frac{a+b+d}{b}\theta^* - \frac{a}{b}y - \frac{d}{b}z - \frac{\sqrt{a+b+d}}{b}\Phi^{-1}\left(\frac{R-1}{R} \right)$$

Thus for quality values higher than θ^* the firm will not default because a sufficient number of investors will decide to prolong credit.

Backed up by the above analysis we now move to the essential part of the model where as shown above the ex-ante probability of default is given by

$$prob(default) = prob(\theta \le \theta^*) = \Phi(\sqrt{a}(\theta^* - y))$$

A logical conclusion is that the likelihood of default increases in equilibrium value θ^* so that all model parameters that reduce θ^* will automatically reduce the probability of default as well. The model further assumes that with rational expectations, investors will learn that the rating's precision d is given by $(1-r_2)a+(1-r_1-r_2)c$[27]. Plugging this into the equilibrium equation for θ delivers

$$\theta^* = \Phi\left(\frac{1}{\sqrt{b}}\left(\begin{array}{l} a\left((2-r_2)\theta^* - y - (1-r_1)z\right) + \left(1-r_1-r_2\right)c\left(\theta^* - z\right) - \\ \sqrt{(2-r_2)a+b+(1-r_1-r_2)c}\,\Phi^{-1}\left(\frac{R-1}{R}\right) \end{array}\right)\right)$$

From the equation above we can see that the probability of default decreases in the ex-ante expected firm quality, y, in the announced rating, z, and in the offered repayment rate, R. Now we proceed to the next step of comparing the equilibrium value $\theta*$ with the equilibrium value without the presence of a rating agency θ_W^*:

$\theta_W^* > \theta^* \Leftrightarrow$

$$\theta_W^* - \theta^* > \left[1-r_1+(1-r_1-r_2)\frac{c}{a}\right](\theta*-z) + \frac{1}{a}\Phi^{-1}\left(\frac{R-1}{R}\right)\left[\sqrt{a+b} - \sqrt{(2-r_2)a+b+(1-r_1-r_2)c}\right]$$

Thus, the above inequality finds that the introduction of a rating agency reduces the probability of default (by reducing the interval in which default occurs with certainty from $[0,\theta_W^*]$ to $[0,\theta*]$ as long as $\theta*$ lies sufficiently below z, i.e. as long as the rating agency announces a sufficiently high rating. In this case the l.h.s. of the above equality will be positive and the r.h.s. will be negative and the equality will be satisfied.

[27] r_1 is the weight attached to the competitive argument of the utility function of the rating agency, which comes from the assumption that a rating agency has a competitive aim which induces the CRA to reduce her risk of either losing the firm as a future customer by announcing a below average rating, or of losing investors as users of her information-provision by announcing inflated ratings that might increase their portfolio risk substantially. r_2 is the weight of a feedback argument which represents the feedback-effect which is states that the CRA should try not to contribute to an (inefficient) firm default via the announcement of her rating

Thus, Bannier and Tyrell (2005) conclude from their model that "…for firms that are able to confide sufficiently optimistic information about business prospects to the CRA despite a pessimistic prior expected firm quality, the probability of default will decrease after the announcement of a rating."[28] They consider this statement as a contribution to their "private information hypothesis", that relates the difference between solicited and unsolicited ratings to an adverse selection problem.

The core conclusion for our examination is that again there exist certain similarity between the case described in this subsection and the problem of adverse selection that we are discussing in this paper. If we assume that an unrated firm in Basel II remains unrated because it is of the "bad" type, then it is similar to a firm which has an unsolicited rating and remains with it because firms solicit a rating "whenever they believe to be able to disclose much more optimistic private information to the CRA than what has a priori been expected."[29] These findings have some important implications for the implementation of Basel II, which will be outlined in the next section.

4.2 Risk mitigation and Implications from Basel II.

As we have seen in the previous sections, there exists a conceptual problem in the Standardized Approach in Basel II. While risky borrowers who have a rating are risk weighted at 150 percent, the unrated borrowers are risk-weighted at 100 percent which poses an adverse selection problem. The reason for this comes mainly from the uncertainty in the risk of an unrated borrower. Thus, the main purpose of Basel II to promote financial stability through making the risk-management systems more robust and responsive to tackle the complexities arising out of new kinds of risks, is threatened.

The adverse selection problem stated above may lead to serious consequences for the banking institution using standardized approach. In contrast to the standardized approach, under the IRB approach, high quality corporate lending attracts a lower capital charge

[28] Bannier/Tyrell (2005), p.19
[29] Bannier/Tyrell (2005), p.19

which corresponds to the internal rating assigned by the bank, while low quality borrowers require a higher capital charge than the 8 percent under Basel I. Under IRB therefore banks will prefer high quality than low quality borrowers, while banks under the standardized approach will have relatively greater incentive to lend to lower quality borrowers particularly those that are not externally rated given that they will still attract an 8 percent capital requirement irrespective of the underlying risk. The possibility that high risk borrowers will migrate to banks under the standardized approach poses a risk for less sophisticated banks and for the financial systems in general. [30]

How can these risks be neutralized? The most strongly emphasized risk mitigation tool proposed by the Basel Committee is the introduction of eligible financial collateral (e.g. cash, gold, debt securities). According to the Accord, a collateralized transaction is one in which banks have a credit exposure or potential credit exposure and that credit exposure or potential credit exposure is hedged in whole or in part by collateral posted by the counterparty or by a third party on behalf of the counterparty.[31]The Basel II Accord provides two approaches for risk-weighting of the collateral – simple and comprehensive.

In the simple approach the risk weight of the collateral instrument collateralizing or partially collateralizing the exposure is substituted for the risk weight of the counterparty. For the collateral to be recognized it must be pledged for at least the life of the exposure and must be marked to market and revalued with a minimum frequency of six months.

In the comprehensive approach, when taking collateral banks will need to calculate adjusted exposure to the counterparty for capital adequacy purposes in order to take account of the effects of the collateral. Banks are required to adjust both the value of the exposure and the value of the collateral, using haircuts, so that they can be able to take account of possible future fluctuations in the value of either. Under the comprehensive

[30] See Akhtar (2006), p.11
[31] See Basel Committee on Banking Supervision (2004), p.26

approach, for a collateralized transaction, the exposure amount after risk mitigation is calculated as follows:

$$E^* = \max\{0, [E \times (1 + He) - C \times (1 - Hc - Hfx)]\}$$

where:

E^* = the exposure value after risk mitigation

E = the current value of the exposure

He = haircut appropriate to the exposure

C = the current value of the collateral received

Hc = haircut appropriate to the collateral

Hfx = haircut appropriate for currency mismatch between the collateral and the exposure

As we have seen in the model of Janda (2006) pledging of collateral can not only serve as a good risk mitigation technique with regard to securing the exposure amount, can also serve as a good signal for the bank for the quality of the borrower. Therefore, using collateral should be promoted by the Basel Accord as an appropriate measure for risk mitigation and decreasing the effects of the adverse selection thus decreasing the risk at which the bank exposures itself.

The requirement of collateral should be accompanied by an effective credit contract design which can be used for screening of the quality of the counterparties. Such contract design was presented in Janda (2006) where two different types of contracts were designed for the "good" and "bad" types of borrowers where each type will have the incentive to choose the contract which is designed for him. In addition, a proper loan pricing strategy may also serve as a screening technique.

Another way of decreasing risks in debt contracts can be introduced as an appropriate loan commitment contract which states that the borrower will have future borrowing benefits from the bank if he completes the current contract.
In general, the regulatory framework under which the banks are operating should be balanced in such way that banks' commercial interests should be made consistent with the supervisory interests regulating the banking institutions.

5. Conclusion.

Basel II is recognized to be a necessary step in the development of financial regulation and supervision. The transition from Basel I to Basel II has brought more complicated system of risk assessment, mitigation and management systems and has offered financial industry innovative and sophisticated approaches to weighting risks.

Although, the New Accord has proven to be more flexible in assessing risks, its design poses some challenges for the banks which adopt its approaches. This is especially true for the banks under the standardized approach which have to use external credit ratings to assess the risk weights for their counterparties. The banks are facing an adverse selection problem in that unrated risky borrowers may decide to take advantage of the 100% risk weight attributed to them and remain unrated and thus receive cheaper loans while at the same time exposing the bank to credit risk. Since the bank cannot identify the true borrowers' quality it needs to apply some screening and risk mitigation techniques which may decrease their exposure at risk. The implications for banks under the standardized approach are that they will have relatively greater incentive lending to more risky and unrated borrowers since the capital requirement for them is 8% as in Basel I.

The problem can be solved by requiring a collateral and applying different screening techniques to reveal the quality of the borrower. One such method can be a better design of the credit contracts which separates "bad" type from "good" type by providing incentive for each type to choose the contract designed for them.

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Appendix 1

$$\max_{[(e^G, w^G),(e^B, w^B)]} p[\prod(e^G) - w^G] + (1-p)[\prod(e^B) - w^B]$$

$$s.t.\_\ u(w^G) - v(e^G) \geq \underline{U}$$

$$u(w^B) - k.v(e^B) \geq \underline{U}$$

$$u(w^G) - v(e^G) \geq u(w^B) - v(e^B)$$

$$u(w^B) - k.v(e^B) \geq u(w^G) - k.v(e^G)$$

Where $u(w^B)$ and $u(w^G)$ are the utilities for the G type and B type respectively and where the first two constraints are participation constraints and the second two are incentive compatibility constraints

Appendix 2

$$\max_{(R_L, C_L, R_H, C_H)} M = \theta U_L + (1-\theta) U_H$$

$$= \theta [p_L (X - R_L) - (1 - p_L) C_L] + (1-\theta)[p_H (X - R_H) - (1 - p_H) C_H]$$

Subject to:

$$p_i (X - R_i) - (1 - p_i) C_i \geq p_i (X - R_j) - (1 - p_i) C_j$$

$$U_i \geq 0$$

$$p_i R_i + (1 - p_i)\alpha(1 + C_i) = I$$

$$0 \leq C_i \leq W$$

Where $i, j \in \{L, H\}$.