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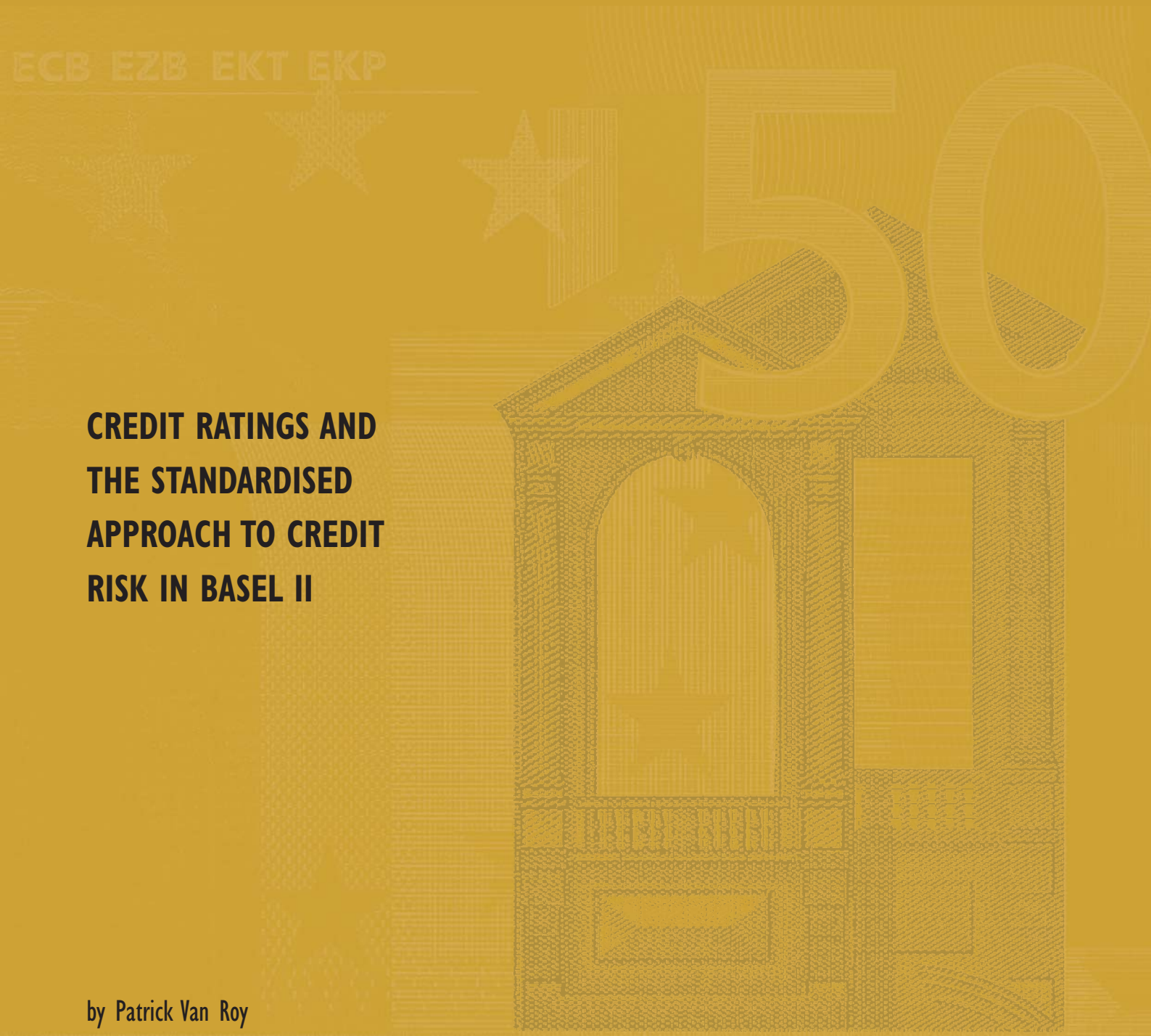

CREDIT RATINGS AND THE STANDARDISED APPROACH TO CREDIT RISK IN BASEL II

by Patrick Van Roy

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In 2005 all ECB publications will feature a motif taken from the €50 banknote.

1 *This paper was initiated while I was a graduate researcher at the European Central Bank. I would like to thank Reint Gropp, Philipp Hartmann, Mathias Dewatripont and an anonymous referee for helpful comments and suggestions. The assistance of Bureau Van Dijk in providing some of the data used in this study is also gratefully acknowledged. All remaining errors are mine.*

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Abstract

This paper simulates the minimum capital requirements for the wholesale exposures of a medium-sized bank in each EMU country depending on the credit rating agencies chosen by the bank to risk-weight its exposures in the standardised approach to credit risk in Basel II. Three main results emerge from the analysis. First, although the use of different combinations of credit rating agencies leads to significant differences in minimum capital requirements, these differences never exceed 10% of EMU banks' regulatory capital for wholesale exposures on average. Second, the standardised approach provides a small regulatory capital incentive for banks to use several credit rating agencies to risk-weight their exposures. Third, the minimum capital requirements for the wholesale exposures of EMU banks will be higher in Basel II than in Basel I. I also show that the incentive for banks to engage in regulatory arbitrage in the standardised approach to credit risk is limited.

Keywords: New Basel Capital Accord, capital requirements, credit rating agencies

JEL classification: G21, G28

Non-technical summary

This paper focuses on the standardised approach to credit risk in Basel II, the new framework for banks' regulatory capital adopted by G-10 countries. Numerous studies have recently analysed the internal ratings based approach to credit risk, which will be implemented by large banks at the end of 2006. On the other hand, the standardised approach has received little research attention even though evidence indicates that it will be adopted by 30% of European banks, mostly active in the retail, securities and cooperative sectors. The standardised approach relies on credit ratings of borrowers assigned by "external credit assessment institutions" (ECAIs) to compute banks' regulatory capital for credit risk. While the recognition and validation of a particular ECAI's assessments are the responsibility of national supervisors, the choice of the identity and number of ECAIs that banks work with is left to their discretion. This study investigates whether this discretion may create differences in capital requirements depending on the ECAI (or combination of ECAIs) chosen by banks to risk-weight their exposures. The use of different ECAIs may lead to differences in capital requirements for two reasons: (1) credit ratings are a subjective assessment of a counterparty's probability of default and as such differ across ECAIs because of differences in opinion, methodology, rating scale etc. Differences in credit ratings are likely to create differences in regulatory risk-weights, hence in capital requirements; (2) ECAIs do not have the same coverage across rating markets and across countries. Differences in coverage are likely to create differences in capital requirements because counterparties which are not rated by an ECAI are assigned a risk-weight by default in Basel II.

The paper, which includes a summary of the points in Basel II that are related to the use of ECAIs by banks, is based on a sample consisting of 3,125 corporates, banks and sovereigns rated by Moody's, S&P and/or Fitch. Summary statistics show that disagreements between these three credit rating agencies average 18% for corporates, 15% for banks and 13% for sovereigns, once credit ratings are mapped into the regulatory risk-weights specified by the Basel Committee. In addition, disagreements between credit rating agencies are lopsided for corporates and for banks, meaning that one ECAI is systematically more conservative than its competitors. This evidence, which is robust over time, is consistent with the most recent academic work on disagreements between credit rating agencies. In order to investigate whether the choice of different ECAIs results in different capital requirements, I use a resampling method to generate

random portfolios of loans to corporates, banks and sovereigns granted by EMU banks. The capital requirements attached to these portfolios are calculated both under Basel I and Basel II. The simulations are based on statistics reflecting the composition of EMU banks' loan portfolio and the breakdown between their rated and unrated claims. In addition, the simulations also include assumptions about the average credit quality of EMU banks' loan portfolios, the average maturity of their interbank exposures and the sectoral distribution of their corporate exposures.

The results of the paper are as follows: first, although significant differences exist between the minimum capital requirements implied by the assessments of Moody's, S&P and/or Fitch, these differences do not exceed 6% of the minimum capital requirements for loans to corporates, banks and sovereigns when assuming that banks lend to rated and unrated counterparties, and 10% when assuming that banks only lend to rated counterparties; second, the standardised approach to credit risk provides a small regulatory capital incentive for banks to use several ECAIs to risk-weight their exposures; third, the minimum capital requirements for corporate, interbank and sovereign claims will be higher in Basel II than in Basel I. These different results are considered to be reassuring for banking supervisors.

Since the results mentioned above are based on the assumption that banks will not modify their lending policy following the introduction of Basel II, I also investigate a case in which banks choose to engage in regulatory capital arbitrage by lending only to counterparties that receive a favourable assessment from the ECAI they use to risk-weight their exposures. I show that such a strategy does not allow banks to decrease capital requirements for wholesale (i.e. corporate, interbank and sovereign) exposures below their Basel I level.

It is important to point out that this paper may underestimate differences in capital requirements because it is based on the assessments of the world's three largest credit rating agencies. Several studies indeed show that smaller credit rating agencies, whose assessments will also be used in Basel II, tend to assign more favourable credit ratings than those issued by Moody's, S&P and Fitch. This paper also insists on the fact that using cumulative default rates of credit ratings instead of their letter equivalent to map rating categories into regulatory risk-weights may not be sufficient to eliminate differences in assessments between ECAIs.

1 Introduction

In May 2003, the Basel Committee on Banking Supervision released its third - and final - consultative paper on the New Basel Capital Accord, which is meant to replace the 1988 capital adequacy framework by a more risk-sensitive approach. One year later, on June 26, 2004, central bank governors and the head of bank supervisory authorities from the G-10 countries endorsed the new framework commonly known as Basel II. Implementation of the new framework in member jurisdictions is expected at year-end 2006, though some advanced approaches to risk measurement may only become available at year-end 2007. Formally, the New Basel Capital Accord consists of three mutually reinforcing pillars: pillar 1, which sets minimum capital requirements for credit, market and operational risks; pillar 2, which requires banks to assess their capital requirements in relation to their risk and supervisors to take action if risks are too high; pillar 3, which establishes core disclosure by banks in order to improve market discipline. This paper focuses on the first pillar of Basel II and more specifically on credit risk, the risk of loss due to default by a borrower. The Basel Committee has developed two approaches for calculating regulatory capital for credit risk, the so-called "standardised approach" and "internal ratings based approach" (hereafter IRB). The standardised approach uses external ratings such as those provided by "external credit assessment institutions"[2] (hereafter ECAIs) to determine risk-weights for capital charges, whereas the IRB allows banks to develop their own internal ratings for risk-weighting purposes subject to the meeting of specific criteria and supervisory approval. While large internationally active banks should opt for the IRB, the vast majority of small and medium-sized credit institutions from the G-10 are expected to adopt the simpler standardised approach (see for instance Basel Committee [2003a] and [2003b]). Outside the G-10, the standardised approach will also be the one preferred by most banks moving to Basel II given their accounting and information (e.g. lack of data) weaknesses.[3]

The increased role given to credit rating agencies in the standardised approach to credit risk has led to many reactions from national supervisors and academic researchers. On the supervisory side, many studies and enquiries into the work and functioning of

[2] The term "external credit assessment institutions" refers to credit rating agencies and export credit agencies. Since this study only deals with the assessments provided by the former, the terms "ECAIs" and "credit rating agencies" are used interchangeably throughout the paper.
[3] Some developing countries like China and India have already announced that they will not adopt the Basel II framework (The Economist, 2003).

credit rating agencies have been launched with the aim of better understanding the credit rating industry and making policy recommendations to reform it (e.g. Basel Committee [2000] and Securities and Exchange Commission [2003]). On the academic side, many studies have pointed to some potential dangers of linking regulatory risk-weights to credit ratings, including a greater procyclicality of capital requirements (Amato and Furfine, 2003) and a greater volatility of capital requirements for banks located in developing countries (Ferri et al., 2001).

In spite of this growing interest for credit rating agencies, one issue related to the standardised approach has received little attention from academic researchers so far, namely the impact of the choice of different rating agencies on banks' regulatory capital. Indeed, while the New Basel Accord makes national supervisors responsible for determining whether the assessments of a particular ECAI can be used for risk-weighting purposes, it allows banks to choose the ECAI(s) they want to work with among those validated by their supervisor. This discretion left to banks regarding the choice of external credit assessment institutions has raised some concerns among market participants and even among credit rating agencies. For instance, Duff & Phelps Credit Rating Co. (DCR), the third largest US credit rating agency before its merger with Fitch Ratings in 2001, pointed out that "important decisions need to be made about the number of external ratings banks should be required to use. DCR believes at least two ratings should be used to ensure a higher degree of transparency and to reduce unwarranted reliance on a single, perhaps more favourable, rating" (RiskWorld, 2000).[4] Aside from generating differences in capital requirements, significant differences in external ratings - or combinations of external ratings - could also affect banks' lending policies (through regulatory capital arbitrage) and hence the quality and efficiency of credit allocation as well as risk monitoring.

Therefore, a contribution of this paper is to provide evidence about disagreements between credit rating agencies and their impact on capital requirement differences. More precisely, this study simulates the capital requirements for the wholesale (i.e. corporate, interbank and sovereign) exposures of a representative bank in each EMU country both under the current and the New Basel Accord. In the latter case, I focus on the standardised approach by using the ratings assigned by the world's three largest credit rating agencies: Moody's Investors Service (Moody's), Standard & Poor's (S&P) and Fitch Ratings (Fitch). Several results emerge from the analysis. First, although

[4] Admittedly, this remark may also have been motivated by a conflict of interest.

significant differences exist between the minimum capital requirements generated by different combinations of ECAIs, the difference between the least and the most favourable combinations never exceeds 10% of banks' regulatory capital for loans to corporates, banks and sovereigns on average in the EMU. Second, banks have a small regulatory capital incentive to work with several ECAIs to risk-weight their exposures. Third, the minimum capital requirements for loans to corporates, banks and sovereigns will be higher in Basel II than in Basel I. Since these conclusions are reached *ceteris paribus*, I also investigate the case where banks choose to modify their lending policy following the implementation of Basel II. More precisely, I examine whether the discretion left to banks regarding the choice of their ECAI(s) may give rise to "regulatory capital arbitrage", a practice whereby banks choose to tailor their lending policy to lower their capital requirements. I find that the regulatory capital incentive to engage in capital arbitrage in Basel II is small.

It should be pointed out that this paper focuses on bank assets whose risk-weights are determined by ECAIs' assessments. This means that my simulations compute capital requirements for corporate, interbank and sovereign claims, but not for other types of assets (e.g. retail, SME or securitised assets). Since the "Third Quantitative Impact Study" (QIS 3) conducted by the Basel Committee (2003a and 2003b) shows precisely that the retail portfolio of banks is the area of activity where their capital requirements will be most affected under the standardised approach, this study only gives an imperfect idea of how capital requirements will change between Basel I and Basel II. Also, I rely on QIS 3 to support some of my hypotheses and results throughout the paper.[5] Caution is obviously needed when comparing the results of this study and QIS 3 since they are based on different groups of institutions (i.e. EMU vs. G-10 banks) and different estimation techniques (i.e. simulations vs. aggregation of bank individual results). Nonetheless, I believe that these comparisons are interesting because they provide a benchmark against which my assumptions and findings can be assessed.

The remainder of the paper is structured as follows. Section 2 summarises the standardised approach to credit risk in Basel II and reviews the literature dealing with disagreements between credit rating agencies. The sample and the methodology used in this study are described in section 3. Section 4 reports the results, while section 5

[5] More precisely, I use QIS 3 results for "Group 2" (i.e. small and medium-sized) banks since this group of institutions is more likely to adopt the standardised approach (Basel Committee, 2003a). However, some "Group 2" banks may also use the IRB (foundation) approach.

concludes and presents some policy implications of the findings for the implementation of the standardised approach to credit risk.

2 The standardised approach to credit risk in Basel II and review of the literature

2.1 The standardised approach to credit risk in Basel II

It is now certain that the standardised approach will be adopted by a large number of banks, not necessarily located in low-income countries. According to a survey of 294 financial institutions from 38 countries conducted in late 2003, 35% of total respondents (30% of European respondents) planned to opt for this simpler approach to credit risk (KPMG, 2004). Compared to previous years, these percentages were much higher because banks appear to have realised the significant level of effort required to comply with the IRB. Moreover, the uncertainty surrounding regulators' approach to capital relief is forcing some banks to reconsider their decision to adopt the advanced approaches to credit risk. The banks which will most likely adopt the standardised approach in Europe are non-quoted banks, some quoted banks and the vast majority of banks belonging to the mutual sector (Credit Suisse, 2003).

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

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

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

where: RW_i = risk-weight attached to asset "i" A_i = asset "i" (i = 1,...n)
RWA = risk-weighted assets RC = regulatory capital

As shown in formula (2), the minimum amount of regulatory capital that a bank must hold for credit risk is equal to 8% of its risk-weighted assets. The key difference between Basel I and the standardised approach to credit risk in Basel II is the choice of the risk-weights (RW_i) in formula (1). While Basel I only recognises a simple

OECD/non-OECD distinction to set risk-weights for corporate, interbank and sovereign claims, the standardised approach aims at providing a greater sensitivity to credit risk by linking risk-weights to the assessments provided by ECAIs. Table 1 shows the risk-weighting scheme put forward by the Basel Committee, whereas Table 2 presents a comparison of rating scales across agencies and an interpretation of the core rating categories. The latter table is helpful since the rating notation used by the Basel Committee (2004) follows the conventions of one particular agency, S&P. In the new framework, rated corporate claims will be assigned to one of four risk buckets (20%, 50%, 100% and 150%) depending on their external rating as opposed to only one bucket (100%) currently, while unrated corporate claims will retain the same risk-weight as in the current capital adequacy framework (100%). Regarding interbank claims, national supervisors will have the choice between two options (Option 1 and Option 2). Under Option 1, rated interbank claims will receive a risk-weight one category below that assigned to claims on their sovereign of incorporation. Under Option 2, rated interbank claims will receive a risk-weight based on their own external rating, with short-term (i.e., less than three-month maturity) claims generally attracting lower capital charges than long-term claims. The risk-weight for unrated interbank claims will also depend on the option chosen by national supervisors. Note that no unrated claim on a corporate or a bank may receive a risk-weight lower than the one applied to claims on its sovereign of incorporation. Finally, claims on sovereigns will be classified into five risk categories (ranging from 0% to 150%) compared to only two (0% and 100%) in the current framework. Thus, the standardised approach in Basel II yields capital charges which are indeed more sensitive to credit risk than the current capital requirements. Although the accuracy of the new risk-weighting scheme has been questioned by numerous studies,[6] it is now certain that banks adopting the standardised approach will be required to implement it by year-end 2006.

Regarding the eligibility and the recognition process of external credit assessments, the Basel Committee requires national supervisors to determine whether the assessments of a particular ECAI can be used for the purpose of determining minimum capital levels in their jurisdiction. In order to ease the work of the national supervisors, the Basel Committee (2004, p. 23) has established a list of six criteria to be satisfied by external

[6] Most notably by Altman and Saunders (2001) and Altman et al. (2002), who use data on US bond ratings, defaults and loss rates. The second paper finds that the standardised approach overestimates the relative riskiness of high quality relative to low quality debt.

credit assessment institutions: objectivity, independence, international access/ transparency, disclosure, resources and credibility (these six criteria are in fact similar to those used by the US Securities and Exchange Commission to designate "nationally recognized statistical rating organizations"). At this stage, Moody's, S&P and Fitch are the only credit rating agencies to have been granted the ECAI designation by the national authorities of all member countries of the Basel Committee. In addition, national supervisors will also be responsible for mapping the credit ratings of smaller ECAIs into the regulatory risk-weights available under the standardised approach by comparing the long-run average cumulative default rates (CDRs) of their assessments to long-run "reference" CDRs.[7] An ECAI whose CDRs start exceeding a "trigger" level above the "reference" CDRs could potentially lose its eligibility (Basel Committee [2004], Annex 2).

Once national supervisors have decided which ECAIs' assessments may be used in their jurisdiction, banks are allowed to choose both the identity and the number of eligible ECAIs they want to work with. Conditional on supervisory approval, banks may even decide to disregard ECAIs' assessments and risk-weight all their corporate exposures at 100% (Basel Committee [2004], p.19). This offers the possibility for banks to stay under the current capital adequacy framework as far as corporate claims are concerned (cf. Table 1). The only constraints for banks applying the standardised approach to credit risk is that they must disclose which ECAIs they use and that they must use their ratings consistently. This provision means that banks are not allowed to "cherry pick" among the assessments of different ECAIs with the purpose of lowering their capital requirements. In order to prevent banks from doing so, the Basel Committee has developed a series of guidelines on "multiple assessments" to be applied by banks working with several external credit assessment institutions. These guidelines (Basel Committee [2004], p.24) state that a bank working with two ECAIs whose assessments map into different risk-weights must use the higher risk-weight. When the bank works with three or more ECAIs whose assessments lead to different risk-weights, the guidelines require the bank to use the higher of the two lowest risk-weights. Note that these guidelines seem to imply that banks have no reason to move from one to two ECAIs as it may only increase or leave unchanged the risk-weight attached to their claims. However, this reasoning fails to take into account that banks may able to reduce

[7] The long-run "reference" CDRs are a twenty-year average of Moody's and S&P three-year CDRs. Fitch is not considered in this average because its rating history only goes back to 1990.

the number of their unrated counterparties by working with two ECAIs. Since credit ratings generally map into risk-weights lower than the ones assigned to unrated counterparties, banks may thus have an incentive to go from one to two ECAIs.

An implicit assumption behind Basel II is that the main credit rating agencies, whose assessments are used to construct long-run "reference" CDRs, are unbiased and have equivalent rating scales. However, the existing literature shows that these credit rating agencies have conflicting views on their clients' creditworthiness. Together with the rule which sets capital charges for unrated claims, this well-established fact raises a number of questions for the design and the implementation of the standardised approach to credit risk. Does the choice of different ECAIs result in different capital requirements and if so, by how much do they differ? Do banks have any incentive to work with ECAIs' assessments or are they better off treating their corporate claims as unrated? Is there an "optimal" choice of ECAIs, which delivers the lowest capital requirements? In order to illustrate the importance of the choice of ECAIs for banks' regulatory capital, the next subsection summarises a series of studies which document the existence of disagreements between credit rating agencies.

2.2 Review of the literature

The literature which is relevant in the context of this study is concerned with how and why credit ratings attached to the same issue (or issuer) differ from one agency to another. This subsection reviews some of the most important contributions to this field of research and relates them to the analysis presented in the paper.

A first strand of the literature analyses rating differences in relation to mostly quantitative variables. Ederington (1986) examines the ratings assigned by Moody's and S&P to the industrial bonds newly issued between 1975 and 1980 and finds that the two rating agencies disagree in approximately 13% of the cases. He concludes that split ratings do not result from differences in rating standards or weights attached to rating determinants, but rather that they represent random differences of opinion. In contrast to these results, Beattie and Searle (1992) find that differences in ratings are mainly due to methodological differences between credit rating agencies. Beattie and Searle use data from the Financial Times Credit Ratings to compare pairs of rating agencies and report an overall disagreement rate of 56%, with the gap between two ratings for the same issuer exceeding one notch in 20% of the cases (one notch is the difference between two

adjacent rating categories, e.g. between AA- and A+). The study by Cantor and Packer (1995) focuses on credit ratings assigned by Moody's and S&P and reports a lower disagreement rate for sovereigns (47%) than for corporates (60%). However, differences of opinion for lower credit ratings appear to be greater for sovereigns than for corporates, a phenomenon that can be explained by the greater uncertainty in the measurement of sovereign credit risk.

A second set of papers shows that disagreements between credit rating agencies may also be linked to qualitative variables such as the issue date of ratings, or the industry and the nationality of the rated entity. Santos (2003) uses a sample of bonds issued by US non-financial firms between 1982 and 2002 and shows that recessions slightly increase the likelihood of mid-credit quality issuers obtaining a rating split. The intuition behind this result is straightforward: recessions are more likely to bring new uncertainties and information frictions, thereby increasing the likelihood of having different rating assessments. Morgan (2002) provides evidence that bond raters disagree more over banks and insurance companies than other sectors using a sample of almost 8,000 US bonds issued between 1983 and 1993. Moody's and S&P disagree on 63% of bank issues and 81% of insurance issues, with the gap between the two ratings exceeding one notch in 18% of the cases for banks and 37% of the cases for insurance companies. Splits among raters also tend to be lopsided irrespective of the sector considered, i.e. one rating agency (Moody's) tends to be more conservative than the other (S&P). However, Morgan shows that splits are relatively more lopsided in the banking industry, where the opacity of bank assets makes the conservative rater err even more on the safe side. Regarding the impact of the nationality of an issuer on its rating, many studies indicate that rating agencies suffer from a home country bias, i.e. they systematically assign higher ratings to firms located in their home country. For instance, a paper by Shin and Moore (2003) provides evidence that split ratings between US and Japanese credit agencies are relatively common, with Moody's and S&P being more conservative than Japanese agencies for more than 70% of the Japanese firms in their sample. Shin and Moore do not find that these lopsided splits can be explained by special corporate governance features of Japanese firms that would be ignored by US rating agencies. Rather, they conclude that this phenomenon is consistent with the home country bias from which Moody's and S&P are generally perceived to suffer (see for instance Fight, 2000).

One alternative explanation for the observed differences in credit ratings is that firms may self-select into the rating process, i.e. firms may only request an additional rating

when they expect an improvement on their existing rating (a practice commonly referred to as "rating shopping"). This hypothesis is tested by Cantor and Packer (1997) using corporate issuer ratings published by five US agencies. Since they cannot reject the hypothesis that there is no selection bias, they conclude that rating differences are mainly attributable to non-identical rating scales across agencies. Tabakis and Vinci (2002) provide a formal test of this assertion by comparing a sample of bank ratings assigned by Moody's, S&P and Fitch. They find that, if the credit ratings assigned by S&P are lower than those assigned by Moody's and Fitch, the default rates associated with the ratings of the three agencies are equivalent. This implies that credit rating differences are mainly due to differences in rating scales and not to differences of opinion, with historical default rates naturally "correcting" rating differences. However, this finding should be considered with care since the study in question suffers from two weaknesses. First, the authors use the default rates attached to corporate and not to bank ratings in their statistical tests, while several sources (e.g. Basel Committee, 2000) suggest that default rates of banks and non-banks differ significantly. Second, Tabakis and Vinci focus on a small sample of banks which are all rated investment grade. Since a well-known feature of default rates is to be very low for investment grade companies and to rise exponentially for speculative grade companies, this increases the likelihood of their tests not to reject the hypothesis that default rates are equal across agencies.

Overall, the literature reviewed in this subsection suggests that disagreements between credit rating agencies are quite prevalent and depend on several quantitative and qualitative variables. However, in the context of this study, *which* factors explain raters' disagreements is less important than the very existence of disagreements. Indeed, the aim of this paper is not to investigate the causes of raters' disagreements but rather to evaluate their consequences on capital requirements. As mentioned earlier, this question has not yet attracted the attention of researchers, although Tabakis and Vinci (2002) acknowledge that differences in assessments may cause differences in capital requirements and attempt therefore to produce a single benchmark rating that aggregates several individual ratings. The next section presents the data set and the methodology that I used to simulate the amount of regulatory capital that EMU banks must hold depending on which credit assessment(s) they choose to risk-weight their exposures in Basel II.

3 Rating data and methodology

3.1 Rating data

The rating data used in this study consist of long-term issuer ratings assigned to corporates, banks and sovereigns by Moody's, S&P and/or Fitch as of June 2002. Credit ratings and the corresponding financial information were obtained from *Osiris* and *Bankscope*, a database of companies and a database of banks, respectively. Issuer ratings, which are not specific to any particular debt issue, provide a comprehensive summary of the ratings of a counterparty by expressing an opinion of its ability to meet its senior financial obligations. However, it should be noted that Basel II explicitly recommends the use of issue - and not issuer - ratings for the purpose of risk-weighting claims.[8] My choice to work with issuer ratings is essentially dictated by their availability through electronic sources and by the fact that collecting a consistent data set of issue ratings is difficult since firms often receive different ratings for different types of debt issues. Moreover, several studies (e.g. Sironi, 2000) show that issue and issuer ratings are highly correlated even though credit rating agencies tend to rate subordinated issues one or two notches below the corresponding issuer senior debt rating.

Table 3 shows that there are 3,125 issuers (2,048 corporates, 972 banks and 105 sovereigns) rated by Moody's, S&P, and/or Fitch in the sample and that the total number of credit ratings is 5,036 meaning that each issuer is rated by 1.6 rating agency on average. The table presents information regarding the size and coverage of the three credit rating agencies which suggests some interesting differences across rating markets (i.e. corporates, banks and sovereigns). For instance, in the corporate rating market, S&P rates 1,818 issuers, twice as much as Moody's (940) and almost four times as much as Fitch (461). In the bank rating market, S&P and Fitch assign roughly the same number of issuer ratings (571 and 599, respectively) well above Moody's (386). However, S&P covers a higher share of US and Asian banks, while Fitch specialises in rating European, Latin American and African banks. In the sovereign rating market, Moody's has a small lead on S&P and Fitch due to its higher coverage of Asian, Latin American and African countries. Table 3 also shows that most corporate and bank credit ratings are assigned in North America and in Europe. More precisely, the US and Canada

[8] Basel II allows the use of issuer credit ratings by banks when the borrower has no specific assessment available for an issued debt (see Basel Committee [2004], pp. 24-25).

together have 1,396 rated corporates (68.2% of all rated corporates) and 207 rated banks (21.3% of all rated banks), while EMU and non-EMU countries together have 354 rated corporates (17.3% of all rated corporates) and 457 rated banks (47% of all rated banks). Although these figures are consistent with the evidence found in credit rating agencies' publications,[9] it is important to bear in mind that that the number of European corporates on which my simulations are based is small. In particular, the number of EMU corporates is only 163 meaning that the rated share of the corporate loan portfolio of EMU banks mainly consists of claims on a relatively low number of issuers (cf. section 4).

Panels A and B of Table 4 show summary statistics about the impact of raters' disagreement on regulatory risk-weight differences. The ratings assigned by Moody's, S&P and Fitch to corporates, banks and sovereigns have been mapped into the different risk-weights chosen by the Basel Committee (cf. Table 1).[10] Panel A presents statistics for jointly rated counterparties, whereas Panel B presents statistics for counterparties rated by at least one rating agency. Both panels compare the risk-weights generated by the credit ratings of two agencies (i.e., Moody's/S&P, Moody's/Fitch and S&P/Fitch) and indicate whether these risk-weights are identical, lower or higher. As shown in Panel A, the regulatory risk-weights implied by Moody's, S&P and Fitch ratings differ on average in 18% of the cases for corporates. Moreover, the risk-weights derived from Moody's ratings are higher or equal than the risk-weights derived from S&P and Fitch ratings in 95.8% and 97.1% of the cases, respectively. In other words, raters' disagreements are lopsided for corporates, with the ratings assigned by one agency (Moody's) almost always leading to higher or equal regulatory risk-weights. Turning to jointly rated banks, one can observe roughly the same percentage of disagreements between raters, with S&P ratings now leading to equal or higher risk-weights than Moody's and Fitch ratings in the vast majority of cases. Indeed, Moody's classifies only four banks and Fitch only one into a higher risk bucket than S&P. The statistics at the bottom of Panel A show a higher rate of agreement for risk-weights attached to sovereigns, with no particular credit rating agency being more conservative than its competitors. Finally, it is important to mention that splits among raters occur mostly

[9] Moody's (2002) and Fitch (2004) indicate that the number of rated banks in the world is slightly above 1,200 while the number of rated corporates is about 2,500 in the US and 600 in Europe. These figures are higher than those presented in this paper since they refer to issue – not issuer – ratings. Nevertheless, they confirm that the number of rated US corporates is roughly four times higher than the number of rated European corporates.

[10] Option 2 for long-term claims was used to convert bank ratings into regulatory risk-weights.

between the 100% – 150% risk categories for corporates and between the 20% – 50% risk categories for banks, i.e., credit rating agencies disagree mostly on adjacent risk-weight classes.

The figures presented in Panel A of Table 4 could be interpreted as evidence that banks wishing to minimise their regulatory capital should disregard Moody's to risk-weight their corporate claims and S&P to risk-weight their interbank claims, i.e. that banks should work only with Fitch's assessments. However, as shown in Table 3, Fitch's coverage of corporates is low. This means that banks relying solely on Fitch assessments would have to treat a lot of their corporate exposures as unrated (i.e., apply a 100% risk-weight) and that they would not be able to use the risk-weight – potentially more favourable – implied by Moody's or S&P ratings. In order to see whether the above analysis is modified when taking into account unrated claims, Panel B of Table 4 looks at counterparties rated by at least one credit rating agency. When a counterparty is not rated by an agency, it receives the risk-weight for unrated claims by default, i.e., 100% in the case of a corporate or a sovereign and 50% in the case of a bank (cf. Table 1). Although Fitch ratings now lead to more conservative risk-weights for banks than S&P ratings, the results in Panel B show, as in Panel A, a high rate of disagreement between credit rating agencies and lopsided risk-weight splits. More precisely, regulatory risk-weights differ on average for 43% of the corporates, 34% of the banks and 22% of the sovereigns. Moody's ratings lead to higher risk-weights for corporates in as much as 43% of the cases, while Fitch ratings lead to higher risk-weights for banks in up to 23% of the cases. As in Panel A, splits mostly occur on adjacent regulatory risk-weight classes.

The main conclusion of Table 4 is that, in spite of the "rating scale compression" introduced by the Basel Committee, differences of opinion and/or differences of coverage among raters are likely to have an impact on regulatory risk-weight differences. The evidence presented in Table 4, though based on risk-weight splits and not on rating splits, is also broadly consistent with the literature reviewed earlier: credit rating agencies disagree more on corporates and banks than on sovereigns and splits among raters are not normally distributed. However, contrary to Morgan (2002), I do not find that rating agencies disagree more on banks than on corporates.[11] Finally, it is also important to mention that time-series evidence from *Osiris* and *Bankscope* indicates that the size and the direction of the risk-weight splits were relatively constant between 1996

[11] It is important to bear in mind that Morgan (2002) focuses on US bond ratings assigned between 1983 and 1993 hence his results are not necessarily comparable with mine.

and 2004 (cf. Appendix 1). Thus, the relatively high rates of disagreement for corporates and banks do not seem to be the result of the uncertainty that may have surrounded June 2002.

While Table 4 clearly shows that differences in external ratings could lead to differences in capital requirements, it does not give an idea of the exact magnitude of these differences. Also, Table 4 does not tell us whether the choice of (say) one rating agency versus two or three would result in very different capital requirements via the guidelines on "multiple assessments". Ultimately, the answer to these questions depends on the geographical and sectoral distributions as well as on the size of banks' exposures. In the following subsection, I outline the main features of the Monte-Carlo simulations that I used to calibrate these differences in the case of EMU banks.

3.2 Methodology

This paper conducts Monte-Carlo simulations by focusing on one bank in each EMU country, which has total assets amounting to € 10 billion and for which assets are drawn at random subject to its balance sheet characteristics satisfying the conditions specified below. A bank of that size exists in each EMU country and is generally classified as a medium-sized institution by national regulators, i.e. exactly the type of bank which is likely to adopt the standardised approach to credit risk.[12] The outcome of a simulation is the amount of regulatory capital (expressed as a percentage of total assets) that the bank must hold to comply with Basel I and the standardised approach to credit risk in Basel II. In the latter case, results are simulated for every possible combination of ECAIs that the bank may choose by following the guidelines on "multiple assessments" set by the Basel Committee (cf. section 2.1). Given that this study focuses on the assessments provided by Moody's, S&P and Fitch, the bank has seven possible choices of ECAIs: it can work with one credit rating agency (Moody's, S&P or Fitch), two credit rating agencies (Moody's/S&P, Moody's/Fitch or S&P/Fitch) or all three credit rating agencies. The simulation is repeated 10,000 times and the frequency distributions of capital adequacy ratios give an estimate of the relevant capital adequacy distributions. From these distributions, I select the 50th percentile as well as the maximum and the minimum values attained by the capital adequacy ratios.

[12] It turns out that the choice of a particular bank size is irrelevant. Simulations for a bank having total assets amounting to € 25 billion or € 3 billion deliver essentially the same results.

The Monte-Carlo method is used in this study because of its lack of assumptions about the functional form of the distribution of capital requirements, which is generally non-normal given the multiple conditions imposed here below. However, it has a major weakness, namely that it rests on the implicit (and unrealistic) assumption that my database contains the whole universe of rated firms. Despite this shortcoming, the Monte-Carlo method is the preferred approach here, especially since numerous papers in the field of banking (e.g. Carey [1998] or Altman et al. [2002]) rely on it to estimate distributions of loss rates, a problem relatively similar to mine.

In the simulations, the randomly drawn portfolios must satisfy a number of conditions otherwise they are rejected. First, the simulated portfolios must respect the geographical and sectoral distributions of bank assets in the country of origin of each bank. Table 5 shows the consolidated balance sheet of banks in each EMU country, which was obtained through the ECB statistical databank. The table breaks down bank assets into the following items: cash, loans (to non-financial firms, banks, sovereigns, other financial institutions, insurance companies and households), securities and money market fund shares/unit, holding of shares and other equities, fixed assets and remaining assets. In addition, the geographical distribution of loans to firms, banks and sovereigns is also given by broad area of the borrower (home country, European Monetary Union and rest of the world). From Table 5, it appears that the majority of claims on firms and sovereigns are domestic, whereas the interbank lending market is more international. On average, loans to firms amount to 20.7% of bank assets in the EMU, while interbank loans and sovereign loans account for 26.6% and 3.6%, respectively. Since the ECB statistical databank does not distinguish between loans to corporates and loans to SMEs, I assume that loans to corporates account for a minority (25%) of loans to domestic firms and a majority (75%) of loans to foreign firms.[13] For instance, in the case of Austria, 5.7% (=22.9% × 25%) of bank assets are assumed to consist of loans to domestic corporates, 1.1% (=1.5% × 75%) of loans to EMU corporates and 1.0% (=3.9% × 75%) of loans to corporates located in the rest of the world. The last column of Table 5 shows that bank assets whose risk-weights are determined by ECAIs' assessments (i.e. wholesale exposures) represent 37.4% of total bank assets on average in the EMU. It is worth stressing that the figures in Table 5 are not specific to small and medium-sized banks. In fact, the distribution of bank assets in Table 5 more than

[13] Masschelein (2003) and Saurina and Trucharte (2003) report that loans to corporates account for 20% and 29% of total loans to firms in Belgium and in Spain, respectively.

probably reflects the distribution of assets of large banks, i.e. the banks which will adopt the internal ratings based approach. To some extent, this problem is insurmountable as the ECB statistical database does not offer a breakdown of bank assets by bank size. Thus, one should interpret the results with caution until evidence on the composition of small and medium-sized banks' loan portfolio is available.

A second condition that the randomly drawn portfolios must satisfy is that their credit quality must correspond to the figures published by the Basel Committee (2003a and 2003b) in its third Quantitative Impact Study. According to the Committee, banks that participated in QIS 3 had 74.3% of their rated corporate claims and 95.7% of their rated interbank claims classified as investment grade.[14] These average figures are used in the simulations by considering that a claim belongs to the investment grade category if it is not rated speculative grade by any of the three credit rating agencies.

A third condition that the selected portfolios must respect is that one-third of corporate exposures must be allocated to firms active in the following five sectors: agriculture and fishing; mining and quarrying; manufacturing; electricity, gas and water supply; construction.[15] I also impose that two-third of interbank claims have a maturity of less than three months,[16] an important assumption since short-term claims on banks receive a preferential treatment in Basel II (cf. Table 1).

In the simulations, bank counterparties consist both of rated and unrated entities. The rated entities are randomly selected among the 3,125 corporates, banks and sovereigns rated by Moody's, S&P and/or Fitch provided that the conditions mentioned above are respected. As *Osiris* and *Bankscope* only report the total amount of bank loans of each corporate and each bank, I divide these figures by the number of bank relationships that a corporate or a bank has according to its size.[17] The resulting figures, which can be seen as the average bank loans of each corporate or each bank, are used to fill the portfolio of each EMU bank randomly. In the case of loans to sovereigns, I assume a fixed loan amount of € 10 million. As a final condition in the simulations, a loan to a single (rated) corporate, bank or sovereign borrower cannot consume more than

[14] These figures are for "Group 1" (i.e. large) banks since the figures for "Group 2" (i.e. small and medium) banks published by the Committee are inaccurate.
[15] This figure is based on the figures shown in the annual reports of major EMU banks.
[16] This figure is a rough average of the percentage of short-term interbank claims in Belgium (76%), Germany (53%) and Luxembourg ("more than 50%") found in Degryse and Nguyen (2003), Upper and Worms (2002) and Banque Centrale du Luxembourg (2001), respectively.
[17] The number of bank relationships that a firm has according to its size is taken from a survey of European countries presented in Ongena and Smith (2000).

5% of banks' total regulatory capital. This requirement represents a reasonable constraint from the point of view of actual practice.

Some of the results presented below also include counterparties which are not rated by Moody's, S&P or Fitch. These results are obtained by drawing randomly portfolios with country-specific percentages of unrated counterparties. These percentages are based on the assumption that the distribution between rated and unrated claims of EMU banks corresponds to the breakdown obtained from *Osiris* and *Bankscope*. This breakdown is shown in Table 6. For example, the first row of Table 6 indicates that 70.0% of total claims on Austrian corporates, 47.9% of total claims on EMU corporates (excluding Austrian ones) and 55.8% of total claims on corporates located outside the EMU are unrated (the figures for banks and sovereigns must be interpreted in the same way).[18] In this paper, I assume that these percentages reflect the actual distribution between rated and unrated claims in the corporate loan portfolio of an Austrian bank, i.e. that 70.0% of the domestic corporate loan portfolio, 47.9% of the EMU corporate loan portfolio and 55.8% of the "rest of the world" corporate loan portfolio of an Austrian bank consist indeed of loans to unrated entities.

The figures in Table 6 are not specific to small and medium-sized banks but they can be compared to the figures reported by "Group 2" banks in QIS 3. In order to perform this comparison, I multiply the percentages of loans to corporates, banks and sovereigns in Table 5 by their corresponding unrated share in Table 6 in order to obtain the percentages of corporate, interbank and sovereign claims which are unrated. The resulting figures, which are shown in the columns labelled "AVG" in Table 6, indicate for instance that 66.8% of the corporate loan portfolio, 24.6% of the interbank loan portfolio and 7.8% of the sovereign loan portfolio of an Austrian bank consist of loans to unrated counterparties. The last row of Table 6 shows that the EMU averages of the different country shares are 52.5%, 24.5% and 6.1%, respectively. These figures are slightly higher than the figures mentioned in QIS 3, with "Group 2" classifying 46% of their corporate claims, 3% of their interbank claims and only 1% of their sovereign claims in the unrated bucket. I interpret this as evidence that my results are likely to slightly underestimate differences in capital requirements between ECAIs since they are based on higher shares of unrated claims than those reported by banks which will probably adopt the standardised approach.

[18] The identity of the banks that granted these loans is not disclosed in *Osiris* and *Bankscope*.

Eventually, it proved impossible to simulate portfolios respecting the different conditions imposed in this section for five EMU countries (Austria, Finland, Greece, Italy and Portugal) due to a lack of rated corporates and/or rated banks allowing building such portfolios. As a consequence, results are only presented for the remaining seven EMU countries for which I was able to simulate portfolios whose characteristics correspond to what was specified above.

4 Results

The results of the Monte-Carlo simulations are presented in Tables 7 to 9. First, in Table 7, I assume that a share of the banks' portfolio is made up of loans to unrated counterparties, which corresponds to the present situation in the EMU (the results found in this table are based on the percentages of unrated corporates, banks and sovereigns shown in Table 6). Second, in Table 8, I assume that the totality of the banks' portfolio is made up of loans to rated counterparties. Although this assumption does not represent the current situation of EMU banks, it may be interesting to consider this extreme case scenario since the number of rated issuers has increased dramatically in Europe over the last fifteen years.[19] This trend has been recently encouraged through the publication of recommendations intended to promote best practice and to improve the liquidity and credibility of European credit markets. These recommendations, published by a group of leading financial institutions, include the fact that issuers obtain at least two ratings from among the three principal agencies active in Europe, i.e. Moody's, S&P and Fitch (UK Society of Investment Professionals, 2003). Third, in Table 9, I assume that banks work with S&P and choose to lend only to counterparties that receive a favourable risk-weight from that ECAI. I call this situation "regulatory capital arbitrage".

The structure of Tables 7 to 9 is identical. For each country, I present the amount of regulatory capital (expressed as a percentage of total assets) that banks are required to hold for their corporate, interbank and sovereign loan portfolios under different risk-weighting schemes, by considering the mean of the simulated distributions. The sum of capital requirements for these three portfolios then gives the total regulatory capital requirements that banks must satisfy. These requirements are relatively low (i.e.

[19] For instance, the number of European companies rated by Moody's has grown by more than 35% each year since 1997 (Moody's, 2003).

typically below 2%) because they do not incorporate capital charges for assets whose risk-weights are not determined by ECAIs' assessments (e.g. retail, SME or securitised assets). Finally, since total capital requirements are calculated at the mean of the distribution, I also report the minimum and maximum values that they attain in the simulations.

In order to find out whether the total capital requirements observed in Tables 7 to 9 are significantly different across combinations of ECAIs, statistical tests on the mean of their distribution are carried out. In the tables, I report the cases where the tests fail to reject the null hypothesis that the distributions of total requirements have the same mean. For instance, in the case of France (Table 7), the statistical tests do not reject the null hypothesis that the distributions of total capital requirements have the same mean in two cases: (1) when comparing the distributions resulting from the choice of S&P versus Fitch; (2) when comparing the distributions resulting from the choice of S&P and Fitch together versus Moody's, S&P and Fitch together. In all other cases, the statistical tests do reject the null hypothesis that the distributions of total capital requirements have the same mean.

Regarding the weighting of interbank claims in Basel II, results are presented for the case in which risk-weights are determined by individual bank ratings (Option 2) and not by the rating of the sovereign of incorporation of the bank (Option 1).[20] In fact, the difference between the two options is relatively small and in some cases even not statistically significant, a result which echoes the findings of Ferri et al. (2001). The narrow difference between Options 1 and 2 is an interesting result given that some interested parties (e.g. Austrian Federal Economic Chamber, 2003) expressed their concerns that the two options could lead to distortions of competition between countries adopting one option over the other. In light of my results, these concerns seem to be largely unfounded. Given that the two options appear to be equally costly in terms of regulatory capital and that several studied have pointed out the inconsistencies of Option 1,[21] this paper therefore supports the use of Option 2 to risk-weight interbank claims in the EMU area.

[20] The Basel Committee (2003a) mentions that seven G-10 countries have decided to implement Option 1 while the remaining six have decided to adopt Option 2. Obviously, it would have been better to respect the choice made by national supervisors in the simulations, but the Committee refuses to disclose the identity of "Option 1" and "Option 2" countries given the preliminary nature of the decision taken by G-10 members.

[21] For a summary of the arguments against the use of Option 1, see the comments issued by the Companhia Portuguesa de Rating (2003).

4.1 No regulatory capital arbitrage (Tables 7 and 8)

This subsection focuses on Tables 7 and 8, which both assume that banks do not modify their lending policy following the implementation of Basel II. The results at the bottom of each table are for the EMU as a whole and are obtained by averaging country results. I first compare the results for the EMU as a whole with those shown in QIS 3 for the G-10 as a whole in order to see whether the simulations produce realistic figures. The QIS 3 results for "Group 2" banks adopting the standardised approach show that loans to corporates attract roughly the same capital requirements as loans to banks and that the capital requirements for loans to sovereigns are close to zero under the current capital adequacy framework. They further forecast a decrease of 10% in the capital requirements for loans to corporates, an increase of 15% in the capital requirements for loans to banks and almost no change in the capital requirements for loans to sovereigns between Basel I and Basel II. The EMU averages in Tables 7 and 8 are in line with these results even though this study and QIS 3 are based on different groups of banks (i.e., EMU versus G-10 banks). Indeed, the simulations show a decrease in EMU banks' capital requirements for corporate loans, which can be attributed to the good quality of their corporate loan portfolio. As a consequence, it is very unlikely that EMU banks will use the Basel Committee's provision allowing them to treat their corporate exposures as unrated. The simulations also point out an increase in EMU banks' capital requirements for interbank loans, which is not surprising given that loans to OECD banks - the bulk of interbank loans in the EMU - received a very favourable treatment in Basel I. The simulated capital requirements for loans to sovereigns are unchanged between Basel I and Basel II. Thus, the simulations in Tables 7 and 8 appear to produce realistic results in light of QIS 3.

Hereunder, I present the main contribution of this paper, namely an analysis of the differences in capital requirements resulting from the choice of different ECAIs in Basel II. It is important to bear in mind that the results given in Table 7 provide a lower bound for these differences since they are based on the assumption that some bank counterparties are unrated whereas the results given in Table 8 provide an upper bound for the differences since they assume that all bank counterparties are rated. It is therefore not surprising that the figures in Table 7 reveal only modest differences between the total capital requirements resulting from the choice of different ECAIs. Turning to the average results for the EMU, the difference between the highest and the

lowest amount of total regulatory capital for loans to corporates, banks and sovereigns is equal to € 8 million in Basel II. Indeed, the choice of Moody's alone yields a total amount of regulatory capital (expressed as a percentage of total assets) of 1.33 while the choice of all three credit rating agencies together yields a total amount of regulatory capital (expressed as a percentage of total assets) equal to 1.25.[22] This means that EMU banks can lower their capital charge for corporate, interbank and sovereign loans by a mere 6% on average if they choose to work with all three credit rating agencies together instead of working with Moody's alone. If EMU banks choose to work with another combination of ECAIs, their regulatory capital relief will be even smaller. For instance, a bank adding the assessments of S&P to those of Moody's only decreases its total amount of regulatory capital for loans to corporates, banks and sovereigns by € 4 million on average in the EMU. However, the results in Table 7 may underestimate the differences in capital requirements resulting from the choice of different ECAIs for two reasons at least: (1) these results are based on slightly higher shares of unrated claims than those reported by "Group 2" banks in QIS 3; (2) these results fail to capture the fact that the number of rated European issuers will certainly increase in the future.[23] The differences in capital requirements in Basel II may thus lie between the figures reported in Table 7 and those shown in Table 8, the latter table being admittedly an extreme scenario which would not be expected to hold in the short to medium term. Nevertheless, it is important to point out that capital requirements are slightly lower in Table 8 than in Table 7 meaning that banks have a small capital incentive to lend only to rated counterparties i.e. to move from the situation described in Table 7 to the situation depicted in Table 8.

The figures in Table 8 reveal slightly larger differences between ECAIs than those shown in Table 7. Looking at the average results for the EMU, the difference between the highest and the lowest amount of regulatory capital for loans to corporates, banks and sovereigns is now equal to € 12 million. In some countries, this difference is notably higher as it reaches € 19 million for Belgium, € 16 million for Luxembourg and € 20 million for Spain. More generally, substantial differences in capital requirements exist between almost any combination of ECAIs. For instance, in the case of France, a bank choosing to risk-weight is portfolio of loans to corporates, banks and sovereigns with S&P instead of Moody's saves € 10 million of regulatory capital.

[22] Since the bank considered in this study has total assets amounting to € 10 billion, one percentage point (0.01) in the tables represents € 1 million in terms of regulatory capital.
[23] Fitch (2004) indicates for instance that even though only 600 European corporates are rated at the moment, another 1,000 may consider acquiring a rating in the coming years.

The above results demonstrate that the choice of different ECAIs in the standardised approach to credit risk could lead to some differences in capital requirements. The choice of the ECAI (or combination of ECAIs) delivering the lowest capital requirements may thus be of interest to banks. With respect to this matter, some results hold for every EMU country in Tables 7 and 8. A first result is that, when a bank works with only one credit rating agency, the choice of Moody's generally leads to the highest total capital requirements. A second result is that, when a bank works with two credit rating agencies, any combination of ECAIs involving Moody's always leads to higher total capital requirements than the choice of S&P and Fitch together. This result can be attributed to the higher capital requirements for loans to corporates and for loans to banks entailed by the choice of any combination of ECAIs involving Moody's. As far as loans to corporates are concerned, these higher capital requirements mainly reflect the fact that Moody's assigns tougher credit ratings to corporates than its competitors (cf. Table 4) whereas in the case of interbank loans, these higher capital requirements are mainly due to Moody's relatively poor coverage of banks (cf. Table 3). A third important result is that banks benefit from a small decrease in regulatory capital when they choose to work with an additional credit rating agency i.e., capital requirements slightly decrease when banks work with a second credit rating agency and they are further lowered when the banks work with a third credit rating agency. It is worth stressing that this result is non-trivial, especially when considering the transition from one to two ECAIs. Indeed, as pointed out earlier, the guidelines on "multiple assessments" set by the Basel Committee seem to imply that banks have no reason to move from one to two ECAIs since it may only increase or leave unchanged the risk-weight attached to their claims. This reasoning fails to take into account that banks may also benefit from working with a second ECAI if it assigns lower risk-weights than the ones assigned by default to claims which are not rated by the first ECAI. In fact, Tables 7 and 8 show precisely that the regulatory capital benefit of having additional counterparties rated outweighs the cost of having some of them rated twice. This result is important because it suggests that banks will have a small regulatory capital incentive to use several assessments to risk-weight their exposures in the standardised approach to credit risk. If banks work with several ECAIs, the measurement of credit risk will be based on different opinions and will be more accurate than if it was based on one credit rating agency only or on a rigid rule, as in Basel I. The Basel Committee will then reach its main objective, i.e. that the risk measurement of banks should be improved thanks to Basel II.

Finally, the results in Tables 7 and 8 also shed light on the differences between Basel I and Basel II and on the countries which may benefit from lower capital requirements in Basel II. When assuming that some bank counterparties are unrated (Table 7), total capital requirements increase between Basel I and Basel II in each EMU country irrespective of banks' choice of ECAIs. When assuming that all bank counterparties are rated (Table 8), total capital requirements also increase though by a smaller amount. Total capital requirements may even decrease in Belgium and in Spain depending on banks' choice of ECAIs. However, since Table 8 is based on the extreme assumption that banks only grant loans to rated counterparties, these results are not emphasized here. Overall, the evidence presented in the paper indicates that Basel II will increase the capital requirements for the corporate, interbank and sovereign loans of EMU banks adopting the standardised approach to credit risk irrespective of their lending policy toward (un)rated counterparties.[24] However, as said earlier, any global assessment of whether banks will benefit from a capital relief in Basel II should also take into account that capital requirements for claims whose risk-weight are not determined by ECAIs' assessments will change compared to Basel I. The Third Quantitative Impact Study reports for instance that capital requirements for "Group 2" banks' retail portfolio will decrease by 23% in the standardised approach to credit risk. Since retail activities of "Group 2" banks account for the largest share of their current capital requirements, the overall change in capital requirements may be close to zero as stated in the Committee's objectives.

From a regulatory perspective, the above results are relatively reassuring. First, the differences between the total capital requirements resulting from the choice of different ECAIs in Basel II – though statistically significant – never exceed 10% on average in the EMU. Second, banks have a small regulatory capital incentive to work with several ECAIs to risk-weight their exposures. Third, the total capital requirements for corporate, interbank and sovereign loans will be higher in Basel II than in Basel I, thereby making banks more resistant to adverse financial shocks. These results hold *ceteris paribus*, i.e. when assuming that banks do not modify their lending policy following the introduction of the new capital adequacy rules. However, the likely increase in total capital requirements may lead banks to alter their lending behaviour in order to distort the effects of Basel II. The consequences of banks engaging in such practices are investigated in the next subsection.

[24] Adding the new capital charge for operational risk to the capital charge for credit risk would only strengthen this conclusion.

4.2 Regulatory capital arbitrage (Table 9)

When capital adequacy rules oblige banks to maintain a capital cushion in excess of what they would otherwise choose, banks may start using different methods to make their capital ratio look artificially high relative to the riskiness of their exposures. This phenomenon is commonly referred to as "regulatory capital arbitrage". There is evidence that the volume of regulatory capital arbitrage was large and growing rapidly after the implementation of Basel I, especially among the largest banks (Basel Committee, 1999).

One of the oldest and most popular forms of regulatory capital arbitrage is known as "cherry-picking". In the context of Basel I, cherry-picking is defined as the practice whereby banks shifted their portfolio's composition toward lower quality credits within a particular risk-weight category, e.g. the 100% risk bucket. This subsection explores the possibility for banks to engage in an alternative form of cherry-picking in Basel II by shifting their portfolio's composition toward counterparties which receive a favourable risk-weight from the ECAI(s) that they use to risk-weight their exposures. Since the standardised approach to credit risk offers the possibility to banks to choose their ECAI(s), banks may want to tailor their lending policy to exploit the differences of opinion that frequently arise between external credit assessment institutions.

The most obvious way for banks to engage in cherry-picking is to choose to work with a given ECAI and to only grant loans to counterparties for which the ECAI's assessments yield lower or equal risk-weights than the assessments of the other ECAIs. This strategy is illustrated in Table 9 by assuming that banks use S&P to risk-weight their exposures and only lend to counterparties for which S&P assessments lead to lower or equal risk-weights than the assessments of Moody's and Fitch.[25] It should be stressed that the assumptions underlying Table 9 are quite extreme. First, I assume that the portfolio of banks consists only of loans to rated counterparties, like in Table 8. Second, I assume that banks only grant loans to entities that receive a "favourable" assessment from S&P, which reduces the number of rated counterparties to which banks can lend by 23% compared to Tables 7 and 8. Third, I make the implicit assumption that differences between credit rating agencies remain constant though time, otherwise the viability of

[25] S&P was chosen arbitrarily. The conclusions of this subsection are unaffected for other choices of ECAIs.

the strategy consisting in lending only to counterparties which had a favourable assessment from S&P in June 2002 is undermined.[26]

In spite of these quite extreme assumptions, the results in Table 9 are once more reassuring from a regulatory standpoint. Indeed, the capital requirements resulting from the choice of S&P alone are still higher than those in Basel I, though of course lower than those implied by any other combination of ECAIs in Basel II. I interpret this result as evidence that, even under quite extreme circumstances, capital arbitrage is unlikely to allow banks to decrease very strongly their capital charge for loans to corporates, banks and sovereigns.

5 Conclusion and policy implications

This paper focuses on the standardised approach to credit risk in Basel II. I investigate whether the choice of different external credit assessment institutions has an impact on EMU banks' minimum capital requirements for loans to corporates, banks and sovereigns. This question deserves attention because numerous studies have shown that credit ratings differ substantially across rating agencies. In addition, differences in coverage between rating agencies may also create incentives for banks to adopt one ECAI (or combination of ECAIs) instead of another.

I find three main results. First, although significant differences exist between the minimum capital requirements implied by the assessments of Moody's, S&P and/or Fitch, these differences do not exceed 6% of the minimum capital requirements for loans to corporates, banks and sovereigns when assuming that banks lend to rated and unrated counterparties, and 10% when assuming that banks only lend to rated counterparties. Thus, this result does not support the request made by some market participants to oblige banks to consider several assessments in order to avoid them relying "on a single, perhaps more favourable, rating" (RiskWorld, 2000). Second, the standardised approach to credit risk provides a small regulatory capital incentive for banks to use several ECAIs to risk-weight their exposures. As a consequence, the measurement of credit risk in Basel II is likely to improve compared to Basel I. Third, the minimum capital

[26] The latter assumption is not necessarily unrealistic. NERA Economic Consulting (2003) provides evidence that credit rating agencies tend to change their ratings in the same direction though not necessarily at the same time.

requirements for corporate, interbank and sovereign loans will be higher in Basel II than in Basel I. However, the overall change in the minimum capital requirements of EMU banks may be close to zero or even negative since this paper abstains from simulating capital requirements for assets whose risk-weights are not determined by ECAIs' assessments.

The conclusions mentioned above may not hold anymore if banks choose to modify their lending policy following the introduction of the new capital adequacy rules. In order to investigate this possibility, I present an extreme case scenario in which banks choose to work with one particular ECAI in Basel II and only grant loans to counterparties which receive a favourable assessment from that ECAI. I show that such a strategy does not allow banks to lower capital requirements below their Basel I level. As a consequence, the incentive for banks to engage in regulatory arbitrage in the standardised approach to credit risk is believed to be limited.

It is important to stress that the results of this paper probably underestimate the differences in capital requirements resulting from the choice of different ECAIs because they focus only on the assessments of the world's three largest credit rating agencies. As mentioned earlier, several studies show that credit rating agencies tend to be more favourable to firms located in their home country. Hence differences in capital requirements may be larger in countries where banks actively use the assessments of these (often smaller) credit rating agencies in addition to those of the "Big Three". This may be the case in Japan for example, where banks often rely on the ratings of two local agencies, Japan Credit Rating Agency and Rating and Investment Information Inc., which rate a majority of domestic firms between one and two notches higher than Moody's and S&P (Shin and Moore, 2003). Similar differences are found when informally comparing the assessments of several credit rating agencies located in developing countries with those of Moody's, S&P and Fitch. Thus, differences in capital requirements between ECAIs may be larger in the countries where the vast majority of banks are expected to adopt the standardised approach to credit risk.

It should be noted that the Basel Committee's proposal to use cumulative default rates of credit ratings instead of their letter equivalent to map rating categories into regulatory risk-weights may not eliminate differences in assessments between ECAIs. The reason is essentially that the long-run "reference" cumulative default rates (CDRs) set by the Committee for the mapping of rating categories into risk-weights are a 20-year average of Moody's and S&P's CDRs, with no other rating agency offering data over

such a long time period. As a consequence, the comparison of a rating agency's long-run average CDRs with the long-run "reference" CDRs calculated by the Committee will necessarily be imperfect and the correspondence between different rating scales not guaranteed. Moreover, there does not appear to be a mechanism built into the New Basel Accord requiring long-run "reference" CDRs to be updated over time. This is a problem since Cantor and Falkenstein (2001) find that historical default rates are not constant over time.

The statistics presented in this paper may also help to interpret some recent results for the internal ratings based approach, which show that internal credit ratings assigned by banks differ significantly. For example, Carey (2001) finds that internal ratings computed by 20 US banks differ in about 55% of the cases, while Jacobson et al. (2003) compare internal ratings computed by 2 major Swedish banks and find that they "differ widely in quite some cases".[27] These differences in internal ratings may be due to the type of rating system chosen by the banks (i.e. expert- vs. model-based systems) or to the time-horizon of the internal ratings (i.e. through-the-cycle vs. point-in-time ratings). However, an alternative explanation to these differences may be that banks implementing the IRB generally benchmark their assessments against existing external ratings. As a consequence, differences of opinion among external raters may cause differences of opinion among internal ratings systems and the evidence presented in this paper may be of interest to the credit risk departments of banks which choose to adopt the internal rating based approach.

Several caveats apply to the findings of this study. First, the impact of Basel II is simulated by focusing on a bank whose balance sheet characteristics match those of an "average" bank in its country of origin. Obviously, the results cannot be generalised to every bank whose distribution of assets, credit quality etc. do not necessarily correspond to those of the "average" bank. Second, this paper uses June 2002 rating data. Since credit ratings change over time, the results only imperfectly capture the differences in capital requirements that may emerge when Basel II is implemented. Nevertheless, I believe that differences comparable to those presented in this paper are likely to exist under the new capital adequacy framework, given the evidence on the persistence of disagreements between credit rating agencies (cf. Appendix 1). Third, the results are only based on a sample of the whole population of credit ratings issued by Moody's, S&P and Fitch. Since this sample is relatively large, I am, however, confident that my results

[27] The comparison is not easy to make since the two banks have different internal rating scales.

are robust and will hold for other samples of credit ratings. Finally, this paper abstains from modelling the impact of risk-mitigation techniques on banks' regulatory capital. Credit-risk mitigants such as collaterals, guarantees and credit derivatives, are used by banks to transfer their risk to a third party and to reduce their capital charge in accordance with the provisions set by the Basel Committee. In spite of their growing importance, risk-mitigation techniques were not considered in the present study. This is due to the absence of precise data on the portion of EMU bank loans that are collateralised, which prevents me from assigning collaterals randomly to the assets drawn in the Monte-Carlo simulations.[28] Note that the Committee (2003a and 2003b) indicates that even banks found it difficult to gather data on eligible collaterals, with those participating in QIS 3 reporting less than 10% of their total exposures as being secured by collateral. As a consequence, the results of this study (as those in QIS 3) probably somewhat overestimate the minimum capital requirements for wholesale exposures.

[28] This approach would have been similar to the one followed by Derviz et al. (2003).

References

[1] Altman, E.I. and A. Saunders (2001), "An analysis and critique of the BIS proposal on capital adequacy and ratings", *Journal of Banking and Finance*, vol. 25 (1), pp. 25-46.

[2] Altman, E.I., Bharath, S.T. and A. Saunders (2002), "Credit ratings and the BIS capital adequacy reform agenda", *Journal of Banking and Finance*, vol. 26 (5), pp. 909-921.

[3] Amato, J.D. and C.H. Furfine (2003), "Are credit ratings procyclical?", working paper # 129, Bank for International Settlements, Basel.

[4] Austrian Economic Chamber (2003), "Comments on the third Consultative Paper", Bank for International Settlements, Basel.

[5] Banque Centrale du Luxembourg (2001), "Annual Report 2000".

[6] Basel Committee on Banking Supervision (1999), "Capital requirements and bank behaviour: the impact of the Basel Accord", working paper # 1, Bank for International Settlements, Basel.

[7] Basel Committee on Banking Supervision (2000), "Credit ratings and complementary sources of credit quality information", working paper # 3, Bank for International Settlements, Basel.

[8] Basel Committee on Banking Supervision (2003a), "Quantitative Impact Study 3 – Overview of Global Results", Bank for International Settlements, Basel.

[9] Basel Committee on Banking Supervision (2003b), "Supplementary Information on QIS 3", Bank for International Settlements, Basel.

[10] Basel Committee on Banking Supervision (2004), "International Convergence of Capital Measurements and Capital Standards", Bank for International Settlements, Basel.

[11] Beattie, V. and S. Searle (1992), "Bond Ratings and Inter-Rater Agreement: A Cross-Sectional Analysis, *Journal of International Securities Markets*, vol. 6 (2), pp. 167-172.

[12] Cantor, R. and E. Falkenstein (2001), "Testing for rating consistency in annual default rates", Product of the Moody's Standing Committee on rating Consistency, available at http://www.defaultrisk.com/pp_test_12.htm.

[13] Cantor, R. and F. Packer (1995), "Sovereign Credit Ratings", *Current Issues in Economics and Finance*, vol. 1 (3), Federal Reserve Bank of New York, pp. 1-6.

[14] Cantor, R. and F. Packer (1997), "Differences of Opinion in the Credit Rating Industry", *Journal of Banking and Finance*, vol. 21 (10), pp. 1395-1417.

[15] Carey, M. (1998), "Credit Risk in Private Debt Portfolios", *Journal of Finance*, vol. 53 (4), pp. 1363-1387.

[16] Carey, M. (2001), "Some Evidence on the Consistency of Banks' Internal Credit Ratings", Federal Reserve Board Discussion Paper.

[17] Companhia Portuguesa de Rating (2003), "Comments on the third Consultative Paper", Bank for International Settlements, Basel.

[18] Credit Suisse (2003), "Basel II: Implications for Banks and Banking Markets", Economic and Policy Consulting, available at https://entry4.credit-suisse.ch/csfs/research/p/d/de/publikationen/media/pdf/spo_0307_basel_II_spezial_de.pdf

[19] Degryse, H and G. Nguyen (2003), "Interbank exposures: an empirical examination of systemic risk in the Belgian banking system", working paper # 43, National Bank of Belgium.

[20] Derviz, A., Kadlcakova, N. and L. Kobzova (2003), "Credit Risk, Systematic Uncertainties and Capital Requirements for an Artificial Bank Loan Portfolio", working paper # 9, Czech National Bank.

[21] Economist, The (2003), "Blockage in Basel: New rules for international banks' capital have hit an obstacle", vol. 369 (October 4th), p. 85.

[22] Ederington, L.H. (1986), "Why Split Ratings Occur?", *Financial Management*, vol. 15 (1), pp. 37-47.

[23] Ferri, G., Liu, L.G. and G. Majnoni (2001), "The role of rating agency assessments in less developed countries: Impact of the proposed Basel guidelines", *Journal of Banking and Finance,* vol. 25 (1), pp. 115-148.

[24] Fight, A. (2000), "The Ratings Game", John Wiley & Sons Ltd.

[25] Fitch Ratings (2004), "How to manage your rating agency relationship?", available at http://www.gtnews.com.

[26] Jacobson, T., Lindé, J. and K. Roszbach (2003), "Internal Ratings Systems, Implied Credit Risk and the Consistency of Banks' Risk Classification Policies", working paper # 155, Sveriges Riksbank.

[27] KPMG (2004), "Results of the Basel II survey 2003 – Eight questions on the New Basel Accord", available at http://www-5.ibm.com/il/services/bcs/basel2/pdf/IBM_conference_2903041.pdf.

[28] Masschelein, N. (2003), "The Basel II Capital Accord, SME Loans and Implications for Belgium", Financial Stability Review (2), pp. 151-172, National Bank of Belgium.

[29] Moody's (2002), "Default and Recovery Rates of European Corporate Bond Issuers", London.

[30] Moody's (2003), "Inside Moody's – European Corporate Finance", London.

[31] Morgan, D. (2002), "Rating banks: Risk and Uncertainty in an Opaque Industry", *American Economic Review*, vol. 92 (4), pp. 874-888.

[32] NERA Economic Consulting (2003), "Credit ratings for structured products: A Review of analytical Methodologies, Credit Assessment Accuracy, and Issuer Selectivity among the Credit Rating Agencies", available at http://www.nera.com/image/6384.pdf.

[33] Ongena, S. and D.C. Smith (2000), "What Determines the Number of Bank Relationships? Cross-Country Evidence", *Journal of Financial Intermediation*, vol. 9 (1), pp. 26-56.

[34] RiskWorld (2000), "Basel Proposals Would Reduce Risk to Global Banking System, Says Duff & Phelps Credit Rating Co.", available at http://www.riskworld.com/PressRel/2000/PR00a037.htm.

[35] Santos, J.A.C. (2003), "Why firms access to the bond market differs over the business cycle: a theory and some evidence", available at http://ssrn.com/abstract=464701.

[36] Saurina, J. and C. Trucharte (2003), "The impact of Basel II on lending to small- and medium-sized firms. A regulatory policy assessment based on the Spanish Credit Register", Bank of Spain.

[37] Securities and Exchange Commission (2003), "Report on the Role and Function of Credit Rating Agencies in the Operation of the Securities Markets", available at http://www.sec.gov/news/studies/.

[38] Shin, Y.S and W.T. Moore (2003), "Explaining differences between Japanese and U.S agencies", *Review of Financial Economics*, vol. 12 (4), pp. 327-344.

[39] Sironi, A. (2000), "Testing for Market Discipline in the European Banking Industry: Evidence from Subordinated Debt Issues", working paper # 2000-40, FEDS.

[40] Tabakis, E. and A. Vinci (2002), "Analyzing and combining multiple credit assessments of financial institutions", working paper # 123, European Central Bank.

[41] UK Society of Investment Professionals (2003), "Improving market standards in the Sterling and Euro Fixed Income Credit Markets", available at http://www.uksip.org/.

[42] Upper, C. and A. Worms (2002), "Estimating Bilateral Exposures in the German Interbank Market: Is there a Danger of Contagion?", discussion paper # 43, Economic Research Centre of the Deutsche Bundesbank.

Table 1: Risk-weights for credit risk in Basel II (standardised approach) and in Basel I

Portfolio			Basel II (standardised approach) AAA to AA-	A+ to A-	BBB+ to BBB-	BB+ to BB-	B+ to B-	Below B-	Not rated	Basel I OECD	Basel I Non-OECD
Corporate			20%	50%	100%	100%	150%	150%	100%	100%	100%
Bank [a]	Option 1		20%	50%	100%	100%	100%	150%	100%	20%	100%
	Option 2	LT	20%	50%	50%	100%	100%	150%	50%		
		ST	20%	20%	20%	50%	50%	150%	20%	20%	20%
Sovereign			0%	20%	50%	100%	100%	150%	100%	0%	100%

Note: [a] The distinction between Option 1 (risk-weight one category below that of the sovereign) and Option 2 (risk-weight based on the rating of the bank) applies only in Basel II

Source: Basel Committee on Banking Supervision (2004)

Table 2: Comparison of long-term issuer rating scales between credit rating agencies

Credit quality	Credit rating agency: Moody's	S&P	Fitch
		Investment grade	
Highest credit quality	Aaa	AAA	AAA
High credit quality	Aa1 to Aa3	AA+ to AA-	AA+ to AA-
Strong payment capacity	A1 to A3	A+ to A-	A+ to A-
Adequate payment capacity	Baa1 to Baa3	BBB+ to BBB-	BBB+ to BBB-
		Speculative grade	
Possibility of credit risk	Ba1 to Ba3	BB+ to BB-	BB+ to BB-
Significant credit risk	B1 to B3	B+ to B-	B+ to B-
High credit risk	Caa1 to Caa3	CCC+ to CCC-	CCC+ to CCC-
Default is likely	Ca	CC	CC
Default is imminent	C	C	C
In Default	-	D, SD	DDD, DD, D

Source: Basel Committee on Banking Supervision (2000) and website of the three credit rating agencies

Table 3: Geographical distribution of long-term issuer ratings by credit rating agency (June 2002)

	Corporates				Banks				Sovereigns			
Absolute numbers												
	Moody's	S&P	Fitch	Total [a]	Moody's	S&P	Fitch	Total [a]	Moody's	S&P	Fitch	Total [a]
North America	705	1273	308	1396	89	174	118	207	2	2	2	2
Europe (EMU)	69	150	29	163	119	161	170	282	12	12	12	12
Europe (excluding EMU)	54	155	67	191	67	68	126	175	22	23	23	24
Asia and Oceania	70	152	7	187	74	106	79	154	20	18	18	23
Latin America	40	80	50	102	34	47	53	96	25	22	13	27
Africa and Middle East	2	8	0	9	3	15	53	58	15	12	8	17
Total	940	1818	461	2048	386	571	599	972	96	89	76	105
Coverage (%) [b]												
	Moody's	S&P	Fitch	Total	Moody's	S&P	Fitch	Total	Moody's	S&P	Fitch	Total
North America	50.5	91.2	22.1	100	43.0	84.1	57.0	100	100	100	100	100
Europe (EMU)	42.3	92.0	17.8	100	42.2	57.1	60.3	100	100	100	100	100
Europe (excluding EMU)	28.3	81.2	35.1	100	38.3	38.9	72.0	100	91.7	95.8	95.8	100
Asia and Oceania	37.4	81.3	3.7	100	48.1	68.8	51.3	100	87.0	78.3	78.3	100
Latin America	39.2	78.4	49.0	100	35.4	49.0	55.2	100	92.6	81.5	48.1	100
Africa and Middle East	22.2	88.9	0.0	100	5.2	25.9	91.4	100	88.2	70.6	47.1	100
Total	45.9	88.8	22.5	100	39.7	58.7	61.6	100	91.4	84.8	72.4	100

Notes: [a] Total rated population (= set of entities rated by at least one of the three credit rating agencies)
[b] Coverage of an area by a credit rating agency is calculated as the proportion of entities rated by that agency relative to the total rated population of the area

Source: *Osiris* (update 18) and *Bankscope* (update 143.2)

Table 4 (Panel A): Counterparties jointly rated by two credit rating agencies, A_1 and A_2 (June 2002)

Corporates

			Risk-weights in Basel II (standardised approach)		
A_1	A_2	n	$A_1 > A_2$	$A_1 = A_2$	$A_1 < A_2$
Moody's	S&P	762 (100)	139 (18.2)	591 (77.6)	32 (4.2)
Moody's	Fitch	175 (100)	24 (13.7)	146 (83.4)	5 (2.9)
S&P	Fitch	381 (100)	37 (9.7)	327 (85.8)	17 (4.5)

Banks

			Risk-weights in Basel II (standardised approach)		
A_1	A_2	n	$A_1 > A_2$	$A_1 = A_2$	$A_1 < A_2$
Moody's	S&P	256 (100)	4 (1.6)	201 (78.5)	51 (19.9)
Moody's	Fitch	206 (100)	8 (3.9)	187 (90.8)	11 (5.3)
S&P	Fitch	289 (100)	43 (14.9)	245 (84.8)	1 (0.3)

Sovereigns

			Risk-weights in Basel II (standardised approach)		
A_1	A_2	n	$A_1 > A_2$	$A_1 = A_2$	$A_1 < A_2$
Moody's	S&P	84 (100)	6 (7.1)	73 (86.9)	5 (6.0)
Moody's	Fitch	71 (100)	6 (8.5)	61 (85.9)	4 (5.6)
S&P	Fitch	69 (100)	5 (7.3)	61 (88.4)	3 (4.3)

Source: *Osiris* (update 18) and *Bankscope* (update 143.2)

Table 4 (Panel B): Counterparties rated by at least one credit rating agency, A_1 or A_2 (June 2002)

Corporates

			Risk-weights in Basel II (standardised approach)		
A_1	A_2	n	$A_1 > A_2$	$A_1 = A_2$	$A_1 < A_2$
Moody's	S&P	1966 (100)	532 (27.0)	1258 (64.0)	176 (9.0)
Moody's	Fitch	1197 (100)	510 (42.6)	540 (45.1)	147 (12.3)
S&P	Fitch	1898 (100)	371 (19.5)	1163 (61.3)	364 (19.2)

Banks

			Risk-weights in Basel II (standardised approach)		
A_1	A_2	n	$A_1 > A_2$	$A_1 = A_2$	$A_1 < A_2$
Moody's	S&P	700 (100)	89 (12.7)	451 (64.4)	160 (22.9)
Moody's	Fitch	778 (100)	72 (9.2)	524 (67.4)	182 (23.4)
S&P	Fitch	881 (100)	124 (14.1)	596 (67.6)	161 (18.3)

Sovereigns

			Risk-weights in Basel II (standardised approach)		
A_1	A_2	n	$A_1 > A_2$	$A_1 = A_2$	$A_1 < A_2$
Moody's	S&P	101 (100)	10 (9.9)	81 (80.2)	10 (9.9)
Moody's	Fitch	101 (100)	11 (10.9)	76 (75.2)	14 (13.9)
S&P	Fitch	96 (100)	9 (9.3)	76 (79.2)	11 (11.5)

Note: unrated corporates and unrated sovereigns receive a 100% risk-weight, unrated banks receive a 50% risk-weight
Source: *Osiris* (update 18) and *Bankscope* (update 143.2)

Table 5: Distribution of bank assets in EMU countries (December 2000; as a percentage of total assets)

Country	Cash	Loans to firms			Loans to banks			Loans to sovereigns			Loans to			SEC	EQU	FIX	REM	Wholesale exposures [a]
		DOM	EMU	ROW	DOM	EMU	ROW	DOM	EMU	ROW	OFI	INS	HOU					
Austria	0.5	22.9	1.5	3.9	16.8	4.8	5.9	5.6	0.1	1.2	2.2	0.1	11.1	12.8	6.3	0.9	3.3	44.2
Belgium	0.2	12.2	0.9	3.3	5.3	10.6	8.7	3.5	0.0	0.1	2.5	0.2	12.8	28.1	3.5	0.6	7.4	34.4
Finland	0.4	18.9	0.2	3.0	6.1	4.0	12.0	0.8	0.0	0.2	4.7	0.1	27.8	14.3	1.7	1.6	4.2	30.2
France	0.1	13.7	0.4	2.1	23.0	3.8	6.5	3.4	0.0	0.3	1.1	0.5	14.7	13.5	6.3	0.8	9.8	42.3
Germany	0.3	12.3	0.5	3.1	18.3	3.0	4.3	7.9	0.3	0.6	0.8	0.1	23.3	16.0	6.0	0.6	3.0	40.2
Greece	0.7	20.4	0.1	1.8	17.5	2.1	5.7	1.8	0.0	0.0	0.3	0.0	8.2	23.0	5.9	1.4	11.1	33.6
Ireland	0.3	10.8	2.8	6.2	8.6	7.3	9.0	0.1	2.9	2.0	4.4	0.1	15.6	21.1	2.3	0.5	6.0	39.4
Italy	0.4	26.7	0.3	0.9	10.6	3.3	2.9	3.4	0.0	0.1	8.3	0.2	14.0	12.2	5.0	2.6	8.9	27.9
Luxembourg	0.1	0.9	5.8	7.1	10.7	26.5	11.5	0.1	0.8	0.5	2.1	0.1	2.6	24.7	2.0	0.5	3.8	60.0
Netherlands	0.2	17.3	0.5	2.4	13.9	5.0	10.1	2.7	0.1	0.3	5.7	0.4	23.4	10.1	4.0	0.5	3.3	38.6
Portugal	0.5	19.5	0.3	0.9	8.1	4.9	7.9	0.7	0.0	0.0	5.1	0.1	21.8	8.7	4.8	1.0	15.8	27.4
Spain	0.5	23.6	0.4	1.6	12.9	3.8	2.8	2.8	0.0	0.2	0.7	0.1	25.6	11.5	6.7	1.8	5.2	29.9
EMU average [b]	0.4	16.6	1.1	3.0	12.7	6.6	7.3	2.7	0.4	0.5	3.2	0.2	16.7	16.3	4.5	1.1	6.8	37.4

Notes: DOM = domestic; EMU = European Monetary Union; ROW = rest of the world

OFI = other financial institutions; INS = insurance companies; HOU = households and individual enterprises

SEC = securities and MMF shares/unit; EQU = shares and other equities; FIX = fixed assets; REM = remaining assets

[a] Sum of loans to corporates (assumed to represent 25% of loans to domestic firms and 75% of loans to foreign firms), loans to banks and loans to sovereigns

[b] Unweighted average of countries' figures

Source: ECB

Table 6: Loans to unrated counterparties by broad geographic area (December 2000; as a percentage of total loans in the area considered)

Country	Loans to unrated corporates				Loans to unrated banks				Loans to unrated sovereigns			
	DOM	EMU	ROW	AVG	DOM	EMU	ROW	AVG	DOM	EMU	ROW	AVG
Austria	70.0	47.9	55.8	66.8	23.6	28.8	24.0	24.6	0.0	0.0	46.3	7.8
Belgium	97.1	46.3	55.8	85.9	7.8	29.6	24.0	23.0	0.0	0.0	46.3	1.6
Finland	43.8	48.8	55.8	45.5	3.1	28.7	24.0	19.1	0.0	0.0	46.3	9.3
France	40.4	51.2	55.8	42.7	29.8	28.1	24.0	28.4	0.0	0.0	46.3	4.0
Germany	59.6	45.1	55.8	58.4	37.6	24.8	24.0	33.8	0.0	0.0	46.3	3.1
Greece	50.1	48.5	55.8	50.5	23.3	28.6	24.0	23.9	0.0	0.0	46.3	0.0
Ireland	45.5	48.6	55.8	49.2	30.8	28.5	24.0	27.7	0.0	0.0	46.3	18.6
Italy	52.2	48.1	55.8	52.3	18.5	29.6	24.0	21.7	0.0	0.0	46.3	0.7
Luxembourg	35.8	48.9	55.8	51.6	66.9	26.7	24.0	34.9	0.0	0.0	46.3	17.5
Netherlands	58.5	47.9	55.8	57.9	7.3	30.3	24.0	17.0	0.0	0.0	46.3	5.0
Portugal	43.7	48.7	55.8	44.3	16.7	28.8	24.0	22.3	0.0	0.0	46.3	2.3
Spain	22.0	52.9	55.8	24.6	12.0	29.5	24.0	17.1	0.0	0.0	46.3	3.0
EMU average [a]	51.6	48.6	55.8	52.5	23.1	28.5	24.0	24.5	0.0	0.0	46.3	6.1

Notes: DOM = domestic; EMU = European Monetary Union; ROW = rest of the world; AVG = weighted average of loans to unrated counterparties located at home, in the EMU and in the rest of the world

[a] Unweighted average of countries' figures

Source: *Osiris* (update 18) and *Bankscope* (update 143.2)

Table 7: Average regulatory capital per asset class assuming that some bank counterparties are unrated (June 2002; as a percentage of total assets) [a]

Belgium

		External credit assessment institution(s) chosen in Basel II						
Portfolio	Basel I	M	S	F	M+S	M+F	S+F	M+S+F
Corporate	0.50	0.49	0.48	0.49	0.48	0.49	0.48	0.48
Bank	0.44	0.61	0.58	0.59	0.56	0.58	0.55	0.54
Sovereign	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Total	**0.94**	**1.12**	**1.07**	**1.09**	**1.05**	**1.07**	**1.03**	**1.03**
Minimum	0.90	0.99	0.93	0.98	0.93	0.98	0.93	0.91
Maximum	1.06	1.39	1.41	1.32	1.22	1.23	1.28	1.19

Tests of hypothesis never reject H_0.

France

		External credit assessment institution(s) chosen in Basel II						
Portfolio	Basel I	M	S	F	M+S	M+F	S+F	M+S+F
Corporate	0.43	0.41	0.38	0.41	0.38	0.39	0.38	0.38
Bank	0.57	0.82	0.81	0.78	0.79	0.77	0.78	0.77
Sovereign	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Total	**1.02**	**1.25**	**1.21**	**1.21**	**1.20**	**1.19**	**1.18**	**1.18**
Minimum	0.98	1.09	1.04	1.08	1.06	1.05	1.04	1.05
Maximum	1.10	1.56	1.46	1.38	1.37	1.36	1.37	1.37

Tests of hypothesis do not reject H_0 when comparing S and F; S+F and M+S+F.

Germany

		External credit assessment institution(s) chosen in Basel II						
Portfolio	Basel I	M	S	F	M+S	M+F	S+F	M+S+F
Corporate	0.46	0.45	0.42	0.46	0.42	0.45	0.42	0.42
Bank	0.44	0.67	0.68	0.68	0.67	0.66	0.67	0.66
Sovereign	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Total	**0.93**	**1.16**	**1.14**	**1.17**	**1.13**	**1.14**	**1.12**	**1.12**
Minimum	0.91	1.04	1.00	1.11	1.00	1.04	1.01	1.00
Maximum	0.99	1.33	1.30	1.31	1.30	1.31	1.29	1.30

Tests of hypothesis do not reject H_0 when comparing S and M+F.

Notes: [a] "Minimum" and "Maximum" refer to the lowest and highest values taken by total capital requirements. The null hypothesis (H_0) is that the distributions of total capital requirements have the same mean; M = Moody's, S = S&P, F = Fitch.

Table 7ctd: Average regulatory capital per asset class assuming that some bank counterparties are unrated (June 2002; as a percentage of total assets) [a]

Ireland

		External credit assessment institution(s) chosen in Basel II						
Portfolio	Basel I	M	S	F	M+S	M+F	S+F	M+S+F
Corporate	0.76	0.75	0.73	0.73	0.74	0.73	0.73	0.73
Bank	0.45	0.63	0.62	0.60	0.60	0.59	0.59	0.58
Sovereign	0.13	0.14	0.14	0.14	0.14	0.14	0.14	0.14
Total	**1.34**	**1.52**	**1.49**	**1.47**	**1.48**	**1.46**	**1.45**	**1.45**
Minimum	1.29	1.32	1.31	1.33	1.32	1.29	1.31	1.32
Maximum	1.46	1.86	1.89	1.67	1.67	1.66	1.65	1.64

Tests of hypothesis do not reject H_0 when comparing F and M+S; M+F and S+F.

Luxembourg

		External credit assessment institution(s) chosen in Basel II						
Portfolio	Basel I	M	S	F	M+S	M+F	S+F	M+S+F
Corporate	0.79	0.78	0.74	0.77	0.75	0.75	0.73	0.74
Bank	0.85	1.17	1.19	1.14	1.15	1.12	1.15	1.12
Sovereign	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Total	**1.68**	**1.98**	**1.96**	**1.94**	**1.94**	**1.91**	**1.92**	**1.90**
Minimum	1.61	1.75	1.72	1.71	1.70	1.68	1.69	1.69
Maximum	1.83	2.34	2.35	2.24	2.26	2.25	2.24	2.25

Tests of hypothesis do not reject H_0 when comparing F and M+S; M+F and S+F.

Netherlands

		External credit assessment institution(s) chosen in Basel II						
Portfolio	Basel I	M	S	F	M+S	M+F	S+F	M+S+F
Corporate	0.52	0.52	0.51	0.52	0.51	0.52	0.51	0.51
Bank	0.52	0.69	0.71	0.69	0.69	0.67	0.68	0.67
Sovereign	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Total	**1.07**	**1.23**	**1.24**	**1.23**	**1.22**	**1.21**	**1.20**	**1.20**
Minimum	1.01	1.08	1.07	1.11	1.07	1.09	1.06	1.06
Maximum	1.20	1.56	1.58	1.39	1.41	1.39	1.37	1.36

Tests of hypothesis do not reject H_0 when comparing M+F and S+F.

Notes: [a] "Minimum" and "Maximum" refer to the lowest and highest values taken by total capital requirements. The null hypothesis (H_0) is that the distributions of total capital requirements have the same mean; M = Moody's, S = S&P, F = Fitch.

Table 7ctd: Average regulatory capital per asset class assuming that some bank counterparties are unrated (June 2002; as a percentage of total assets) [a]

Spain

		External credit assessment institution(s) chosen in Basel II						
Portfolio	Basel I	M	S	F	M+S	M+F	S+F	M+S+F
Corporate	0.59	0.57	0.45	0.47	0.46	0.46	0.44	0.45
Bank	0.33	0.48	0.47	0.45	0.46	0.45	0.45	0.45
Sovereign	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Total	**0.93**	**1.06**	**0.93**	**0.93**	**0.93**	**0.93**	**0.91**	**0.91**
Minimum	0.91	0.98	0.82	0.80	0.84	0.81	0.79	0.79
Maximum	0.97	1.20	1.09	1.13	1.09	1.12	1.09	1.09

Tests of hypothesis do not reject H_0 when comparing Basel I and S; Basel I and F; S and F; S and M+S; F and M+S; M+S and M+F; S+F and M+S+F.

EMU average

		External credit assessment institution(s) chosen in Basel II						
Portfolio	Basel I	M	S	F	M+S	M+F	S+F	M+S+F
Corporate	0.58	0.57	0.53	0.55	0.53	0.54	0.53	0.53
Bank	0.51	0.72	0.72	0.70	0.70	0.69	0.69	0.68
Sovereign	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Total	**1.13**	**1.33**	**1.29**	**1.29**	**1.28**	**1.27**	**1.26**	**1.25**
Minimum	1.10	1.27	1.21	1.24	1.22	1.22	1.20	1.20
Maximum	1.18	1.41	1.37	1.35	1.33	1.33	1.31	1.30

Tests of hypothesis do not reject H_0 when comparing S and F.

Notes: [a] "Minimum" and "Maximum" refer to the lowest and highest values taken by total capital requirements. The null hypothesis (H_0) is that the distributions of total capital requirements have the same mean; M = Moody's, S = S&P, F = Fitch.

Table 8: Average regulatory capital per asset class assuming that all bank counterparties are rated (June 2002; as a percentage of total assets) [a]

Belgium

		External credit assessment institution(s) chosen in Basel II						
Portfolio	Basel I	M	S	F	M+S	M+F	S+F	M+S+F
Corporate	0.50	0.50	0.38	0.49	0.39	0.50	0.38	0.39
Bank	0.44	0.61	0.58	0.59	0.55	0.57	0.54	0.53
Sovereign	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Total	**0.94**	**1.12**	**0.97**	**1.09**	**0.95**	**1.08**	**0.93**	**0.93**
Minimum	0.90	0.94	0.78	0.94	0.76	0.92	0.76	0.76
Maximum	1.06	1.48	1.33	1.28	1.15	1.29	1.12	1.12

Tests of hypothesis never reject H_0.

France

		External credit assessment institution(s) chosen in Basel II						
Portfolio	Basel I	M	S	F	M+S	M+F	S+F	M+S+F
Corporate	0.43	0.42	0.35	0.42	0.36	0.41	0.35	0.36
Bank	0.57	0.83	0.80	0.78	0.78	0.77	0.77	0.76
Sovereign	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Total	**1.02**	**1.27**	**1.17**	**1.21**	**1.16**	**1.20**	**1.14**	**1.14**
Minimum	0.98	1.03	0.90	1.02	0.90	1.00	0.88	0.89
Maximum	1.10	1.61	1.53	1.50	1.47	1.41	1.47	1.46

Tests of hypothesis do not reject H_0 when comparing S+F and M+S+F.

Germany

		External credit assessment institution(s) chosen in Basel II						
Portfolio	Basel I	M	S	F	M+S	M+F	S+F	M+S+F
Corporate	0.46	0.45	0.42	0.46	0.42	0.45	0.42	0.42
Bank	0.44	0.61	0.64	0.62	0.61	0.60	0.62	0.60
Sovereign	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Total	**0.93**	**1.10**	**1.09**	**1.11**	**1.07**	**1.07**	**1.06**	**1.05**
Minimum	0.91	0.91	0.91	0.99	0.89	0.92	0.92	0.88
Maximum	0.99	1.31	1.31	1.35	1.26	1.29	1.29	1.27

Tests of hypothesis do not reject H_0 when comparing M+S and S+F.

Notes: [a] "Minimum" and "Maximum" refer to the lowest and highest values taken by total capital requirements. The null hypothesis (H_0) is that the distributions of total capital requirements have the same mean; M = Moody's, S = S&P, F = Fitch.

Table 8ctd: Average regulatory capital per asset class assuming that all bank counterparties are rated (June 2002; as a percentage of total assets) [a]

Ireland

		External credit assessment institution(s) chosen in Basel II						
Portfolio	Basel I	M	S	F	M+S	M+F	S+F	M+S+F
Corporate	0.76	0.73	0.69	0.68	0.70	0.67	0.69	0.70
Bank	0.45	0.62	0.64	0.60	0.59	0.57	0.59	0.57
Sovereign	0.13	0.11	0.11	0.12	0.11	0.11	0.11	0.11
Total	**1.34**	**1.47**	**1.44**	**1.40**	**1.41**	**1.36**	**1.39**	**1.37**
Minimum	1.29	1.19	1.20	1.17	1.16	1.11	1.15	1.16
Maximum	1.46	1.83	1.84	1.66	1.70	1.60	1.66	1.65

Tests of hypothesis do not reject H_0 when comparing F and S+F.

Luxembourg

		External credit assessment institution(s) chosen in Basel II						
Portfolio	Basel I	M	S	F	M+S	M+F	S+F	M+S+F
Corporate	0.79	0.75	0.65	0.72	0.67	0.70	0.65	0.66
Bank	0.85	1.12	1.15	1.10	1.09	1.05	1.10	1.05
Sovereign	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Total	**1.68**	**1.90**	**1.83**	**1.86**	**1.79**	**1.78**	**1.78**	**1.74**
Minimum	1.61	1.57	1.44	1.48	1.42	1.45	1.43	1.35
Maximum	1.83	2.38	2.39	2.27	2.17	2.14	2.16	2.11

Tests of hypothesis do not reject H_0 when comparing M+S and M+F; M+F and S+F.

Netherlands

		External credit assessment institution(s) chosen in Basel II						
Portfolio	Basel I	M	S	F	M+S	M+F	S+F	M+S+F
Corporate	0.52	0.50	0.47	0.51	0.48	0.49	0.47	0.47
Bank	0.52	0.70	0.71	0.68	0.69	0.67	0.67	0.66
Sovereign	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Total	**1.07**	**1.21**	**1.21**	**1.21**	**1.18**	**1.17**	**1.16**	**1.16**
Minimum	1.01	0.96	0.99	1.03	0.99	0.97	0.99	0.96
Maximum	1.20	1.59	1.64	1.46	1.51	1.39	1.41	1.46

Tests of hypothesis do not reject H_0 when comparing M and S; M and F; S and F.

Notes: [a] "Minimum" and "Maximum" refer to the lowest and highest values taken by total capital requirements. The null hypothesis (H_0) is that the distributions of total capital requirements have the same mean; M = Moody's, S = S&P, F = Fitch.

Table 8ctd: Average regulatory capital per asset class assuming that all bank counterparties are rated (June 2002; as a percentage of total assets) [a]

Spain

		External credit assessment institution(s) chosen in Basel II						
Portfolio	Basel I	M	S	F	M+S	M+F	S+F	M+S+F
Corporate	0.50	0.57	0.41	0.43	0.41	0.43	0.40	0.40
Bank	0.44	0.48	0.47	0.45	0.46	0.45	0.45	0.45
Sovereign	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Total	**0.94**	**1.06**	**0.89**	**0.89**	**0.89**	**0.88**	**0.86**	**0.86**
Minimum	0.90	0.92	0.73	0.75	0.74	0.75	0.73	0.73
Maximum	1.06	1.21	1.10	1.10	1.07	1.09	1.06	1.06

Tests of hypothesis do not reject H_0 when comparing S and F; S and M+S; F and M+S; M+S and M+F; S+F and M+S+F.

EMU average

		External credit assessment institution(s) chosen in Basel II						
Portfolio	Basel I	M	S	F	M+S	M+F	S+F	M+S+F
Corporate	0.58	0.56	0.48	0.53	0.49	0.52	0.48	0.49
Bank	0.51	0.71	0.71	0.69	0.68	0.67	0.68	0.66
Sovereign	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Total	**1.13**	**1.30**	**1.23**	**1.25**	**1.21**	**1.22**	**1.19**	**1.18**
Minimum	1.10	1.21	1.13	1.17	1.12	1.14	1.11	1.10
Maximum	1.18	1.40	1.36	1.35	1.31	1.31	1.30	1.28

Tests of hypothesis never reject H_0.

Notes: [a] "Minimum" and "Maximum" refer to the lowest and highest values taken by total capital requirements. The null hypothesis (H_0) is that the distributions of total capital requirements have the same mean; M = Moody's, S = S&P, F = Fitch.

Table 9: Average regulatory capital per asset class assuming that banks engage in regulatory capital arbitrage (June 2002; as a percentage of total assets) [a]

Belgium

		External credit assessment institution(s) chosen in Basel II						
Portfolio	Basel I	M	S	F	M+S	M+F	S+F	M+S+F
Corporate	0.50	0.50	0.36	0.49	0.38	0.50	0.37	0.38
Bank	0.43	0.61	0.53	0.59	0.53	0.59	0.54	0.54
Sovereign	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Total	**0.93**	**1.12**	**0.90**	**1.09**	**0.92**	**1.09**	**0.91**	**0.92**
Minimum	0.90	0.97	0.74	0.95	0.76	0.96	0.74	0.76
Maximum	1.06	1.45	1.11	1.35	1.12	1.37	1.12	1.13

Tests of hypothesis do not reject H_0 when comparing F and M+F; M+S and M+S+F.

France

		External credit assessment institution(s) chosen in Basel II						
Portfolio	Basel I	M	S	F	M+S	M+F	S+F	M+S+F
Corporate	0.43	0.41	0.34	0.42	0.35	0.41	0.35	0.35
Bank	0.57	0.82	0.75	0.79	0.75	0.78	0.75	0.75
Sovereign	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Total	**1.02**	**1.25**	**1.11**	**1.22**	**1.12**	**1.21**	**1.11**	**1.12**
Minimum	0.98	1.04	0.87	1.03	0.87	0.99	0.88	0.88
Maximum	1.10	1.58	1.37	1.46	1.38	1.46	1.37	1.38

Tests of hypothesis do not reject H_0 when comparing S and S+F; M+S and M+S+F.

Germany

		External credit assessment institution(s) chosen in Basel II						
Portfolio	Basel I	M	S	F	M+S	M+F	S+F	M+S+F
Corporate	0.46	0.45	0.40	0.46	0.41	0.45	0.40	0.41
Bank	0.44	0.63	0.60	0.62	0.61	0.62	0.61	0.61
Sovereign	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Total	**0.93**	**1.11**	**1.04**	**1.11**	**1.05**	**1.10**	**1.04**	**1.05**
Minimum	0.91	0.96	0.91	1.03	0.92	0.96	0.91	0.91
Maximum	0.99	1.34	1.25	1.30	1.26	1.30	1.26	1.26

Tests of hypothesis do not reject H_0 when comparing M and F; M+S and M+S+F.

Notes: [a] "Minimum" and "Maximum" refer to the lowest and highest values taken by total capital requirements. The null hypothesis (H_0) is that the distributions of total capital requirements have the same mean; M = Moody's, S = S&P, F = Fitch.

Table 9ctd: Average regulatory capital per asset class assuming that banks engage in regulatory capital arbitrage (June 2002; as a percentage of total assets) [a]

Ireland

		External credit assessment institution(s) chosen in Basel II						
Portfolio	Basel I	M	S	F	M+S	M+F	S+F	M+S+F
Corporate	0.76	0.74	0.67	0.74	0.68	0.72	0.67	0.68
Bank	0.45	0.63	0.58	0.60	0.58	0.60	0.58	0.58
Sovereign	0.13	0.12	0.11	0.12	0.11	0.12	0.11	0.11
Total	**1.34**	**1.48**	**1.35**	**1.46**	**1.37**	**1.44**	**1.36**	**1.37**
Minimum	1.29	1.24	1.14	1.24	1.15	1.21	1.15	1.15
Maximum	1.46	1.92	1.55	1.72	1.59	1.71	1.58	1.60

Tests of hypothesis do not reject H_0 when comparing M+S and M+S+F.

Luxembourg

		External credit assessment institution(s) chosen in Basel II						
Portfolio	Basel I	M	S	F	M+S	M+F	S+F	M+S+F
Corporate	0.79	0.75	0.62	0.74	0.65	0.71	0.63	0.64
Bank	0.85	1.14	1.06	1.11	1.06	1.08	1.06	1.06
Sovereign	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Total	**1.68**	**1.92**	**1.71**	**1.88**	**1.74**	**1.83**	**1.72**	**1.74**
Minimum	1.61	1.58	1.40	1.56	1.46	1.55	1.45	1.46
Maximum	1.83	2.36	2.00	2.23	2.04	2.13	2.02	2.05

Tests of hypothesis do not reject H_0 when comparing S and S+F; M+S and M+S+F.

Netherlands

		External credit assessment institution(s) chosen in Basel II						
Portfolio	Basel I	M	S	F	M+S	M+F	S+F	M+S+F
Corporate	0.52	0.50	0.45	0.52	0.47	0.49	0.45	0.47
Bank	0.52	0.70	0.65	0.68	0.65	0.67	0.65	0.66
Sovereign	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Total	**1.07**	**1.21**	**1.11**	**1.21**	**1.14**	**1.18**	**1.12**	**1.14**
Minimum	1.01	1.01	0.93	1.06	0.95	0.98	0.93	0.95
Maximum	1.20	1.61	1.32	1.45	1.35	1.41	1.33	1.35

Tests of hypothesis do not reject H_0 when comparing M and F; M+S and M+S+F.

Notes: [a] "Minimum" and "Maximum" refer to the lowest and highest values taken by total capital requirements. The null hypothesis (H_0) is that the distributions of total capital requirements have the same mean; M = Moody's, S = S&P, F = Fitch.

Table 9ctd: Average regulatory capital per asset class assuming that banks engage in regulatory capital arbitrage (June 2002; as a percentage of total assets) [a]

Spain

		External credit assessment institution(s) chosen in Basel II						
Portfolio	Basel I	M	S	F	M+S	M+F	S+F	M+S+F
Corporate	0.59	0.57	0.40	0.46	0.41	0.44	0.40	0.41
Bank	0.33	0.48	0.45	0.46	0.45	0.46	0.45	0.45
Sovereign	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Total	**0.93**	**1.06**	**0.86**	**0.93**	**0.86**	**0.91**	**0.86**	**0.87**
Minimum	0.91	0.96	0.72	0.76	0.72	0.73	0.72	0.72
Maximum	0.97	1.26	1.06	1.14	1.09	1.12	1.06	1.09

Tests of hypothesis do not reject H_0 when comparing Basel I and F; M+S and S+F; M+S and M+S+F.

EMU average

		External credit assessment institution(s) chosen in Basel II						
Portfolio	Basel I	M	S	F	M+S	M+F	S+F	M+S+F
Corporate	0.58	0.56	0.46	0.55	0.48	0.53	0.47	0.48
Bank	0.51	0.71	0.66	0.69	0.66	0.69	0.66	0.66
Sovereign	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Total	**1.13**	**1.31**	**1.15**	**1.27**	**1.17**	**1.25**	**1.16**	**1.17**
Minimum	1.10	1.17	1.02	1.11	1.03	1.09	1.04	0.03
Maximum	1.18	1.55	1.35	1.47	1.36	1.42	1.35	1.36

Tests of hypothesis do not reject H_0 when comparing M+S and M+S+F.

Notes: [a] "Minimum" and "Maximum" refer to the lowest and highest values taken by total capital requirements. The null hypothesis (H_0) is that the distributions of total capital requirements have the same mean; M = Moody's, S = S&P, F = Fitch.

Appendix 1: Distribution of risk-weights in Basel II, 1996-2004 (jointly rated corporates and jointly rated banks) [a]

Corporates [b]

	1996	1997	1998	1999	2000	2001	2002	2003	2004
M > S						19.5	18.4	20.5	21.8
M = S						77.6	77.7	76.7	75.5
M < S	...	...	...	...	...	2.9	3.9	2.8	2.7
n						487	746	776	848
M > F						19.7	12.8	13.4	12.9
M = F						75.8	84.1	81.4	82.8
M < F	...	...	...	...	...	4.5	3.0	5.2	4.3
n						66	164	172	209
S > F						14.7	10.4	6.7	6.5
S = F						81.4	84.1	87.0	88.8
S < F	...	...	...	...	...	4.0	5.5	6.3	4.7
n						177	365	415	509

Banks [c]

	1996	1997	1998	1999	2000	2001	2002	2003	2004
M > S	1.9	2.9	8.8	6.1	5.3	6.0	2.8	1.6	0.4
M = S	82.9	82.6	76.9	86.6	81.9	71.9	77.6	75.3	78.9
M < S	15.2	14.5	14.3	7.3	12.8	22.1	19.7	23.1	20.7
n	210	207	238	164	243	235	254	251	261
M > F	16.9	14.4	13.8	10.5	11.4	11.0	7.1	1.8	0.4
M = F	76.8	83.0	84.2	88.3	87.6	76.1	83.3	91.0	90.7
M < F	6.3	2.6	2.0	1.2	1.0	12.9	9.5	7.2	8.9
n	142	153	152	162	193	209	210	221	247
S > F	20.8	20.4	17.1	15.3	19.0	14.5	14.1	16.3	16.4
S = F	75.4	78.9	82.3	84.0	80.6	85.2	85.2	82.7	81.6
S < F	3.8	0.7	0.6	0.7	0.4	0.3	0.7	1.0	1.9
n	130	147	175	150	242	297	284	313	359

Notes: [a] As of end-January; M = Moody's, S = S&P, F = Fitch
[b] *Osiris* did not exist before 2001
[c] S&P rating information for 1999 (as mentioned on *Bankscope)* subject to omissions

Source: various updates of *Osiris* and *Bankscope*

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