

What do Basel Capital Accords mean for SMEs?

Autoria: Clara Cardone-Riportella, Antonio Trujillo-Ponce, Anahí Briozzo

Summary

In 2010 the Basel Committee on Banking Supervision (BCBS) agreed new international banking guidelines as a response to the financial crisis of 2008. This new Accord, known as Basel III, tries to achieve financial stability and strengthen the solvency of banks and liquidity without diminishing the flow of money from the credit market. Within this context, this paper analyses the impact of new Basel Accords (Basel II and III) on bank capital requirements for Small and Medium-sized Enterprises (SMEs) when the internal ratings-based (IRB) approach is used. To do this, we develop a rating system for Spanish SMEs. To compute bank capital requirements we identify risk rating classes using the predicted probability of default (PD) through a *logit* model. In order to estimate one year of PDs, we use the *Sistema de Análisis de Balance Ibéricos* (SABI) database for Spanish firms. The final sample (defaulted and active firms) is obtained using a methodology similar to Altman and Sabato (2007), which considers for each year of the sample a ratio of defaulted to total firms equal to a prior probability of default. Our sample contains 489 defaulted firms and 8,994 active firms. Our paper complements the previous literature by using the SABI database with information “from the demand-side” of the credit market, and by considering a relevant period, from 2005 to 2009, which could be considered as an economic cycle. We also examine the effect on the credit risk premium charged by banks of the guarantee offered by a Loan Guarantee Association (LGA) to an SME; and whether this foreseeable decrease in the interest rate applicable to the SME’s loan is compensated by the cost of this guarantee. The application of Basel II and Basel III Capital Accords have important consequences for banks, SME borrowers, and LGAs, which are financial intermediaries whose importance is increasing and which appear, practically, all over the countries in the European Union. For banks, the new banking regulation means working in a more stable financial environment. For SMEs, the Capital Accords mean the payment of premiums according to the risk of their business initiatives. In the past, the alternative involved restrictions in their access to credit, arising specifically from the difficulty that calibrating that risk presented for the banks. At the same time, the SMEs need to be instructed in the management of risk, knowing that the lender will assess them in that respect. Finally, in the face of the challenge of Basel Accords, the LGAs must accept that, like the SMEs they guarantee, they may need to submit themselves to the same processes of measurement of risk as those to which their associates are submitted, i.e., at a credit rating.

Keywords: Bank capital requirements; Credit risk mitigation; Bank financing of SMEs; Basel II; Basel III; Loan Guarantee Association.

1. Introduction

In 2010 the Basel Committee on Banking Supervision (BCBS) agreed new international banking guidelines as a response to the financial crisis of 2008. This new Accord, known as Basel III, tries to achieve financial stability and strengthen the solvency of banks and liquidity without diminishing the flow of money from the credit market. The new framework also aims to improve risk management and governance as well as strengthen banks' transparency and disclosures, learning from the financial crisis. However, unlike Basel II (2004), Basel III does not imply a major change in the previous Capital Accord but rather they complement each other; it simplifies and strengthens the numerator of the capital ratio and introduces some macroprudential components to the regulatory framework. Among the main elements proposed by Basel III are the following: first, it substantially raises the quality and quantity of capital, with a greater focus on common equity. Capital needs to be of the highest quality to better absorb losses from shocks that could emanate from anywhere; second, Basel III also introduces a simple leverage ratio, which will act as a backstop to the risk-based measure. Such a measure is critical to underpinning the whole regime and will provide a simple, easy to understand sanity check of the results produced by the risk-based framework. A third dimension of Basel III is the use of capital buffers. The conservation buffer provides a strong incentive for banks to build up capital in good times while the countercyclical buffer should help protect banks against the dangers of rapid credit growth. Finally, sound liquidity risk management principles and global liquidity standards will help ensure that banks more effectively manage this risk and maintain adequate liquidity buffers.

Regarding the impact on financial aspects of small and medium-sized enterprises (SMEs), the importance of SMEs for the BCBS is evident from the various modifications that were made with the object that the new banking regulation established in Basel II should not turn out to be too detrimental for these companies in terms of the capital required.¹ However, because of Basel II Accord sets up capital requirements that are more sensitive to risk, it increases the risk premium that the banks charge on SMEs and, as a result, it exacerbates their very well-known financial difficulties (Cardone-Riportella & Trujillo-Ponce, 2007). Nevertheless, the new banking regulation allows companies to make use of collateral, guarantees and credit derivatives, on-balance sheet netting, mortgages, etc. to mitigate credit risk. It is, therefore, interesting for banks to know the impact of such techniques on their capital requirements, as this could mean that some types of credit-risk mitigation techniques are more advisable than others.

In this sense, our paper emphasises the impact on the bank's capital of the guarantee provided by the Loan Guarantee Associations (LGAs). We examine the effects of this guarantee on the credit risk premium that banks had to charge to their SME clients, and whether this foreseeable theoretical reduction in the interest rates is compensated by the cost of the guarantee requested. It is well known that in order to reduce the problems derived from information asymmetries, there are entities all over the world that mediate with banks to give guarantees supporting the operations of SMEs. The LGAs act as guarantors of SMEs in dealings with banks, with the object of reducing risks for banks by providing loans to small and medium-sized companies. This support helps small companies get financing under better conditions in terms of rate, credit amount, term, and guarantee (Camino and Cardone, 1999; IDEA, 2003). In parallel, many countries, with the aim of offering sufficient cover and guarantee for the risks contracted by the LGAs and facilitate the reduction of the cost of the guarantee for their partners, use reinsurance systems. Their objective is to provide a second, or a backup guarantee, for the operations guaranteed by an LGA. In Spain, the Spanish Reinsurance Company (CERSA), provides a second guarantee to banks.

The main objectives of this paper are: i) first, to analyse the impact of the new banking regulation (Basel Capital Accords, II and III) on the bank's capital requirements for loans to SMEs, considered either as retail or corporate, when the internal ratings-based (IRB) approach is used; and ii) second, to study the impact on this capital requirement (and hence on the credit risk premium) when the SME access to the credit market guaranteed by an LGA.²

The paper is structured as follows. Section 2 presents a review of the research literature. Section 3 develops a model to predict one-year SME default for the Spanish firms and derives capital requirements for banks under the new banking regulation when IRB approach is used. Section 4 analyses how the guarantee granted by an LGA to an SME influences the bank's capital requirements. Section 5 conducts an analysis about the impact of the LGA guarantees on the credit risk premium and, ultimately, on the interest rates applicable to SMEs and compares it with the cost of the LGA guarantee. Section 6 concludes.

2. Review of research literature

There are several studies in the literature analysing the impact on the capital requirements of the banks of the financing of SMEs. Altman and Sabato (2005) examine the effects of Basel II on capital requirements of banks using data from the USA, Italy, and Australia. They conclude that banks would have significant profits even with lower capital requirements, when considering SMEs as retail customers, provided that IRB approach is applied. However, for SMEs treated as corporate entities, the capital requirements are considered to be slightly greater than those considered as retail entities. This leads to the assumption, in their opinion, that most banks would apply both systems simultaneously; i.e., they would consider one part of the loans granted to SMEs as corporate entities and the rest as retail entities. Through a breakeven analysis, they observed that banks would be obliged to classify at least 20% of their SMEs portfolio as retail entities to maintain the current capital requirement. According to Berger (2006), the adoption of the advanced internal ratings-based (A-IRB) approach by large credit entities in the USA, may not signify a reduction in the interest rates applied to loans granted to SMEs, but may be enough to produce a substitution effect with respect to other credit entities that are smaller. Ruthenberg and Landskroner (2008) find that big, high-quality banks, which are expected to adopt the IRB approach, will tend to serve the less risky customers while small banks, which are expected to adopt the standardised approach, will tend to serve the riskier customers and, thus, become riskier themselves. Other remarkable studies that have considered Basel II Accord are: Schwaiger (2002), for the Austrian economy; Scellato, G. and Ughetto, E., (2010), for the Italian market; Blum (2008), Decamps *et al.* (2004), Dietsch and Petey (2004), Johnston (2009), Kerkhof and Melenberg (2004), Lindquist (2004), Medema *et al.* (2009) and Repullo and Suárez (2004), and Berger and Udell (2004) and Berger (2006) for the US market, among others.

In Spain, Saurina and Trucharte (2004) use information from the *Spanish Credit Register* ("from the offer side" of the credit market), and estimate capital requirements taking aggregate average of probability of default (PDs) for SMEs (sales below €50M) and large firms (sales above €50M) for the period 1994 to 2001. They analyse the consultative documents issued prior to the approval of the Basel II Accord, focusing their analysis on SMEs and their repercussions on banks financing Spanish companies. They observe that the modifications made in 2002, considered part of the financing of SMEs either as retail or corporate entities. Moreover, they also observed that adjustments made for size in the PD curve depending on the category. This substantially improved the capital requirement figures required which were reduced on average to 6.5% for the IRB approach, and 6% for the Standardised approach for SMEs included in the retail category. The rest of the SMEs included in the corporate category, also saw that the capital requirements were reduced to 10.23% and 8% for the IRB and Standardised approaches respectively. Thus, they conclude

that at least at the level of the Spanish credit system as a whole, there were no incentives for a change in the current pattern of bank financing provided to corporate entities. Although, the final effect will depend again on the percentage of financing provided to SMEs considered as retail entities. It is worth stressing that these results did not take into consideration the latest modifications prior to the definitive approval of the agreement. Finally, Cardone-Riportella y Trujillo-Ponce (2007) conduct a scenario analysis to consider the impact of the guarantees given to Spanish SMEs in relation to the capital requirements demanded by Basel II.

Our paper contributes to previous empirical literature by using a large sample of firms extracted from the SABI (*Sistema de Análisis de Balances Ibéricos*) database, with information “from the demand-side” of the credit market.³ We also consider a relevant period, from 2005 to 2009, which takes into consideration the deep economic crisis after 2007 in Spain. And finally, we include in the analysis, for the first time, the new capital requirements proposed in the Basel III Accord.

3. Bank capital requirements for SMEs

Under the new banking regulation, the way an SME is treated will differ according to the approach chosen by the particular bank, Standardised or IRB, and according to whether the bank includes the SME in the corporate or retail category. In the Standardised approach, banks must classify their exposures to risk according to various groups, and establish weights based on the credit rating given to the SME by an external credit assessment institution.⁴ On the other hand, the IRB approach is based on the internal estimations made by the bank, which allow the bank to calculate capital requirements that are more sensitive to the risk. Under the foundation approach (F-IRB), banks provide their own estimates of probability of default (PD) and rely on the supervisory estimates for other risk components: the loss given default (LGD), the exposure at default (EAD), and the effective maturity of the operation (M). Under the advanced approach (A-IRB), banks provide more of their own estimates of PD, LGD, EAD, and their own calculation of M, subject to meeting minimum standards. For both the foundation and advanced approaches, banks must always use the risk-weight functions provided in Basel Accords for the purpose of deriving capital requirements (see Table A.1 in Appendix A).

Therefore, the estimation of the PD is a key aspect of the new banking regulation. It must be a long-run average of 1-year default rates for borrowers in the grade. The length of the underlying historical observation period used must be at least 5 years, and the bank is permitted to apply for its calculation by one or more of the following techniques: i) internal default experience; ii) mapping to external data; or iii) statistical default models.

3.1. A model of default for Spanish SMEs

In this section, we develop a specific model to estimate one-year SME probability of default for Spanish firms. To do this, we use data from the SABI database, which contains accounting and financial information for the majority of Spanish SMEs. We consider firms with sales below €50M that defaulted in the period from 2005 to 2009.⁵ The final sample (defaulted and active firms) is obtained using a methodology similar to the used by Altman and Sabato (2007), which consider for each year of the sample a ratio of defaulted to total firms equal to a prior probability of default. In our paper, we use the PD reported previously by Saurina and Trucharte (2004) for Spanish SMEs (3.07%, for the 1994-2001 period). However, because of the economic crisis, we adjust PD estimations for years 2008 and 2009 (“crisis” period years) following bankruptcy rates evolution from Spanish National Statistics Institute (INE) data. The average PD on data from INE for years 2005-2007 is 0.0325%. In 2008 the PD increased on 78.16% from this average, and in 2009 the PD was 146.07% greater than the 2005-2007 average. Considering these calculations, for year 2008 (first year of

economic crisis) we assume a PD of 5.47% (3.07% x 1.78), and for year 2009 a PD of 7.55% (3.07% x 2.46). Table 1 shows the conformation of the final sample, based on data from SABI. The second column shows the defaulted firms for each year, while the third column shows active firms (that have not defaulted since the corresponding year up to 2010). The number of active firms was randomly selected to obtain a ratio of defaulted to total firms equal to the prior one-year PD. The 2005-2009 average PD of the sample is 5.28%.

Table 1:
Sample distribution (Sales €5-50 m.)

Year of default	One-year PD	Defaulted firms (1)	Active firms (2)	TOTAL (1+2)
2005	3.07%	9	284	293
2006	3.07%	10	316	326
2007	3.07%	88	2,779	2,867
2008	5.47%	186	3,215	3,401
2009	7.55%	196	2,400	2,596
TOTAL	-	489	8,994	9,483

Note: This table shows the sample distribution of defaulted and active firms per year, is the One-year PD for years 2005-2007 (normal years). The one-year PD for years 2008 and 2009 is calculated adjusting the “normal years” PD by the annual variation shown in the last column in Table 1. The third column shows the number of defaulted firms (with sales between €5 to 50 m.) found in SABI database. Active firms are those that have not defaulted since the corresponding year up to 2010. The number of active firms was selected to obtain a ratio of defaulted to total firms equal to the prior one-year PD.

Source: Authors' calculations on data from INE and SABI.

Table 2:
Explanatory variables

Explanatory variables	Category
Natural log of total assets (LNA) Firm age (Age)	<i>Size</i>
Added Value/ Total assets (AVTA) ROA (EBIT/ Total assets) ROE Ordinary profits / Sales (OPS) Extra-ordinary profits / Ordinary profits (EPOP) EBITDA / Total debt (EBITDATD) Financial charges / Sales (FCS) (Financial profits – Financial charges)/ Total debt (FRTD) Financial charges / Total debt (FCTD)	<i>Profitability – Performance</i>
Cash/ Total assets (CTA) Cash Flow/ Short term debt Cash Flow/ Total assets (CFTA) Current assets / Short term debt (CASTD) Cash/ Short term debt (CSTD)	<i>Liquidity</i>
Long term debt / Total assets (LTDTA) Total debt/Equity Total debt/Total assets (TDTA)	<i>Leverage</i>
Tangible assets / Total assets (TanTA) Accounts payable / Total assets (APTA) Sales / Total assets (SalesTA) Sales / Current assets (SCA)	<i>Activity</i>
Sales growth (Sgrowth) Assets growth (TAgrowth)	<i>Growth</i>

After selecting the sample of firms, we have to choose a set of explanatory variables that will help us to predict the PD for each rating class. Based on previous studies (Altman and Sabato, 2005; 2007), we analyze 24 financial ratios for the year prior to default in addition to firm age and time dummy variables, including interaction terms (see Table 2)⁶.

Using a stepwise variable selection, based on goodness of fit, percentage of correct predictions, and stability of the results, the logistic equation is as follows:⁷

$$Z_{i,t} = b_0 + b_1 \cdot \text{TDTA}_{i,t-1} + b_2 \cdot \text{ROA}_{i,t-1} + b_3 \cdot \text{FRTD}_{i,t-1} + b_4 \cdot \text{SalesTA}_{i,t-1} + b_5 \cdot \text{CFTA}_{i,t-1} + b_6 \cdot \text{TanTA}_{i,t-1} + b_7 \cdot \text{TAGrowth}_{i,t-1} + b_8 \cdot \text{Age} + b_9 \cdot y_{2008} + b_{10} \cdot y_{2009} + b_{11} \cdot \text{FRTD}_{i,t-1} \cdot y_{2009} + b_{12} \cdot \text{TanTA}_{i,t-1} \cdot y_{2009} + \varepsilon_{it} \quad (1)$$

Where $Z_{i,t}$ is the log odds of the dependent variable for the i^{th} case in the t^{th} period, b_0 is a constant and the “b” terms are the logistic regression coefficients. All the ratios used as independent variables enter into the regression equation staggered by one period, because we want to predict one year PDs. The final model contains 12 variables: 1 size variables, 2 profitability variables, 1 leverage variable, 1 liquidity variables, 1 growth variable, 2 activity variables, 2 time variables, and 2 interaction terms (see Table 3). We observe that only the dummy variables for the crisis years are relevant (2008 and 2009). The interaction terms are relevant only for year 2009, when they interact with of financial results to Total Debt (FRTD) and Tangible Assets to Total Assets (TanTA). We see that the negative effect of FRTD and TanTA on the probability of default decreases in magnitude for year 2009.

Table 3:

Selected variables and their observed effect on probability of default

Variable	Observed sign	Ratio category
Total debt / Total assets (TDTA)	3.987***	Leverage
ROA	-7.457***	Profitability - Performance
(Financial profits – Financial charges)/ Total debt (FRTD)	-21.929***	
Sales / Total assets (Sales/TA)	-0.183***	Activity
Tangible assets / Total assets (TanTA)	-2.508***	
Cash Flow/ Total assets (CFTA)	-6.706***	Liquidity
Asset growth (TA Growth)	0.218**	Growth
Firm age (Age)	-0.028***	Size
Year 2008 (y2008) (Dummy variable)	0.839***	Time dummy
Year 2009 (y2009) (Dummy variable)	0.513*	
FRTD * y2009	10.845**	Interaction term
TanTA * y2009	2.606***	
N defaulted (N not defaulted): 489 (8994)		
Log pseudo-likelihood: -3585.5698		
Wald statistic: 294.55***		
Pseudo-R2: 0.4545		

Note: * Statistical significance level at the 10% level, ** at the 5%, *** level at the 1%.

To describe the relationship between Z_i and the probability of entering in default state (π_i) for the i^{th} case we use the following link function:

$$\pi_i = \frac{e^{Z_i}}{1 + e^{Z_i}} \quad (2)$$

The model correctly predicts 85% of defaults and 83% of non-defaults.

3.2. *Deriving Bank Capital Requirements*

In order to compute the formulas to estimate bank capital requirements under the IRB approach we make the following general assumptions:

- Expected one-year PDs are computed using the logit model that we developed in the previous Section.
- We use a fixed LGD of 45% (percentage suggested in the F-IRB approach for senior, unsecured loan exposures).
- We rank the firms by their expected PDs, and then compute the number of defaults by the number of firms in each group (observed PDs). Rating classes are created to obtain the value of PD closest to the one showed by bond equivalent PD distributions⁸. Note that PDs and weights vary from SMEs as retail vs. SMEs as corporate.
- The percentage of firms in each rating class is used as weight for the capital requirement.
- For a detail of all the formulas used in calculations see Table A.1.

In addition, we make some specific assumptions depending on whether SMEs are considered as retail or as corporate.

3.2.1. *SMEs considered as retail (Table 4)*

The logit model creates 7 rating classes when considering all SMEs as retail⁹.

3.2.2. *SMEs considered as corporate (Tables 5 and 6):*

- The sample is divided into two groups: small firms (sales between €5 and 25 million) and medium-sized firms (sales between €25.01 and 50 million).¹⁰ The sample contains 84.8% small firms and 15.2% medium-sized firms.
- The logit model creates 7 rating classes for small firms, and 6 rating classes for medium-sized firms.¹¹ With this classification we obtain a weighted average PD of 5.26% for small firms and 4.49% for medium-sized firms. As expected, smaller firms are riskier.
- We select possible maturities of three years for smaller firms and five years for medium-sized firms.
- The maturity adjustment is a function only of PD.
- For size adjustment we use the sample average amount of sales for each group: €12.1 (Small-sized-firms) and €33.4 million (Medium-sized firms).

Under Basel II, for SMEs classified as retail, the bank capital requirements are 3.926%. If SMEs are considered as corporate, using as weights the participation of each size-group in the sample, the bank capital requirements result of 7.36% ($0.848 \times 7.054\% + 0.152 \times 9.063\%$). With the new banking rules agreed in 2010 (Basel III) these requirements rise up to 5.152% when the SMEs are considered as retail and up to 9.66% ($0.848 \times 9.259\% + 0.152 \times 11.895\%$) if banks classify their SME portfolio as corporate. As we expected, our results show that banks will face higher capital requirements with Basel III Accord than under the previous ones.

Table 4:
Capital requirements for SMEs considered as retail

Rating	PD	Weight	Basel II		Basel III		Cases	Default
			CR	Cum. weight	CR	Cum. weight		
A	0.107%	0.0984	0.0100	0.098%	0.0131	0.129%	933	1
BBB+	0.174%	0.1823	0.0140	0.354%	0.0184	0.464%	1,729	3
BBB	0.244%	0.1726	0.0177	0.659%	0.0232	0.865%	1,637	4
BB	0.823%	0.1409	0.0356	1.160%	0.0467	1.522%	1,336	11
B+	2.436%	0.1818	0.0514	2.094%	0.0674	2.748%	1,724	42
B	5.927%	0.0836	0.0573	2.573%	0.0753	3.378%	793	47
CCC	28.625%	0.1404	0.0963	3.926%	0.1264	5.152%	1,331	381
Average	5.157%						Total 9,483	489

Note: This table shows the capital requirements, in percentage, for a loan to an SME included in the retail category. PD is the probability of default, LGD (loss given default) is assumed as 45%; CR is the capital requirement or regulatory capital, as a percentage of the EAD, calculated according to equation (4) in Table A.1 for Basel II, and according to equation (6) for Basel III. In the third column, the weights are assigned using the percent of firms in each rating class. In the Cum. weight column, the product of the capital requirement (CR) and the weight is cumulated to obtain the total capital requirement. In the last two columns we show the distribution of total firms (Cases) and defaulted firms (Default) for each class.

Table 6:
Capital requirements for SMEs considered as corporate (Sales between €25-50m)

Rating	PD	Weight	Basel II		Basel III		Cases	Default
			CR	Cum weight	CR	Cum weight		
BBB+	0.183%	0.3800	0.04021	1.528%	0.0528	2.005%	546	1
BB	1.042%	0.0668	0.07885	2.055%	0.1035	2.697%	96	1
BB-	1.852%	0.0752	0.09198	2.746%	0.1207	3.604%	108	2
B+	2.335%	0.1788	0.09715	4.483%	0.1275	5.884%	257	6
B	7.071%	0.2067	0.13327	7.238%	0.1749	9.500%	297	21
CCC	26.316%	0.0926	0.19717	9.063%	0.2588	11.895%	133	35
Average	4.593%						Total 1,437	66

Note: This table shows the capital requirements, in percentage, for a loan to an SME in the corporate category, with average annual sales of €33.4 million. PD is the probability of default, LGD (loss given default) is assumed as 45%; the maturity of the operation is assumed to be 5 years; CR is the capital requirement or regulatory capital, as a percentage of the EAD, calculated according to equation (8) in Table A.1 for Basel II, and according to equation (9) for Basel III. In the third column, the weights are assigned using the percent of firms in each rating class. In the Cum. weight column, the product of the capital requirement (CR) and the weight is cumulated to obtain the total capital requirement. In the last two columns we show the distribution of total firms (Cases) and defaulted firms (Default) for each class.

4. Credit-risk mitigation in the new banking regulation: The case of the LGA

Banks use a number of techniques to mitigate the credit risks to which they are exposed. For example, exposures may be collateralised by first-priority claims (in whole or in part with cash or securities), guaranteed by a third party, or a bank may buy a credit derivative to offset various forms of credit risk. Additionally, banks may agree to net loans owed to them against deposits from the same counterparty. The effect of this reduction of risk is that lower requirements of capital requirements are imposed under Basel II and III Accords. Now the next question is whether all the types of guarantee offered by the borrower have equal capacity to reduce the risk for the banks (Vargas, 2001). The specific treatment given to each of the various types of credit-risk mitigation techniques, and hence, to the eligible assets or

guarantors may differ according to the approach employed by the bank (standardised, F-IRB, and A-IRB), although there are features common to all the three of them.

Related to the guarantees, a range of guarantors and protection providers are recognised, and a substitution approach is applied. Thus, only guarantees issued by entities with a lower risk weight than the counterparty will lead to reduced capital charges, since the protected portion of the counterparty exposure is assigned the risk weight of the guarantor or protection provider, whereas the uncovered portion retains the risk weight of the underlying counterparty. It is in this context that the guarantee awarded by an LGA becomes important. The new banking regulation allows the effect of this cover to be taken into account, although both the guarantee and the LGA must meet a series of requirements for a reduction in the CR to be obtained.¹²

The treatment of the guarantee provided by an LGA in the IRB approach differs depending on whether the banks utilise the values provided by the supervisors for the loss in the event of default or LGD (foundation IRB), or employ their own internal estimations (advanced IRB). Under either of the approaches, credit risk mitigation in the form of guarantees must not reflect the effect of double default. Thus, if the bank recognises the guarantee, the adjusted risk-weight must not be less than that of a comparable direct exposure to the guarantor, in this case, the LGA.

4.1. Foundation IRB

The banks that utilise the F-IRB approach for calculating their regulatory capital recognise the guarantees provided by the LGA in the following way. They derive the risk-weighting from the covered portion of the loan utilising the risk-weighting function appropriate for the LGA and the PD corresponding to the LGA or any intermediate rating between that of the SME and LGA, if the bank deems a full substitution treatment not to be warranted. In addition, the bank may replace the LGD of the underlying transaction with the LGD applicable to the guarantee, taking into account the seniority and any collateralisation of a guaranteed commitment. The risk-weighting and the LGD associated with the SME will be assigned to the part not covered by the guarantee. At the same time, any mismatch between the term of the operation and the duration of the guarantee will be taken into consideration.

4.2. Advanced IRB

Banks using the advanced approach for estimating LGDs may reflect the risk-mitigating effect of guarantees through either adjusting PD (the same treatment outlined previously for banks under the F-IRB approach) or LGD estimates. However, in contrast to the foundation approach, guarantees prescribing conditions under which the guarantor may not be obliged to perform (conditional guarantees) may be recognised under certain conditions.

4.3. Retail Exposures

The treatment proposed under new banking regulation for mitigating retail risks in the event of guarantees is very similar to that proposed for those banks that choose to make their own estimations of the LGD. Banks may reflect the risk-reducing effects of guarantees, either in support of an individual obligation or a pool of exposures, through an adjustment of either the PD or LGD estimate, if a series of minimum requirements are met and with the prior approval of the competent authorities. There are no restrictions on the types of eligible guarantors, if they meet the conditions established by the regulation, which are the same as under the advanced IRB approach.

4.4. Reinsurance systems

In Europe, rather more than half of the guarantee systems (56%) have some kind of counter-guarantee, although in most cases this does not cover 100% of the operation.¹³

However, it is clear that the backup guarantee represents a significant support to the creditworthiness of the LGA, and this fact is even recognised by the Spanish regulations. In particular, it is recognised that, when a series of conditions are met, reinsurance is an instrument that reduces the credit risk, and consequently should lead to a reduction of the own resources (of the LGA) required with respect to those commitments that benefit from general contracts of second guarantees or reinsurance. This signifies that the counter-guarantee constitutes a variable to be considered when the bank estimates the PD or LGD applicable under the IRB approach, except where the national legislation stipulates to the contrary. Thus, those SMEs endorsed by an LGA whose guarantees are indirectly counter-guaranteed to a significant percentage by any reinsurance company should benefit from the lower capital requirements by the lender bank.

5. Analysis and Results

After deriving the capital requirements with the new banking rules (see Tables 4 to 6), we measure the credit risk premium that banks should charge on loans to SMEs, guaranteed or not by an LGA. Following Martín y Trujillo (2004), and Liebig *et al.* (2007), among others, we determine the credit risk premium for commercial loans as the sum of two components: the expected loss (EL) and the opportunity cost of the regulatory capital.^{14,15} EL represents an average value of the expected losses owing to credit risk in 1 year from an economic perspective. It is estimated as the product of three variables already known: EAD, PD, and LGD. Banks view EL as a cost component of doing business, and manage them by a number of means, including through the pricing of credit exposures and provisioning. With respect to this, the amount imputable to the borrower in terms of “foreseen loss,” as a percentage of the exposure to the risk, would be equal to $PD \times LGD$. On the other hand, the bank must also consider the possibility of a “not expected loss” or unexpected loss (UL), derived from the volatility associated with the probability of default. This UL will be reflected in the assignment of own funds that constitutes the regulatory capital. Capital is needed to cover the risks of such losses, and therefore, it has a loss-absorbing function. Interest rates, including credit risk premium, charged on credit exposures, should absorb the cost of these capital requirements. The cost of the regulatory capital that the loan in question “consumes,” is obtained by multiplying this capital requirement or CR by any variable representative of the return required from it, for example, by the ROE ratio. Therefore, we calculate the credit risk premium as follows:

$$\text{Credit risk premium (as a percentage)} = PD \cdot LGD + ROE \cdot CR$$

5.1. Credit risk premiums for SMEs without LGA guarantees

Based on our previous calculations from Tables 4 to 6, we quantify the components that comprise the credit risk premium for SMEs without guarantee as shown in Table 7. According to the data from the Spanish Association of Banks, the average Return of Equity (ROE) of Spanish banks during 2000-2009 was 14.6%¹⁶ while the LGD is assumed to be 45%. We can observe that at higher rates of insolvency, the banks need a higher CR, and the higher rates of interest should be applied to loan operations with SMEs. At a similar probability of default, the SME borrowers with lower annual sales will benefit more in terms of differential of interest, although it should be remembered that, in principle, the lower the annual sales volume of the SME, the higher is its probability of bankruptcy, *ceteris paribus*. In this way, banking regulation try to alleviate the burden represented by the new capital requirements for companies of small size as much as possible, by not excessively increasing the consequent risk premium.

Table 7:
Credit risk premiums for SMEs, as a percentage of the EAD.

SME treated as Corporate								
a) Firms with average sales of € 12.1 m. (small firms)								
Rating	PD	EL	CR	Basel II ROE x CR	CRP	CR	Basel III ROE x CR	CRP
A	0.126%	0.057%	2.477%	0.362%	0.418%	3.251%	0.475%	0.531%
BBB+	0.180%	0.081%	3.003%	0.439%	0.519%	3.942%	0.576%	0.656%
BBB	0.256%	0.115%	3.613%	0.527%	0.643%	4.742%	0.692%	0.808%
BB+	1.113%	0.501%	6.734%	0.983%	1.484%	8.838%	1.290%	1.791%
BB	1.820%	0.819%	7.749%	1.131%	1.950%	10.171%	1.485%	2.304%
BB-	4.705%	2.117%	9.890%	1.444%	3.561%	12.981%	1.895%	4.012%
CCC	28.442%	12.799%	17.832%	2.603%	15.402%	23.404%	3.417%	16.216%
b) Firms with average sales of € 33.4 m. (medium firms)								
Rating	PD	EL	CR	Basel II ROE x CR	CRP	CR	Basel III ROE x CR	CRP
BBB+	0.183%	0.082%	4.021%	0.587%	0.670%	5.278%	0.771%	0.853%
BB	1.042%	0.469%	7.885%	1.151%	1.620%	10.348%	1.511%	1.980%
BB-	1.852%	0.833%	9.198%	1.343%	2.176%	12.072%	1.762%	2.596%
B+	2.335%	1.051%	9.715%	1.418%	2.469%	12.750%	1.862%	2.912%
B	7.071%	3.182%	13.327%	1.946%	5.128%	17.492%	2.554%	5.736%
CCC	26.316%	11.842%	19.717%	2.879%	14.721%	25.879%	3.778%	15.620%
SME treated as Retail								
Rating	PD	EL	CR	Basel II ROE x CR	CRP	CR	Basel III ROE x CR	CRP
A	0.107%	0.048%	0.996%	0.145%	0.194%	1.307%	0.191%	0.239%
BBB+	0.174%	0.078%	1.402%	0.205%	0.283%	1.840%	0.269%	0.347%
BBB	0.244%	0.110%	1.767%	0.258%	0.368%	2.319%	0.339%	0.449%
BB	0.823%	0.371%	3.556%	0.519%	0.890%	4.668%	0.681%	1.052%
B+	2.436%	1.096%	5.138%	0.750%	1.846%	6.744%	0.985%	2.081%
B	5.927%	2.667%	5.735%	0.837%	3.504%	7.527%	1.099%	3.766%
CCC	28.625%	12.881%	9.634%	1.407%	14.288%	12.645%	1.846%	14.727%

Note: PD is the probability of default from Tables 4 to 6; LGD (loss given default) is assumed as 45%; EL denotes the expected loss as a percentage of the exposure to the risk, which is estimated as the product of both the probability of default or PD and the loss given default or LGD; ROE is the average return on equity for Spanish banks during the period 2000-2009; CR is the capital requirement or regulatory capital, as a percentage of the EAD (data from Tables 4 to 6); ROE x CR refers to the opportunity cost of the regulatory capital; and Credit Risk Premium (CRP) is the sum of two components: the expected loss (EL) and the opportunity cost of the regulatory capital (ROE x CR).

5.2. Credit risk premiums for SMEs guaranteed by an LGA

Next, we analyse the impact of the LGA guarantee on the CR demanded of banks for loans to SMEs to determine its effect on the credit risk premium previously calculated. It has already been shown how the reduction of risk (as a consequence of the existence of the guarantee of the LGA) is translated into reduced capital requirements and, ultimately, into lower risk premiums (interest rates) chargeable to the SMEs, thus reducing the cost of credit for the SMEs. The precise quantification of the new credit risk premium will depend on the value taken by the basic variables of the risk (mainly the PD and the LGD) for the endorsing LGA. It is almost certain that the probability of default of the LGA will be lower than that of the borrower SME; hence, the amount of the EL (the first component of the credit risk premium) should be considerably reduced. If the possible existence of reinsurance is added to

this, and since both the SME and its endorsing LGA would need to become insolvent for the bank not to recover its money, the expected value of any loss would be even lower.

After quantifying credit risk premiums for SMEs guaranteed by an LGA in Table 8, we show that under Basel II the CRP is 0.221% in the best case possible (maturity assumed as 3 years and PD of the LGA equals to 0.03%).¹⁷ When the creditworthiness of the LGA worsens the risk premiums increase, reaching about 2% in the worst case considered in our study (loan maturity assumed as 5 years and PD of the LGA equals to 1%).¹⁸ Under the new banking rules proposed in Basel III those percentages will be higher: 0.285% and 2.466%, respectively.

Next, in Table 9 we present the differences of the estimated credit risk premiums for the credits to SMEs guaranteed by an LGA with a PD of 0.03%, against the CRP for loans without LGA guarantee. These differences always favour operations supported by an LGA. A sole exception exists for this result: when SMEs are treated as retail, the lowest risk class (A) has a lower CRP when the company is not guaranteed by an LGA. Note also that those divergences are greater as the SME rating decreases and under Basel III standards.

Table 8:
Credit risk premiums for SMEs guaranteed by an LGA

Maturity= 3 years							
PDLGA	EL	Basel II			Basel III		
		CR	ROE x CR	CRP	CR	ROE x CR	CRP
0.030%	0.014%	1.419%	0.207%	0.221%	1.862%	0.272%	0.285%
0.250%	0.113%	4.614%	0.674%	0.786%	6.056%	0.884%	0.997%
0.500%	0.225%	6.396%	0.934%	1.159%	8.395%	1.226%	1.451%
0.750%	0.338%	7.544%	1.101%	1.439%	9.902%	1.446%	1.783%
1.000%	0.450%	8.367%	1.222%	1.672%	10.981%	1.603%	2.053%
Maturity= 5 years							
PDLGA	EL	Basel II			Basel III		
		CR	ROE x CR	CRP	CR	ROE x CR	CRP
0.030%	0.014%	2.195%	0.320%	0.334%	2.881%	0.421%	0.434%
0.250%	0.113%	6.288%	0.918%	1.031%	8.253%	1.205%	1.317%
0.500%	0.225%	8.369%	1.222%	1.447%	10.984%	1.604%	1.829%
0.750%	0.338%	9.642%	1.408%	1.745%	12.655%	1.848%	2.185%
1.000%	0.450%	10.519%	1.536%	1.986%	13.806%	2.016%	2.466%

Note: PDLGA is the probability of default of the LGA. EL denotes the expected loss as a percentage of the exposure to the risk, which is estimated as the product of both the probability of default or PD and the loss given default or LGD (assumed as 45%); ROE is the average return on equity for Spanish banks during the period 2000-2009 (assumed as 14.6%). CR is the capital requirement or regulatory capital, as a percentage of the EAD, calculated according to equation (8) in Table A.1 (the maturity of the operation is assumed to be 3 years). Under Basel III, CR is calculated according to equation (9) in Table A.1 (the maturity of the operation is assumed to be 3 years). ROE x CR refers to the opportunity cost of the regulatory capital; and Credit Risk Premium (CRP) is the sum of two components: the expected loss (EL) and the opportunity cost of the regulatory capital (ROE x CR).

5.3. Assessment of the cost of the LGA guarantee

Having reached this point, the subsequent questions are: What is the cost of the guarantee for the SME, and is this cost compensated by the reduction of the risk premium previously calculated that, in theory, the bank should translate into a lower rate of interest for an operation guaranteed by an LGA?

Table 9: Differences of credit risk premiums for Spanish SMEs guaranteed by an LGA (with a PD of 0.03%) versus SMEs without LGA guarantees.

This table shows the differences in credit risk premium between SMEs that are guaranteed by an LGA (with a PD of 0.03%) and SMEs that are not, as a percentage of the EAD. PDSME is the probability of default extracted from Tables 4 to 6; CRPSME shows the CRP for a SME without LGA guarantee (data from Table 7). PDLGA is the probability of default of the LGA. CRPLGA shows the CRP for a SME with LGA guarantee (data from Table 8). The cases in which the LGA guarantee is not advantageous for an SME are displayed in bold for easier identification: CRP differences that are higher than 0 or that having a negative sign they are not offset by the cost of the LGA guarantee (0.68%).

SME treated as Corporate							
a) Firms with average sales of € 12.1 m. (small firms, maturity=3 years)							
Rating	PDSME	Basel II – PDLGA 0.03%			Basel III – PDLGA 0.03%		
		CRP SME (a)	CRP LGA (b)	Difference CRP (1=b-a)	CRP SME (c)	CRP LGA (d)	Difference CRP (2=d-c)
A	0.126%	0.418%	0.221%	-0.198%	0.531%	0.285%	-0.246%
BBB+	0.180%	0.519%	0.221%	-0.299%	0.656%	0.285%	-0.371%
BBB	0.256%	0.643%	0.221%	-0.422%	0.808%	0.285%	-0.522%
BB+	1.113%	1.484%	0.221%	-1.263%	1.791%	0.285%	-1.506%
BB	1.820%	1.950%	0.221%	-1.730%	2.304%	0.285%	-2.019%
BB-	4.705%	3.561%	0.221%	-3.340%	4.012%	0.285%	-3.727%
CCC	28.442%	15.402%	0.221%	-15.182%	16.216%	0.285%	-15.930%
b) Firms with average sales of € 33.4 m. (medium firms, maturity = 5 years)							
Rating	PDSME	Basel II – PDLGA 0.03%			Basel III – PDLGA 0.03%		
		CRP SME (a)	CRP LGA (b)	Difference CRP (1=b-a)	CRP SME (c)	CRP LGA (d)	Difference CRP (2=d-c)
BBB+	0.183%	0.670%	0.334%	-0.336%	0.853%	0.434%	-0.419%
BB	1.042%	1.620%	0.334%	-1.286%	1.980%	0.434%	-1.546%
BB-	1.852%	2.176%	0.334%	-1.842%	2.596%	0.434%	-2.162%
B+	2.335%	2.469%	0.334%	-2.135%	2.912%	0.434%	-2.478%
B	7.071%	5.128%	0.334%	-4.794%	5.736%	0.434%	-5.302%
CCC	26.316%	14.721%	0.334%	-14.387%	15.620%	0.434%	-15.186%
SME treated as Retail (maturity for guaranteed loans=3 years)							
Rating	PDSME	Basel II – PDLGA 0.03%			Basel III – PDLGA 0.03%		
		CRP SME (a)	CRP LGA (b)	Difference CRP (1=b-a)	CRP SME (c)	CRP LGA (d)	Difference CRP (2=d-c)
A	0.107%	0.194%	0.221%	0.027%	0.239%	0.285%	0.046%
BBB+	0.174%	0.283%	0.221%	-0.062%	0.347%	0.285%	-0.061%
BBB	0.244%	0.368%	0.221%	-0.147%	0.449%	0.285%	-0.163%
BB	0.823%	0.890%	0.221%	-0.669%	1.052%	0.285%	-0.767%
B+	2.436%	1.846%	0.221%	-1.626%	2.081%	0.285%	-1.796%
B	5.927%	3.504%	0.221%	-3.284%	3.766%	0.285%	-3.481%
CCC	28.625%	14.288%	0.221%	-14.067%	14.727%	0.285%	-14.442%

In guarantee systems of mutual type, like the Spanish one, those SMEs that are inclined to obtain a guarantee from an LGA must necessarily become partners (i.e. must participate in the ownership). However, once the credit has been amortised, the company can request the return of its participation. These recoverable contributions (subscription quota or SQ) represent an opportunity cost for the SME borrower. In addition, the SMEs that request a guarantee from an LGA must do so against a series of non-recoverable costs, specifically: i) the study commission (*SC*), charged as a percentage on the amount of guarantee requested, which is intended to reimburse the LGA for conducting a study of the viability of the project; this cost is incurred irrespective of whether the guarantee is finally conceded or not. It is paid only once, when the operation is requested; ii) the commission in the concept of guarantee (*GC*), which is usually charged as a percentage of the amount due at the beginning of each accounting period; this is payable annually by the SME during the term of the guarantee. Its objective is to cover the possible insolvency of the partner endorsed and will depend on the method of amortisation of the loan granted by the bank.

To make it feasible to compare these costs with the credit risk premiums previously calculated, we must estimate the cost of the guarantee as an effective annual amount (IRR). This is given by the following equation of *n* degree:

$$0 = A - (SQ + SC) \cdot A - GC \cdot AD_1 - \frac{GC \cdot AD_2}{(1 + IRR)} - \dots - \frac{GC \cdot AD_n}{(1 + IRR)^{n-1}} + \frac{GC \cdot A - A}{(1 + IRR)^n} \quad (4)$$

Where *A* is the amount of the guarantee, *SQ* the subscription quota to the capital of the LGA, *SC* the study commission, *GC* the guarantee commission, *AD_t* represents the amount due for the loan guaranteed at the beginning of year *t*, and *n* is the term of the loan (in years).

In the most usual case of amortisation of a loan with constant annual repayments (French system) and for average data of the Spanish market for 2009, the result obtained after applying Equation (4) is 0.68%.¹⁹

Therefore, we find that it will be advantageous for an SME to request the guarantee to an LGA with the best credit quality provided that (see Table 9) the SME credit rating is worse than BBB (small firms) or BB+ (medium-sized firms), either under Basel II or Basel III rules (corporate category). If the bank considers the SME portfolio as retail, the LGA guarantee will be profitable for an SME as long as its credit rating is lower than BB, for Basel II standards, and below BBB under Basel III proposals. On the other hand, when the credit quality of the LGA worsens its guarantee becomes less attractive, being only profitable to those SMEs of poorer credit quality if the PD of the LGA equals 1%.

6. Conclusions

The application of Basel II and Basel III Capital Accords have important consequences for banks, SME borrowers, and LGAs, which are financial intermediaries whose importance is increasing and which appear, practically, all over the countries in the European Union. For banks, the new banking regulation means working in a more stable financial environment. Once the banks have learnt how to measure, cover, and appropriately manage the risks to which their operations are exposed, they should face fewer situations of default; but if these situations do occur, they should be better placed to deal with them. For SMEs, the Capital Accords mean the payment of premiums according to the risk of their business initiatives. In the past, the alternative involved restrictions in their access to credit, arising specifically from the difficulty that calibrating that risk presented for the banks. At the same time, the SMEs need to be instructed in the management of risk, knowing that the lender will assess them in that respect. Finally, in the face of the challenge of Basel Accords, the LGAs must accept that,

like the SMEs they guarantee, they may need to submit themselves to the same processes of measurement of risk as those to which their associates are submitted, i.e., at a credit rating.

The guarantee appears to be strengthened under the new banking regulation. Generally, the loans guaranteed by another financial institution, like an LGA, will need backing by reduced amounts of regulatory capital when compared with those loans collateralised by assets (financial or not). Consequently, it is clear that when the credit to the SME is conceded with the guarantee of an LGA, this reduces the capital requirement demanded from the bank, although we find that its final effect on the credit risk premium depends on the values taken by the credit variables of the LGA (principally the PD and the LGD). It is, therefore, necessary for the banks to make a detailed and meticulous analysis of the creditworthiness of the LGA, to determine their PD. Thus, it follows that in those countries that adopt the new banking regulation, it is also necessary for the development of credit agencies to be strengthened, for rating both SMEs and their financial intermediary guarantors, the LGA. In this context, it also seems clear that the reinsurance companies have an important role to play in reinforcing the creditworthiness of the LGA; this importance has been recognised by some countries like Spain, in the legislation for implementing the new Accords. The SMEs endorsed by an LGA, whose guarantees are indirectly counter-guaranteed to a significant percentage by a reinsurance company, should be rewarded with lower capital requirements by the lender, considering that this backup guarantee should be taken into account by the bank in the calculation of the PD or LGD when the IRB approach is used.

Appendix A:

Table A.1: Formulas used in calculations in Tables 4, 5, and 6.

BII indicates the formulation under Basel II Accord, whereas BIII states for Basel III Accord. Remember that, in Basel III, a capital conservation buffer of 2.5% is established above the regulatory minimum capital requirement. In addition, national authorities may require a countercyclical buffer that varies between zero and 2.5% when excess aggregate credit growth is judged to be associated with a build-up of system-wide risk (we do not consider this additional requirement in our study).

SMEs as retail	
Capital requirement CR	$CR(BII) = \left\langle LGD \times N \left[\frac{G(PD) + \sqrt{R} \times G(0.999)}{\sqrt{1-R}} \right] - PD \times LGD \right\rangle \times 1.06 \quad (5)$ $CR(BIII) = CR(BII) \times 0.105 / 0.08 \quad (6)$
Correlation R	$R = 0,03 \cdot \left(\frac{1 - e^{-35 \cdot PD}}{1 - e^{-35}} \right) + 0,16 \cdot \left[1 - \left(\frac{1 - e^{-35 \cdot PD}}{1 - e^{-35}} \right) \right] \quad (7)$
SMEs as corporate	
Capital requirement CR	$CR(BII) = \left\langle LGD \times N \left[\frac{G(PD) + \sqrt{R} \times G(0.999)}{\sqrt{1-R}} \right] - PD \times LGD \right\rangle \left\langle \frac{1 + (M - 2.5) \times b}{1 - 1.5 \times b} \right\rangle \times 1.06 \quad (8)$ $CR(BIII) = CR(BII) \times 0.105 / 0.08 \quad (9)$
Correlation R	$R = 0,12 \cdot \left(\frac{1 - e^{-50 \cdot PD}}{1 - e^{-50}} \right) + 0,24 \cdot \left[1 - \left(\frac{1 - e^{-50 \cdot PD}}{1 - e^{-50}} \right) \right] - 0,04 \cdot \left(\frac{1 - (S - 5)}{45} \right) \quad (10)$
Maturity adjustment	$b = [0,11852 - 0,05478 \cdot \ln(PD)]^2$

Note: CR: Capital requirement, LGD: Loss given default, N (x):Standard normal cumulative distribution, R:Correlation, G (z): Inverse standard normal cumulative distribution, PD: Probability of default, M:Maturity of the operation, b:Maturity adjustment.

References

- Altman E., & Sabato, G. (2005). Effects of the New Basel Capital Accord on Bank Capital Requirements for SMEs, *Journal of Financial Services Research*, 28, 15-42.
- Altman E., & Sabato, G. (2007). Modelling Credit Risk for SMEs: Evidence from the U.S. Market, *Abacus*, 43, 332-357.
- Basel Committee on Banking Supervision (2004). *Basel II: International Convergence of Capital Measurement and Capital Standards: a Revised Framework*. Basel: Bank for International Settlements.
- Basel Committee on Banking Supervision (2010). *Basel III: A Global Regulatory Framework for More Resilient Banks and Banking Systems*. Basel: Bank for International Settlements.
- Berger, A. (2006). Potential Competitive Effects of Basel II on Banks in SME Credit Markets in the United States, *Journal of Financial Services Research*, 29, 5-36.
- Berger, A. & Udell, G. (2006). *A More complete Conceptual Framework about SME Finance*. World Bank Conference on SME: Overcoming Growth Constrains, October 14-15.
- Camino, D. & Cardone, C. (1999). The Valuation and Cost of Credit Insurance Schemes for SME's: the Role of the Loan Guarantee Associations, *International Small Business Journal*, 17, 13-31.
- Cardone-Riportella, C. & Trujillo-Ponce, A. (2007). Efectos del aval de las SGRs en la financiación de las PYME y los requerimientos de capital de Basilea II, *Revista Española de Financiación DT y Contabilidad*, 36, 753-85.
- Celentani, M., García-Posada, M. & Gomez, F. (2010). *The Spanish Business Bankruptcy Puzzle and the Crisis*. FEDEA 2010-11.
- CESGAR (2010). *Informe Sociedades de Garantía Recíproca 2009*, Madrid: Confederación Española de Sociedades de Garantía Recíproca.
- Decamps, J.P., Rochet, J.C., & Roger, B. (2004). The Three Pillars of Basel II: Optimizing the Mix. *Journal of Financial Intermediation* 13, 132-155.
- Dietsch, M., & Petey, J. (2004). Should SME exposures be treated as retail or corporate exposures? A comparative analysis of default probabilities and asset correlations in French and German SMEs, *Journal of Banking & Finance*, 28, 773-788.
- IDEA Consult (2003). *Evaluation of the Commission action to promote the Development of Mutual Guarantee Schemes and their Use by SMEs in the EU*, N° ENTR/01/059, Final Report.
- Johnston, M. (2009). Extending the Basel II approach to estimate capital requirements for equity investments, *Journal of Banking & Finance*, 33, 1177-1185.
- Kerkhof, J., & Melenberg, B. (2004). Backtesting for Risk-based Regulatory Capital, *Journal of Banking & Finance*, 28, 1845-1865.
- Liebig, T., Porath, D., Weder, B., & Wedow, M. (2007). Basel II and bank lending to emerging markets: Evidence from the German banking sector, *Journal of Banking & Finance*, 31, 401-418.
- Lindquist, K. G. (2004). Banks' buffer capital: how important is risk, *Journal of International Money and Finance*, 23, 493-513.
- Martín, J.L. & Trujillo, A. (2004). El rating y la fijación de precios en préstamos comerciales: aplicación mediante un modelo logit, *Revista Europea de Dirección y Economía de la Empresa*, 13, 155-176.
- Medema, L., Koning, R. H., & Lensink, R. (2009). A practical approach to validating a PD model, *Journal of Banking & Finance*, 33, 701-708.
- Repullo, R., & Suárez, J. (2004). Loan Pricing under Basel Capital Requirements, *Journal of Financial Intermediation*, 13, 496-521.

- Ruthenberg, D., & Landskroner, Y. (2008). Loan pricing under Basel II in an imperfectly competitive banking market, *Journal of Banking & Finance*, 32, 2725-2733.
- Saurina, J., & Trucharte, C. (2004). The Impact of Basel II on Lending to Small-and-Medium-Sized-Firms: A Regulatory Policy Assessment based on Spanish Credit Register Data, *Journal of Financial Services Research*, 26, 121–144.
- Scellato, G. & Ughetto, E. (2010). The Basel II reform and the provision of the finance for R&D activities in SMEs: An analysis of the sample of Italian companies, *International Small Business Journal*, 28 (1) 65-89.
- Schwaiger, W. S. (2002). *Basel II Quantitative Impact Study on Austrian Small and Medium-sized Enterprises*. Technical University of Vienna. Vienna.
- Vargas, F. (2001). Introducción al Pilar 1 de Basilea II, *Estabilidad Financiera*, 1, 59-92.

¹ Under the Basel Capital Accords, an SME is understood as a company where the reported sales for the consolidated group of which the firm is a part is less than €50 million.

² Loans extended to SMEs are eligible for retail treatment provided the total exposure of the banking group to a small business borrower (on a consolidated basis where applicable) is less than €1 million.

³ The SABI database is compiled by Bureau van Dijk Electronic Publishing. See <http://www.bvdinfo.com/Products/Company-Information/National/SABI.aspx> for a more detailed description of the database.

⁴ The Basel Accords leave it to the discretion of the national supervisor to allow banks to risk-weight all corporate claims at 100%, without regarding the external ratings. SMEs included in a regulatory retail portfolio may be risk-weighted at 75%, except for the past due loans.

⁵ Default is defined following the Spanish Bankruptcy Regime (Law 22/2003, modified by Royal Decree Law 3/2009). An overview of this regime can be found in Celentani *et al.* (2010).

⁶ We included interaction terms in the form of Dummy year x Explanatory Variable for each year of the sample. This methodology allows us to test if the determinants of default differ through the different years of the economic cycle.

⁷ A weighted logistic regression is used to estimate PDs. The weight assigned to each firm corresponds to N/N_i where N is the total size of the sample and N_i is the sub-sample size for defaulted and non defaulted firms. This model has a higher percentage of correctly predicted defaults than the traditional unweighted logit regression.

⁸ Source:

<http://www.standardandpoors.com/ratings/articles/en/us/?assetID=1245207201119>

⁹ Detailed estimations can be requested to the authors.

¹⁰ Under the IRB approach, for the purposes of the firm-size adjustment for SME borrowers, companies with sales of less than €5 million are treated as if they were equivalent to €5 million.

¹¹ In this sense we depart from previous works (Altman and Sabato, 2005 and 2007), which consider the same rating classes and PDs for SMEs treated as retail or corporate. Detailed estimations can be requested to the authors.

¹² The importance of the guarantee in financing appears to be strengthened under the new banking regulation. The capital requirements are generally lower than for those collateralised by some type of asset, by mortgage or otherwise.

¹³ The Spanish reinsurance company (CERSA) provides backup guarantees for the financial operations underwritten by the LGAs, to different percentages of cover according to the type of operation. The cover for operations ranges from 30% to 75%; new company operations and those of innovative character enjoy more cover. The contracts establish a maximum cost of the cover calculated in function of a Q quality rate in the management of the risk.

¹⁴ Banks can set limits to the risk that they are willing to assume, even if an adequate risk premium has been calculated.

¹⁵ A more exact determination of the credit risk premium would involve using the concept of economic capital instead of regulatory capital. Martín and Trujillo (2004) and Liebig *et al.* (2007) show that the components of the “minimum margin” are the risk-free interest rate, handling charges, the expected loss of the loan, and opportunity costs for the capital allocation associated with the loan. The opportunity costs for the capital allocation refer to regulatory capital if the regulatory capital requirements are binding. Consequently, credits which are priced below the minimum margin are not profitable and will thus not be supplied.

¹⁶ Asociación Española de Banca [Spanish Association of Banks] (2010). Available at:

<http://www.aebanca.es/internet/groups/public/documents/presentaciones/01-201004064.pdf>

¹⁷ Basel Accords establish a minimum value of PD (0.03%) under the IRB approach.

¹⁸ Since the LGA is usually counter-guaranteed by a reinsurance company (in the case of Spain, CERSA) is more likely that the PD is closer to 0.03% than 1% (see Section 4.4).

¹⁹ We assume the following data taken from CESGAR (2010): average amount of the guarantee (A), 66,000€; study commission (SC), 0.5%; guarantee commission (GC), 1.0%; contribution to the capital of the LGA (SQ), 1.0%; rate of interest (i), 6.0%; and average term of the loan (n), 8 years.