



Working paper series

WP FIECAC 13.01

Evaluating the effects of the EU directive proposal for risk-based deposit insurance premiums in Spain

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EVALUATING THE EFFECTS OF THE EU DIRECTIVE PROPOSAL FOR RISK-BASED DEPOSIT INSURANCE PREMIUMS IN SPAIN

April 2013

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Abstract

This paper analyzes the effects on the Spanish banking system of the EU proposal for a new Directive on deposit insurance systems based on risk-sensitive premiums. To do this, we examine the risk profile of Spanish banks during the 2007-2011 period according to several indicators reflecting capital adequacy, asset quality, profitability and liquidity. We conclude that most of banks would increase their contributions with the proposed system, evidencing the cyclical character of the new model. Our results also suggest that risk-based schemes could provide an incentive for sound management by reducing the premiums for those banks with better risk profiles.

JEL classification: G21; G22; G28

Keywords: Banking regulation; financial safety net; deposit insurance premiums; deposit insurance system; moral hazard; European banking system

EVALUATING THE EFFECTS OF THE EU DIRECTIVE PROPOSAL FOR RISK-BASED DEPOSIT INSURANCE PREMIUMS IN SPAIN

1. Introduction

Systemic bank crises occur when many or all of the bank's depositors attempt to withdraw their funds simultaneously. No bank, however solvent it may be, has sufficient liquidity to immediately repay a significant portion of its deposits. These deposits are generally made in the form of long-term credit, which makes it impossible for a bank to return such deposits if its clients choose to withdraw all or a significant portion of them at the same time (the so-called 'bank run'). Furthermore, in the case of a bank run, the bank might be forced to demand immediate repayment of short-term loans granted to other banks on the interbank market or to delay the repayment of credit it has received on this market, which may affect the entire financial market and lead to a crisis in the financial system (Bernet and Walter, 2009).

Policy-makers create a financial safety net to make systemic banking breakdowns less likely and to limit the disruption and fiscal costs generated when they occur.¹ Indeed, one of the main roles played by deposit insurance systems (DISs) is to maintain depositor confidence in the banking system, which lessens the chances of massive fund withdrawals that might severely affect the entire system. Additionally, the DIS acts as a consumer protection system, as it is assumed that the majority of the smaller depositors of the bank are not easily able to monitor the risk that they have taken by opening a deposit account. It was precisely this type of crisis of confidence in much of the European financial system that led the European Union (EU) to expand the level of coverage for deposits. Thus, Directive 2009/14/EC of the European Parliament and Council, dated March 11, 2009, increased this protection from €20,000 to €100,000 per depositor per bank.

The current economic and financial crisis experienced by many European countries has revealed that in times of financial stress, deposit insurance funds (DIFs) may not be sufficient to meet debts related to covered deposits at failed banks. As noted by Mayes (2009), the problem experienced with deposit insurance in Iceland was mainly that it was not expected to be used except in the event of the failure of small banks and even then the expectation was that they would be bought up by the larger banks; thus having a fund

¹ Financial safety net includes deposit insurance, bank insolvency resolution practices, regulatory forbearance policies and the central bank's function of a lender of last resort (Yilmaz and Muslumov, 2008).

representing just 1 or 2 per cent of the stock of deposits in the country was expected to be sufficient to meet all normal eventualities. In Spain, it was necessary to create a new (and public) fund to manage the recent financial system restructuring process.² Therefore, the taxpayers ultimately had to assume responsibility for the inadequate behavior of part of the banking system, which has shown that the way in which the deposit guarantee funds are financed must be improved.

EU members' deposit insurance schemes were only partially harmonized by the European Directive 94/19/EC.³ They differ markedly with respect to the provider and extent of coverage, financing, offsetting and timing of the payment of compensation, leading to confusion that could delay the response to a crisis (García and Nieto, 2007). At present, EU Member States are free to choose the funding mechanisms best suited to their own banking environments, as ex-ante, ex-post and mixed funding mechanisms currently coexist in Europe (see Table 1). Whereas ex-ante financing requires the establishment of a fund in advance from contributions made by the institutions belonging to the fund, ex-post financing systems require members to provide the funds only after the event has occurred. Hybrid or mixed financing systems are a combination of these types; the fund is first established and then supplemented by periodic contributions and extraordinary contributions in cases of contingency.

Roy (2000) concludes that the ex-ante financing system is more effective, while the ex-post system is more efficient. Bernet and Walter (2009) posit that the financial crisis has shown that a modern deposit insurance scheme should be based on ex-ante financing and expect that ongoing reforms will mandate that most ex-post schemes will become ex-ante solutions. However, Morrison and White (2001) find that deposit insurance should be funded not by banks or depositors but out of general taxation. These authors conclude that when the soundness of the financial sector is uncertain, governments should consider supporting DISs and undertaking subsidized recapitalizations.

² The Fund for Orderly Bank Restructuring (FROB) is a public entity created by Royal Decree-law (RDL) 9/2009, dated June 26, concerning bank restructuring and reinforcing the equity of credit institutions.

³ Directive 94/19/EC of the European Parliament and of the Council on Deposit-Guarantee Schemes dated May 30, 1994.

Table 1. Overview of deposit insurance schemes in EU Member States, as of December 2012

	DIS	Funding system	Risk-based premiums
Austria	Deposit Protection Company of the Austrian Commercial Banks	Ex-post	Yes
Belgium	Deposit and Financial Instrument Protection Fund	Ex-ante	No
Bulgaria	Bulgarian Deposit Insurance Fund	Ex-ante	No
Cyprus	Deposit Protection Scheme	Mixed	No
Czech Republic	Deposit Insurance Fund	Ex-ante	No
Denmark	The Guarantee Fund for Depositors and Investors	Mixed	No
Estonia	Guarantee Fund	Ex-ante	No
Finland	Deposit Guarantee Fund	Ex-ante	Yes
France	Deposit Guarantee Fund	Mixed	Yes
	The Deposit Protection Fund of the German Private Commercial Banks	Ex-ante	No
Germany	Deposit Protection Scheme of National Association of German Cooperative Banks	Mixed	Yes
Greece	Hellenic Deposit Guarantee Fund	Ex-ante	No
Hungary	National Deposit Insurance Fund of Hungary	Ex-ante	No
Ireland	Irish Deposit Protection Scheme	Ex-ante	No
Italy	Interbank Deposit Protection Fund	Ex-post	Yes
	Deposit Guarantee Fund of Cooperative Banks	Ex-post	No
Latvia	The Deposit Guarantee Fund	Ex-ante	No
Lithuania	State Company, Deposit and Investment Insurance	Ex-ante	No
Luxembourg	Luxembourg Deposit Guarantee Association	Ex-post	No
Malta	Depositor Compensation Scheme	Mixed	No
Netherlands, the	Collective Guarantee Scheme of Credit Institutions for Repayable Funds and Portfolio Investments	Ex-post	No
Poland	Bank Guarantee Fund	Mixed	No
Portugal	Deposit Guarantee Fund	Ex-ante	Yes
Romania	Deposit Guarantee Fund in the Banking System	Mixed	Yes
Slovakia	The Deposit Protection Fund	Ex-ante	No
Slovenia	Deposit Guarantee Scheme	Ex-post	Yes
Spain	Credit Institution Deposit Guarantee Fund	Ex-ante	No
Sweden	Swedish Deposit Guarantee Board	Ex-ante	Yes
United Kingdom, the	Financial Services Compensation Scheme	Mixed	No

Source: European Commission (2008) and own elaboration from European Forum of Deposit Insurers (EFDI) data.

The European Commission decidedly favors a priori financing in its proposal for a new European Directive on DIS from July 2010.⁴ The economic costs and the costs of deteriorating confidence in the single financial market might ultimately be much higher than the investment needed for the functioning of a pan-EU safety net based on ex-ante contribution systems.⁵ The Commission furthermore proposes that contributions to the

⁴ To ensure sufficient funding, DISs must have 1.5% of eligible deposits on hand after a transition period of 10 years (this amount is referred to as the ‘target level’). If these financial means turn out to be insufficient in the event of a bank failure, banks must pay extraordinary (‘ex-post’) contributions of up to 0.5% of eligible deposits into the DIS. Consequently, ex-ante funds will account for 75% of DISs’ financing and ex-post contributions for 25%.

⁵ One of the most contentious provisions of the EU legislative proposal on DIS is the establishment of a mandatory mutual borrowing facility, whereby if a national deposit guarantee scheme is depleted, it can borrow from another national fund. It could be the first step towards a pan-EU deposit guarantee scheme. However, the creation of a pan-European DIS would imply pooling national sovereignty to an extent not acceptable to the Member States and therefore this idea was temporarily abandoned (Quaglia, 2013).

guarantee system should be established based on the risk profile of the credit institution. The introduction of risk-based adjustments to DIS contributions might be a desirable enhancement to the existing framework and could facilitate the transferability of contributions between schemes (European Commission, 2009). In practice, by increasing the contribution for credit institutions that bear more risk and by reducing it for those with less risk, risk-based adjustments would provide an incentive for sound management. Moreover, risk-based schemes might increase the effectiveness of DISs with regard to their ability to address potential failures.

The aim of this paper is to analyze the effects on the Spanish banking system of the DIS funding model based on risk-sensitive premiums proposed by the European Commission in 2010. Thus, we examine the risk profiles of Spanish banks according to several accounting-based indicators and compare the current contributions to the DIS with those resulting from the application of the EU proposal. Because the period considered in the study (2007-2011) coincides with a bearish phase of the economic cycle, we can interpret this assessment as stress testing.

Following this introduction, we analyze different approaches for funding risk-based DISs in the next section and demonstrate the calculation scheme of premiums envisioned by the Community Directive from July 2010. Section 3 describes the sample and several methodological features considered in our analysis. Section 4 reports on the evolution of the risk profile of Spanish banks. Section 5 examines the application of the new DIS financing system of variable premiums proposed by the EU in the Spanish banking system. Section 6 summarizes and concludes.

2. Risk-based premiums for funding DISs

2.1. Approaches for calculating risk-based contributions to DIS

Ex-ante funding structures are supported by a DIF that is financed by premiums paid by covered institutions. The literature suggests the following three possible approaches for calculating contributions on the basis of the risk profiles of the DIS members (i.e., banks): i) using a single-indicator model; ii) using a multiple-indicator model; and iii) using a default-risk model. The first two models rely on the use of accounting-based indicators to assess the risk profile of DIS members. Those indicators cover key areas commonly used to evaluate the financial soundness of a bank, such as capital adequacy, asset quality,

profitability and liquidity. Whereas the first approach (the single-indicator model) uses a sole accounting-based indicator from these categories (e.g., the capital adequacy ratio under the Basel rules) to compute risk-based contributions, the multiple-indicator model aggregates information from different variables to obtain the adjustment coefficient. Currently, the US Federal Deposit Insurance Corporation (FDIC) uses a multiple-indicator system based on the CAMEL rating system.⁶

Credit-risk models can be used if DISs are thought of as holding portfolios of creditors represented by the banks. Therefore, using the option-pricing theory originally proposed by Black and Scholes (1973) and Merton (1973), it is possible to price the cost of deposit insurance (Merton, 1977). Merton (1977) shows that a DIS may be viewed as a put option on the value of the bank's assets with a strike price equal to the promised maturity value of its debt. Many of the empirical studies generated by Merton's model focus on the issue of over- or underpricing of deposit insurance (e.g., Marcus and Shaked, 1984; Madan and Pennacchi, 2003; Episcopos, 2004; Sironi and Zazzara, 2004; Hwang *et al.*, 2009). The most significant drawback to these models is the absence of market price information for many banks, which makes the model difficult to implement in practice.

Typically, in the EU DISs that adjust their contributions using risk-based information about their members (see Table 1) the annual contribution for each bank is defined in terms of a contribution base, usually the total amount of eligible or covered deposits, and a percentage reflecting the risk attitude of the bank members. A common principle can be seen behind the various adjustment procedures because the contributions are adjusted by decreasing or increasing them by a percentage that is obtained by classifying DIS members into rating classes that are linked to scores from a set of indicators.⁷

2.2. *The moral hazard problem*

Bank safety nets are difficult to design and administer because they have the conflicting objectives of protecting bank customers and reducing banks' incentives to engage in risky activities (Demirgüç-Kunt and Huizinga, 2004). Under the protection of DISs, depositors have little incentive to exert market discipline on banks, which may encourage banks to take excessive risks (Hwang *et al.*, 2009; Yilmaz and Muslumov,

⁶ CAMEL is an acronym for the following five components of bank safety and soundness: capital adequacy, asset quality, management quality, earning ability and liquidity.

⁷ All existing EU DISs that adjust contributions according to the riskiness of banks use accounting-based indicators.

2008). This type of moral hazard behavior is described at length in the deposit insurance literature (e.g., VanHoose, 2007).

Although the existing empirical evidence is mixed, most studies find that deposit insurance increases the risk-taking behavior of banks (Ioannidou and Penas, 2010). This evidence has motivated proposals to change the design of the DIS or to introduce complementary regulations aimed at reducing the risk-taking moral hazard while maintaining depositor protection. The most common types of proposals addressing this moral hazard involve charging banks risk-related insurance premiums and regulating their capital structure (Santos, 2006).⁸ Therefore, using financing models based on variable contributions calculated from the specific risk of each bank might mitigate the risk-taking moral hazard and other inherent problems of DISs (Lee and Kwok, 2000).⁹ This debate has resulted in a consensus that risk-based DISs are more equitable and economically supportable than those that use flat premiums (Bloecher *et al.*, 2003).

2.3. *The European Directive proposal for calculating DIS premiums*

The legislative proposal for a thorough revision of the Directive on DISs adopted by the European Commission in July 2010 favors the last of the approaches outlined above. Thus, contributions from banks to DISs must be calculated according to their risk profiles, which are based on several accounting-based indicators. Taking into account the differences between banking sectors in Member States, the Directive ensures a measure of flexibility by developing a set of core indicators (mandatory for all Member States) and another set of optional supplementary indicators (see Table 2).

The proposed regulation states that the total amount of contributions to be collected by a DIS should first be determined consistent with the target level for DIS funds (i.e., 1.5% of eligible deposits after a transition period of 10 years); following this determination, the amount should be apportioned among DIS member banks according to their risk profiles. The amount (C_i) of the risk-based contribution of a specific member of the system will depend on both its risk share within the system (RS_i) and the total contributions that the guarantee fund seeks to raise (TC), such that:

$$C_i = RS_i \cdot TC \quad (1)$$

⁸ Applying the option-pricing model in a cross-country sample, Hovakimian *et al.* (2003) find that risk shifting is attenuated by risk-sensitive premiums, coverage limits and coinsurance.

⁹ However, several studies show that this risk-controlling potential of ex-ante risk-based deposit insurance premiums may be limited (Chan *et al.*, 1992; Pennacchi, 2006).

RS_i results from the ratio of the amount of contribution of the i^{th} member (RA_i) and the total amount of contributions to the system, both risk-weighted:

$$RS_i = \frac{RA_i}{\sum_{j=1}^n RA_j} \quad (2)$$

Thus, RA_i will be determined by the product of the risk coefficient assigned to the credit institution in accordance with the provisions of the Directive (β_i) and the contribution base (CB_i) (i.e., the eligible deposits)¹⁰:

$$RA_i = \beta_i \cdot CB_i \quad (3)$$

Therefore, in this new method of calculating contributions to the DIS, the key value would be that assumed by the individual risk coefficient β_i , which is determined by a score that considers the risk of each credit institution (total composite score, or ρ_i) that varies from 75% for institutions with minimal risk to 200% for those with significant risk. Thus, banks that obtain an above-average risk assessment will be penalized with up to twice the contributions amount, and banks with below-average credit risk will benefit from a discount of up to 25%. Consequently, the proposed regulation provides incentives for sound risk management and discourages risky behavior by clearly differentiating between the contributions paid by banks with the least and most risk.

The total composite score of each member of the system, ρ_i , results from weighting the two previously mentioned groups of indicators, core and supplementary indicators, at 75% and 25%, respectively.

$$\rho_i = 3/4 \rho_i^{cor} + 1/4 \rho_i^{sup} \quad (4)$$

where the composite sub-score of a member using core indicators is determined as follows:

$$\rho_i^{cor} = 1/4 [\rho_i^{CA1} + \rho_i^{AQ1} + \rho_i^{P1} + \rho_i^{L1}] \quad (5)$$

and the composite sub-score of a member using supplementary indicators is calculated as follows:

¹⁰ The contribution base is the amount of eligible deposits, as is currently the case in most EU Member States. However, over time, covered deposits (i.e., eligible deposits not exceeding the coverage level) will become the contribution base in all Member States because they better reflect the risk to which the DIS is exposed.

$$\rho_i^{sup} = 1/n [\rho_i^{X1} + \rho_i^{X2} + \dots + \rho_i^{Xn}] \quad (6)$$

Table 2. Indicators for calculating risk-based contributions

Classification	Core indicators		Supplementary indicators	
	Indicator	Ratio	Indicator	Ratio
Capital Adequacy (CA)	<i>BIS capital ratio</i>	$CA1 = \frac{\text{Regulatory capital}}{\text{Risk weighted assets}}$	<i>Tier 1 capital ratio</i>	$CA2 = \frac{\text{Tier 1 capital}}{\text{Risk weighted assets}}$
			<i>Excess capital</i>	$CA3 = \frac{\text{Excess capital}}{\text{Risk weighted assets}}$
				$CA4 = \frac{\text{Excess capital}}{\text{Total assets}}$
Asset Quality (AQ)	<i>Non-performing loan (NPL) ratio</i>	$AQ1 = \frac{\text{NPLs}}{\text{Gross loans}}$	<i>Risk weighted assets</i>	$AQ2 = \frac{\text{Risk weighted assets}}{\text{Total assets}}$
			<i>Loan loss provision</i>	$AQ3 = \frac{\text{Loan loss provision}}{\text{Net interest revenue}}$
				$AQ4 = \frac{\text{Loan loss provision}}{\text{Operating income}}$
Profitability (P)	<i>Return on average assets (ROA)</i>	$P1 = \frac{\text{Net income}}{\text{Average total assets}}$	<i>Cost to income ratio</i>	$P2 = \frac{\text{Operating expenses}}{\text{Operating income}}$
			<i>Net margin</i>	$P3 = \frac{\text{Net margin}}{\text{Total capital}}$
Liquidity (L)	To be determined by EU Member States			

Source: European Commission (2010)

3. Data and methodological aspects

3.1. Sample

The aim of this paper is to analyze the effects on the Spanish banking system of the DIS funding model based on risk-sensitive premiums proposed by the European Commission in 2010. Our sample is originally composed of 30 commercial banks, 27 savings banks and 50 credit cooperatives within the Spanish DIS for the period 2007-2011, which represent over 90% of the volume of total assets of the banking system. To prevent the intensive restructuring process experienced by the savings bank sector in 2010 and 2011 from affecting the proper development of this study, we have considered that the entities transformed into commercial banks will be kept within the savings banks category and that the value of the indicators in that year is shared by the diverse entities that constitute the group, both in acquisitions or mergers between savings banks, as in the case

of institutional protection schemes (IPS).¹¹ The financial information used is sourced from public documents (annual accounts, memoranda and reports of prudential relevance).

3.2. Methodological aspects¹²

The core indicators (except for the liquidity indicator) we consider are those established by the European Commission, whose tracking will be obligatory for all European DISs and will include the following: BIS capital ratio (*CAI*), non-performing loan ratio (*AQI*) and return on average assets (*PI*). In the case of supplementary indicators, the Member States will be responsible for specifying those applicable in their jurisdiction, although the Directive does provide some guidance. The availability of information leads us to consider the following supplementary indicators: excess capital ratio (*CA3*), loan loss provision ratio (*AQ3*) and net margin ratio (*P3*).¹³ As for liquidity indicators, their selection is subject to the discretion of the Member State; therefore, we consider the following ratios commonly used in the financial sector: i) liquid asset ratio (*L1* = Liquid assets/ Total assets) as a core indicator and ii) loan-to-deposit (LTD) ratio (*L2* = Net Loans/Total deposits) as supplementary.

The risk levels for the core indicators (*CAI*, *QAI*, *PI*) are defined based on the value scale proposed by the European Commission in 2010. In the case of supplementary indicators (*CA3*, *AQ3*, *P3*, *L2*) and the core liquidity indicator (*L1*), we have used value distribution percentiles of each indicator (see Table 3). As established in equation (4), the risk profile of each credit institution will depend on the scores for the core (*CAI*, *QAI*, *PI*, *L1*) and supplementary (*CA3*, *AQ3*, *P3*, *L2*) indicators.

The risk coefficient, β_i , to be used in equation (3) is determined based on the composite score as established in Table 4. The entities with a score below 1.5 (risk coefficient of 75%) would be at the lower limit, whereas those with a score exceeding 4.5 would be defined as very high risk (with a risk coefficient of 200%). A composite score

¹¹ In 2010, more than 2 years after the start of the international economic and financial crisis, the Spanish banking sector, and most especially the savings banks, faced a major challenge. Capacity in the sector had been attuned to a period of excessive growth marked by extremely high business volumes; thus, the fall in the demand for financial services highlighted excess capacity that needed to be absorbed. Because of this, the banking sector underwent an important restructuring process involving mainly the savings banks. Forty of them participated in some types of integration processes, reducing their number dramatically (Trujillo-Ponce, 2013).

¹² This section relies on Gómez-Fernández-Aguado *et al.* (2013).

¹³ Given the impossibility of obtaining information on surplus capital for some entities from the sample and taking into account that the financial leverage ratio (Total capital/Total assets) is considered a reliable indicator of financial soundness (IMF, 2006), we decided to proxy the excess capital ratio by the financial leverage ratio.

between 1.5 and 2.5 is defined as low risk ($\beta_i = 100\%$), between 2.5 and 3.5 is defined as medium risk ($\beta_i = 125\%$) and between 3.5 and 4.5 is high risk ($\beta_i = 150\%$).

Table 3. Scores to be assigned to a bank based on core and supplementary indicator values

Classification	Ratio (x)	$\rho^x = 1$ (Very low risk)	$\rho^x = 2$ (Low risk)	$\rho^x = 3$ (Medium risk)	$\rho^x = 4$ (High risk)	$\rho^x = 5$ (Very high risk)
Capital Adequacy	CA1	$x > 12.3\%$	$12.3\% \geq x > 9.6\%$	$9.6\% \geq x > 8.2\%$	$8.2 \geq x > 7\%$	$x \leq 7\%$
	CA3	Percentile 60 a 100	Percentile 40 a 60	Percentile 25 a 40	Percentile 10 a 25	Percentile 0 a 10
Asset Quality	AQ1	$x \leq 1\%$	$1\% < x \leq 2.1\%$	$2.1\% < x \leq 3.7\%$	$3.7\% < x \leq 6\%$	$x > 6\%$
	AQ3	Percentile 0 a 20	Percentile 20 a 40	Percentile 40 a 60	Percentile 60 a 80	Percentile 80 a 100
Profitability	P1	$x > 1.2\%$	$1.2\% \geq x > 0.9\%$	$0.9\% \geq x > 0.7\%$	$0.7\% \geq x > 0.5\%$	$x \leq 0.5\%$
	P3	Percentile 0 a 20	Percentile 20 a 40	Percentile 40 a 60	Percentile 60 a 80	Percentile 80 a 100
Liquidity	L1	Percentile 80 a 100	Percentile 60 a 80	Percentile 40 a 60	Percentile 20 a 40	Percentile 0 a 20
	L2	Percentile 0 a 20	Percentile 20 a 40	Percentile 40 a 60	Percentile 60 a 80	Percentile 80 a 100

Source: European Commission (2009, 2010)

Table 4. Risk weights (coefficients) to be assigned to a bank based on its composite score

Composite score (ρ_i)	$1 < \rho_i \leq 1.5$	$1.5 < \rho_i \leq 2.5$	$2.5 < \rho_i \leq 3.5$	$3.5 < \rho_i \leq 4.5$	$4.5 < \rho_i \leq 5$
Risk coefficient (β_i)	75%	100%	125%	150%	200%
Risk level	Very low risk	Low risk	Medium risk	High risk	Very high risk

Source: European Commission (2010)

To facilitate comparisons between the two financing systems, we have matched TC with the total contributions the banks would be required to make each year under the current Spanish rules (0.2% of eligible deposits).¹⁴ We then calculate subsequent individual contributions according to each bank's RS_i value.

¹⁴ RDL 2606/1996, dated December 20, regarding the legal regime for deposit guarantee funds in credit institutions and RDL 16/2011, dated October 14, amended by RDL 19/2011 of 2 December, setting up the Spanish credit institution deposit guarantee fund.

4. Analysis of core and supplementary indicators for Spanish banks

The scoring system or rating that was proposed by the Commission to develop the risk-adjusted model of contributions differentiates five risk levels (very low, low, medium, high and very high) according to the score obtained for each indicator (see Table 3). As a result, the features of the system allow us to assess the degree of strength or weakness of the credit institutions in each of the areas of risk assessment (capital adequacy, asset quality, profitability and liquidity) and thus determine their global profiles through the interaction of their different risk factors (composite score).

To analyze possible differences between the risk profiles of the three types of banks that are considered (commercial banks, savings banks and credit cooperatives) we conduct a one-way analysis of variance (ANOVA) for mean values of each of the core and supplementary indicators. When the ratios that define the risk levels do not verify the assumption of homoscedasticity (most of the time) we use the Welch's test, which is more robust if this supposition fails.¹⁵

4.1. Capital adequacy indicators

The essence of prudential regulation in the financial sector is to guarantee the solvency of the entities that make up the system by establishing minimal capital requirements that all of them should meet. Currently, these requirements are calculated as a share of risk-weighted assets, in accordance with the recommendations of the Basel Committee on Banking Supervision. According to these recommendations, the regulatory capital under the new capital agreements (Basel II and III) is supposed to cover losses that may occur because of credit, market and operational risk. An increase in the capital ratio (CA1) implies an improvement in bank solvency and, therefore, in financial stability. Likewise, an increase in the CA3 indicator is associated with lower bank risk.

Spanish credit institutions maintained solvency levels well above the regulatory minima during the 2007-11 period, which places them at optimal levels for most of the analyzed period (see Table 5).

¹⁵ To contrast the homogeneity of variances, the Levene's test is used.

Table 5. Risk profile of Spanish banks based on capital adequacy indicators

	2007			2008			2009			2010			2011		
	Commercial banks	Savings banks	Credit cooperatives	Commercial banks	Savings banks	Credit cooperatives	Commercial banks	Savings banks	Credit cooperatives	Commercial banks	Savings banks	Credit cooperatives	Commercial banks	Savings banks	Credit cooperatives
CAI (Total capital ratio)															
Very high risk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
High risk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Medium risk	17%	-	-	13%	-	-	7%	-	-	3%	4%	-	4%	10%	2%
Low risk	57%	67%	46%	50%	56%	38%	43%	37%	24%	47%	58%	20%	43%	19%	15%
Very low risk	27%	33%	54%	37%	44%	62%	50%	63%	76%	50%	38%	80%	54%	71%	83%
Mean value	13.030	12.232	14.887	13.531	12.284	15.721	15.178	13.303	16.262	15.467	12.562	16.592	16.605	13.054	16.575
SD	(6.332)	(2.197)	(4.580)	(6.410)	(2.357)	(4.836)	(8.923)	(2.372)	(4.993)	(8.967)	(2.445)	(5.312)	(11.823)	(1.957)	(6.007)
Levene's Test		5.682***			6.776***			5.434***			5.296***			5.072***	
F-test/Welch's Test		5.824***			8.685***			6.298***			10.637***			7.236***	
No. observations	30	27	50	30	27	50	30	27	50	30	26	50	28	21	47
CA3 (Excess capital ratio)															
Very high risk	20%	19%	-	20%	19%	-	20%	19%	-	3%	38%	-	14%	24%	2%
High risk	27%	30%	-	23%	33%	-	20%	37%	-	27%	27%	2%	21%	29%	4%
Medium risk	10%	22%	14%	13%	19%	14%	13%	15%	16%	23%	15%	10%	14%	19%	15%
Low risk	17%	11%	26%	10%	19%	26%	10%	19%	26%	13%	8%	30%	21%	14%	21%
Very low risk	27%	19%	60%	33%	11%	60%	37%	11%	58%	33%	12%	58%	29%	14%	57%
Mean value	6.727	5.530	8.515	7.556	5.671	8.990	8.412	5.941	9.157	9.291	4.505	9.340	8.597	6.484	9.198
SD	(4.204)	(1.831)	(1.968)	(5.104)	(1.874)	(2.103)	(5.850)	(1.842)	(2.176)	(6.614)	(2.721)	(2.096)	(5.710)	(2.048)	(3.175)
Levene's Test		7.168***			7.161***			13.202***			16.276***			3.670**	
F-test/Welch's Test		22.143***			24.896***			23.338***			31.311***			9.030***	
No. observations	30	27	50	30	27	50	30	27	50	30	26	50	28	21	47

Note: ***Significant at the 1% level; **Significant at the 5% level; *Significant at the 10% level

The major recapitalization effort undertaken by the Spanish banking system in recent years is reflected in the gradual increase in the number of banks classified as very low risk, especially among credit cooperatives. The analysis of variance shows highly significant differences between the mean values of the two indicators considered for commercial banks, savings banks and credit cooperatives for the entire analyzed period.

4.2. Asset quality indicators

The credit portfolio is composed of all of the pending debts receivable in favor of the bank, which therefore constitutes the majority of a bank's assets and its core business; thus, it is important to assess risk indicators that assess management's ability to manage and control credit risk. The NPL ratio (AQ1) is the primary indicator used to measure the quality of the credit portfolio. An increasing ratio may signal deterioration in the quality of the credit portfolio, although this value is typically a backward-looking indicator because NPLs are identified when problems emerge. We use the loan loss provision ratio (AQ3) as a supplementary indicator to determine to what degree the banks efficiently manage the risk related to the credit portfolio (expected losses in the portfolio) to profitability (income from interest). The higher the portfolio risk (measured by loan provisions), the greater the compensation that should be required (higher interest). In light of the foregoing, efficient management of a loan portfolio will be reflected in low values of the AQ3 indicator.

During the analyzed period, we find rapid and intense growth in defaults, driven primarily by the strong credit expansion of the previous years and the adverse economic situation that Spain experienced in more recent years. In 2007, the majority of banks were assessed as low and minimum risk, according to the standards established by the proposed European Directive (see Table 6); beginning in 2007, this scenario underwent a substantial modification. From this time forward, we can observe that there is greater concentration in the high- and extreme-risk categories, which is more apparent in the case of savings banks; at the other extreme, the credit cooperatives record the lowest values in the default ratio. The evolution of the AQ3 indicator reveals how increased risk recorded in the credit portfolio has not been accompanied by an increase in interest margins. We also observe more efficient management in credit cooperatives compared to the other entities. The differences observed between the asset quality indicators for Spanish credit institutions are statistically significant for most of the analyzed period.

Table 6. Risk profile of Spanish banks based on asset quality indicators

	2007			2008			2009			2010			2011		
	Commercial banks	Savings banks	Credit cooperatives	Commercial banks	Savings banks	Credit cooperatives	Commercial banks	Savings banks	Credit cooperatives	Commercial banks	Savings banks	Credit cooperatives	Commercial banks	Savings banks	Credit cooperatives
<i>AQ1 (NPL ratio)</i>															
Very high risk	-	-	-	3%	-	2%	13%	19%	-	17%	46%	6%	25%	62%	34%
High risk	-	-	-	17%	26%	8%	40%	48%	28%	50%	42%	34%	39%	33%	30%
Medium risk	10%	4%	8%	37%	52%	32%	30%	33%	48%	20%	12%	34%	21%	5%	17%
Low risk	23%	26%	32%	33%	22%	38%	7%	-	20%	3%	-	22%	4%	-	19%
Very low risk	67%	70%	60%	10%	-	20%	10%	-	4%	10%	-	4%	11%	-	-
Mean value	1.050	0.967	0.984	2.540	2.957	2.047	3.785	4.579	2.953	4.739	5.952	3.536	4.841	7.918	5.159
SD	(0.868)	(0.560)	(0.639)	(1.734)	(0.919)	(1.270)	(2.140)	(1.295)	(1.254)	(3.026)	(2.441)	(1.738)	(3.016)	(4.550)	(3.375)
Levene's Test		2.591*			1.463			2.853*			1.875			0.596	
F-test/Welch's Test		0.095			4.196**			14.206***			9.415***			5.406***	
No. observations	30	27	50	30	27	50	30	27	50	30	26	50	28	21	47
<i>AQ3 (Loan loss provision ratio)</i>															
Very high risk	27%	37%	8%	40%	37%	-	40%	30%	4%	47%	15%	6%	32%	33%	6%
High risk	13%	22%	22%	10%	30%	20%	10%	41%	14%	13%	31%	18%	18%	24%	19%
Medium risk	13%	19%	24%	17%	15%	24%	3%	11%	34%	10%	15%	28%	11%	10%	30%
Low risk	17%	19%	22%	13%	11%	28%	20%	11%	24%	7%	27%	24%	11%	24%	23%
Very low risk	30%	4%	24%	20%	7%	28%	27%	7%	24%	23%	12%	24%	29%	10%	21%
Mean value	18.077	20.909	13.249	35.434	35.204	17.851	40.249	43.332	26.094	59.812	28.880	19.412	54.050	71.940	22.578
SD	(15.347)	(9.673)	(6.372)	(32.918)	(20.093)	(8.568)	(29.325)	(18.976)	(12.083)	(88.318)	(23.196)	(13.653)	(95.825)	(104.605)	(15.593)
Levene's Test		7.478***			13.469***			19.998***			9.955***			7.885***	
F-test/Welch's Test		7.421***			12.399***			10.951***			4.645**			3.678**	
No. observations	30	27	50	30	27	50	30	27	50	30	26	50	28	21	47

Note: *** Significant at the 1% level; **Significant at the 5% level; *Significant at the 10% level

4.3. Profitability indicators

The aim of the profitability indicators is to measure the banks' ability to generate income, as this influences the potential to increase their capital holdings, cover future losses, increase their assets and/or provide dividends. The return on average assets (ROA) is commonly accepted as an effective indicator of financial stability because a banking system with a high level of credit risk and low profitability levels is very vulnerable to macroeconomic shocks, which may lead to financial instability (Aspachs *et al.*, 2007). The considered supplementary indicator (net margin ratio) measures the efficiency of the credit institutions in managing their capital, and a higher value of this ratio is thus associated with lower risk. However, the P3 ratio must be interpreted in combination with capital adequacy indicators, as a high net margin ratio could indicate high profitability and/or low capitalization, whereas a low ratio could indicate low profitability and/or high capitalization (IMF, 2006).

At the beginning of the period under consideration, Spanish banks show an adequate position in terms of ROA according to the risk categories defined in the proposal of the European Directive (see Table 7). However, the deterioration of the Spanish economy as a consequence of the deep economic crisis experienced by the country also affects the profitability indicators. This change causes the majority of the credit institutions to be classified as very high risk in 2011, based on the P1 indicator. Conversely, increased capital as a consequence of the Spanish banking restructuring process and decreased net income leads to a general decline in net margin ratio, which is more evident among savings banks. The analysis of variance shows the differences observed between the profitability ratios by type of bank are statistically significant for most of the analyzed period.

Table 7. Risk profile of Spanish banks based on profitability indicators

	2007			2008			2009			2010			2011		
	Commercial banks	Savings banks	Credit cooperatives	Commercial banks	Savings banks	Credit cooperatives	Commercial banks	Savings banks	Credit cooperatives	Commercial banks	Savings banks	Credit cooperatives	Commercial banks	Savings banks	Credit cooperatives
<i>PI (ROAA)</i>															
Very high risk	30%	15%	6%	57%	44%	20%	60%	74%	48%	70%	96%	74%	86%	90%	81%
High risk	23%	30%	14%	17%	26%	26%	23%	15%	20%	13%	-	12%	4%	10%	11%
Medium risk	17%	26%	40%	13%	19%	26%	7%	4%	20%	10%	4%	8%	4%	-	6%
Low risk	20%	26%	34%	10%	11%	24%	7%	7%	12%	3%	-	6%	4%	-	2%
Very low risk	10%	4%	6%	3%	-	4%	3%	-	-	3%	-	-	4%	-	-
Mean value	0.765	0.767	0.868	0.387	0.580	0.752	0.223	0.405	0.579	0.039	0.2460	0.419	0.013	-0.222	0.332
SD	(0.581)	(0.259)	(0.238)	(0.600)	(0.212)	(0.264)	(0.874)	(0.220)	(0.233)	(1.281)	(0.171)	(0.226)	(1.005)	(1.023)	(0.226)
Levene's Test		5.838***			8.220***			7.701***			9.762***			8.509***	
F-test/Welch's Test		1.614			7.951***			6.832***			7.588***			4.202**	
No. observations	30	27	50	30	27	50	30	27	50	30	26	50	28	21	47
<i>P3 (Net margin ratio)</i>															
Very high risk	27%	-	28%	40%	4%	18%	23%	22%	18%	33%	10%	18%	25%	38%	11%
High risk	10%	11%	30%	13%	26%	20%	17%	19%	22%	17%	17%	22%	7%	24%	26%
Medium risk	17%	30%	16%	3%	15%	32%	17%	15%	24%	10%	10%	30%	14%	19%	23%
Low risk	13%	33%	16%	13%	30%	18%	13%	7%	30%	20%	20%	18%	29%	5%	21%
Very low risk	33%	26%	10%	30%	26%	12%	30%	37%	6%	20%	30%	12%	25%	14%	19%
Mean value	12.642	14.738	10.586	6.251	10.638	8.528	4.497	6.963	6.072	1.357	6.016	4.401	-0.408	-4.183	3.950
SD	(7.234)	(7.018)	(3.515)	(11.551)	(3.464)	(2.908)	(9.463)	(3.158)	(2.035)	(12.721)	(3.668)	(2.039)	(15.074)	(16.895)	(3.689)
Levene's Test		4.920***			10.956***			11.564***			7.581***			9.964***	
F-test/Welch's Test		4.712**			4.460**			1.352			3.095*			3.358**	
No. observations	30	27	50	30	27	50	30	27	50	30	26	50	28	21	47

Note: *** Significant at the 1% level; **Significant at the 5% level; *Significant at the 10% level

4.4. Liquidity indicators

The liquidity indicators assess the ability of the bank to meet its payment obligations upon their maturity. The core ratio (L1) provides an indication of the liquidity available to meet expected and unexpected demands for cash. Higher values of this ratio are associated with lower bank risk. The LTD ratio (L2) measures the extent to which banks use the deposits of their customers (retail and non-financial business customers) to fund the loans granted to those same customers. If the ratio exceeds 100%, it means that the banks are using other, more volatile sources of funds, such as interbank financing or issuance of debt securities, to fund the loans to their customers and therefore run a greater liquidity risk in relation to their refinancing.

The liquidity indicators used offer mixed results (see Table 8). While commercial banks and credit cooperatives maintain the best positions with respect to liquid asset ratios, the credit cooperatives report lower bank risk with respect to the supplementary liquidity indicator (L2). The ANOVA reports that the differences between the mean values of the liquidity indicators considered for Spanish credit institutions are statistically significant for most of the analyzed period.

4.5. Overall risk profile

As stated previously, the overall risk behavior of each bank is described by its composite score, determined by combining the information given by the eight accounting-based indicators as specified in equation (4). The rating system proposed by the EU Directive according to the composite score was shown in Table 4. In the case of the Spanish banking system, the distributions of the banks are defined by four risk levels (minimal, low, medium and high) because there are no credit institutions with extreme risk for the analyzed period (see Table 9). At the beginning of the period, the majority of the banks enjoy a low-medium risk profile, but progressive deterioration can be observed and a significant shift to the high-risk category at the expense of the low-risk profile. The evolution of the global risk profile shows how the strength maintained by the sector in terms of solvency is mitigated by the unfavorable evolution of the profitability and credit portfolio quality indicators.

Table 8. Risk profile of Spanish banks based on liquidity indicators

	2007			2008			2009			2010			2011		
	Commercial banks	Savings banks	Credit cooperatives	Commercial banks	Savings banks	Credit cooperatives	Commercial banks	Savings banks	Credit cooperatives	Commercial banks	Savings banks	Credit cooperatives	Commercial banks	Savings banks	Credit cooperatives
L1 (liquid asset ratio)															
Very high risk	27%	4%	26%	27%	4%	26%	23%	-	30%	20%	4%	30%	25%	5%	26%
High risk	10%	-	36%	7%	7%	34%	10%	19%	26%	17%	15%	24%	14%	24%	21%
Medium risk	17%	26%	18%	17%	15%	24%	10%	11%	30%	13%	31%	18%	21%	24%	17%
Low risk	30%	26%	10%	30%	33%	6%	30%	37%	4%	23%	19%	18%	11%	43%	15%
Very low risk	17%	44%	10%	20%	41%	10%	27%	33%	10%	27%	31%	10%	29%	5%	21%
Mean value	8.046	11.826	5.279	8.439	11.647	4.924	13.029	10.987	6.300	13.191	10.754	7.350	16.630	10.864	10.602
SD	(8.555)	(5.590)	(5.213)	(7.733)	(5.371)	(5.038)	(17.375)	(4.880)	(6.582)	(16.197)	(5.346)	(6.407)	(20.166)	(3.997)	(8.705)
Levene's Test		1.733			2.753*			5.448***			5.498***			9.323***	
F-test/Welch's Test		9.220***			14.552***			7.121***			4.012**			1.138	
No. observations	30	27	50	30	27	50	30	27	50	30	26	50	28	21	47
L2 (LTD ratio)															
Very high risk	57%	15%	2%	57%	11%	4%	60%	11%	2%	53%	15%	2%	46%	19%	4%
High risk	10%	33%	18%	10%	30%	20%	3%	33%	22%	17%	23%	20%	14%	29%	19%
Medium risk	3%	37%	20%	3%	33%	22%	-	33%	24%	-	31%	26%	7%	38%	19%
Low risk	7%	11%	32%	3%	22%	28%	7%	19%	28%	3%	31%	24%	7%	10%	32%
Very low risk	23%	4%	28%	27%	4%	26%	30%	4%	24%	27%	-	28%	25%	5%	26%
Mean value	138.324	105.083	90.223	146.077	103.182	94.101	140.748	99.646	90.194	137.848	101.164	90.439	140.648	104.824	87.724
SD	(119.019)	(10.649)	(16.475)	(155.644)	(10.975)	(15.871)	(139.637)	(10.756)	(15.797)	(120.536)	(14.828)	(16.891)	(134.083)	(16.528)	(24.955)
Levene's Test		11.104***			9.413***			11.427***			11.433***			10.241***	
F-test/Welch's Test		12.974***			5.646***			6.323***			5.888***			6.985***	
No. observations	30	27	50	30	27	50	30	27	50	30	26	50	28	21	47

Note: *** Significant at the 1% level; **Significant at the 5% level; *Significant at the 10% level

Table 9. Overall risk profile of Spanish banks

	2007			2008			2009			2010			2011		
	Commercial banks	Savings banks	Credit cooperatives	Commercial banks	Savings banks	Credit cooperatives	Commercial banks	Savings banks	Credit cooperatives	Commercial banks	Savings banks	Credit cooperatives	Commercial banks	Savings banks	Credit cooperatives
Very high risk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
High risk	10%	-	-	20%	4%	2%	23%	15%	6%	30%	27%	8%	36%	43%	15%
Medium risk	37%	26%	26%	60%	67%	58%	53%	63%	64%	50%	69%	70%	39%	57%	68%
Low risk	53%	67%	74%	17%	30%	40%	23%	22%	26%	17%	4%	20%	25%	-	17%
Very low risk	-	7%	-	3%	-	-	-	-	4%	3%	-	2%	-	-	-
Core Risk (ρ_i^{cor})	2.442	2.046	2.330	2.875	2.657	2.665	3.000	2.9815	2.975	3.092	3.337	3.090	3.188	3.417	3.213
SD	(0.590)	(0.460)	(0.393)	(0.636)	(0.555)	(0.550)	(0.637)	(0.499)	(0.513)	(0.645)	(0.374)	(0.529)	(0.665)	(0.338)	(0.590)
Levene's Test		3.539**			0.442			0.754			3.650**			3.076*	
F-test/Welch's Test		4.953**			1.470			0.020			3.198**			1.165	
Supplementary Risk (ρ_i^{sup})	3.100	2.515	3.148	3.275	3.203	2.380	3.100	3.296	2.435	3.242	2.435	3.144	3.036	2.426	3.488
SD	(0.932)	(0.680)	(0.596)	(0.859)	(0.788)	(0.621)	(0.906)	(0.731)	(0.648)	(0.950)	(0.621)	(0.687)	(1.027)	(0.748)	(0.755)
Levene's Test		5.743***			1.678			2.673*			3.168**			4.151**	
F-test/Welch's Test		10.479***			18.264***			15.474***			14.129***			15.184***	
Overall Risk (ρ_i)	2.607	2.378	2.324	2.976	2.796	2.594	3.026	3.061	2.841	3.130	3.290	2.927	3.151	3.436	3.017
SD	(0.590)	(0.469)	(0.392)	(0.614)	(0.587)	(0.531)	(0.647)	(0.493)	(0.521)	(0.672)	(0.364)	(0.518)	(0.720)	(0.345)	(0.578)
Levene's Test		4.340**			0.055			1.447			4.551**			6.475***	
F-test/Welch's Test		2.253			4.311**			1.803			6.260***			6.992***	
Scheffe's Test/Dunnnett's T3 Test		-			(CB, CC)**			-			(SB, CC)***			(SB, CC)***	
No. observations	30	27	50	30	27	50	30	27	50	30	26	50	28	21	47

Notes: *** Significant at the 1% level; **Significant at the 5% level; *Significant at the 10% level. CB = Commercial banks; SB = Savings banks; CC = Credit cooperatives.

This worsening performance is more evident among commercial banks and savings banks than credit cooperatives. Whereas in 2007, only 10% of commercial banks have a high-risk profile, four years later this percentage amounts to 36%. In the case of savings banks and credit cooperatives (among which there is no high-risk entity in 2007), the proportions of entities with this profile in 2010 approach 43% and 15%, respectively. These differences in the risk profile between the three types of bank are mainly due to supplementary indicators; we only find significant differences between the mean values of the core composite scores for commercial banks, savings banks and credit cooperatives in 2007, 2010 and 2011.

Finally, if a significant F value results from ANOVA for the composite score, we use the Scheffe's test for multiple comparisons to identify differences among bank types. Similarly, we use the Dunnett T3 test for samples with unequal variances.

5. Effects of the change in the DIS funding model on Spanish banks

After analyzing the risk profile of the Spanish credit institutions in the previous section, we examine how applying the financing system proposed by the EU might affect the banking system. To achieve this goal, we calculate the relative change (as a percentage) between risk-weighted contributions and current contributions from the following equation:

$$\text{Change in contributions(\%)} = [(C_i - C_0)/C_0] \times 100 \quad (7)$$

where C_i or risk-weighted contributions is determined as outlined in section 2.3. C_0 refers to the contribution the banks would have to make under the current regulation (0.2% of eligible deposits each year).

Applying the risk-weighted financing model would imply substantial variations in the contributions to the DIF in comparison to those currently made by a large number of credit institutions. Table 10 shows the proportion of institutions that decrease or increase their contributions with the application of the model and the variation range —maximum percentage increase and maximum percentage decrease with respect to current contributions. The percentage of banks that would increase their contributions to the DIF is connected to the trend that shows the risk profile of these institutions in the analyzed period. In 2010 and 2011, as a consequence of a greater concentration of risk in a smaller

number of banks, this impact would be lessened.¹⁶ Consistent with the higher risk profile observed in commercial banks and savings banks, the percentage of these entities that would increase their contributions is significantly higher compared to credit cooperatives, which is evidence of the greater equity of the proposed system.

Table 10. Results from comparing the risk-based premium approach with the current Spanish fixed-rate system

	Commercial banks	Savings banks	Credit cooperatives
2007			
Banks increasing their contribution	46.7%	25.9%	26.0%
Banks reducing their contribution	53.3%	74.1%	74.0%
Highest percentage increase		40.97%	
Highest percentage reduction		29.52%	
2008			
Banks increasing their contribution	80.0%	70.4%	60.0%
Banks reducing their contribution	20.0%	29.6%	40.0%
Highest percentage increase		22.93%	
Highest percentage reduction		38.53%	
2009			
Banks increasing their contribution	76.7%	77.8%	70.0%
Banks reducing their contribution	23.3%	22.2%	30.0%
Highest percentage increase		21.98%	
Highest percentage reduction		39.01%	
2010			
Banks increasing their contribution	30.0%	26.9%	8.0%
Banks reducing their contribution	70.0%	73.1%	92.0%
Highest percentage increase		13.11%	
Highest percentage reduction		43.44%	
2011			
Banks increasing their contribution	35.7%	42.9%	14.9%
Banks reducing their contribution	64.3%	57.1%	85.1%
Highest percentage increase		12.22%	
Highest percentage reduction		25.18%	

Moreover, the number of banks increasing their contributions to the DIF as their risk profile deteriorates reveals the cyclical nature of the model; the system requires banks to

¹⁶ To analyze the degree of concentration of the sector, we use the Herfindahl Index.

pay higher premia in economic downturns, thereby aggravating the effects of economic recessions (Blinder and Wescott, 2001).¹⁷

6. Summary and conclusions

A comprehensive review of the EU deposit insurance scheme is currently ongoing with debate among regulators, supervisors, bankers and consumer groups. The economic crisis experienced by the majority of western financial systems has revealed important limitations of current DISs, which led European authorities to search for measures to improve DIS financing and simultaneously improve market discipline of credit institutions. In this context, in 2010, the European Commission proposed a DIS financing model based on variable contributions of members, in accordance with their risk profiles. This initiative puts forward another regulatory incentive for the prudential management of risk associated with the activities of banks; moreover, the initiative favors financial stability.

This paper contributes to this debate by providing an empirical analysis of how the DIS financing model proposed by the European Commission in 2010 would affect the Spanish banking sector. We examine the risk profiles of commercial banks, savings banks and credit cooperatives and compare the contributions to the DIF under the current flat-rate regime with those that would occur with the application of the new risk-sensitive system. We observe that the majority of credit institutions would experience an increase in their contributions to the DIF compared to the system currently in force; considering that the period considered for the study (2007-2011) coincides with a downward phase of the economic cycle, this observation is evidence of the cyclical character of the proposed financing model.

Moreover, we find that credit cooperatives exhibit better performance than the other credit institutions in terms of risk during the analyzed period. While commercial banks demonstrate a riskier profile in the first years of the study; in 2009 and 2010 the savings banks record the worst results according to indicators proposed by the Directive. Therefore, when applying the proposed regulations to the Spanish financial system, the cost of deposit insurance for commercial banks and savings banks might rise compared to current premiums, whereas credit cooperatives' contributions would decrease. Thus, the increased risk sensitivity of the scheme proposed by the EU would benefit a retail and low-

¹⁷Jarrow *et al.* (2005) and Pennacchi (2005) propose methods to mitigate the effects of the cyclical movements in deposit insurance premiums.

risk banking model, such as that of the credit cooperatives, which currently may be penalized under the regime of fixed-rate premiums. By incorporating risk measures in the financing of the DIS, policy-makers would favor market discipline, benefit better-managed credit institutions and would ultimately contribute to increased stability of the banking system.

Finally, the fact that the European Directive proposal does not consider the impact of factors determining systemic risk, such as correlations between bank investments (Acharya and Yorulmazer, 2008), the size of some institutions (O'Hara and Shaw, 1990) or banking interconnectedness (Allen and Gale, 2000; de Lisa *et al.*, 2011), may lead to those credit institutions with higher systemic risk being subsidized by the rest, which would distort the equity of the system. In practice, quantifying systemic risk can be a major challenge, but recent developments in this area (see Acharya *et al.*, 2010; Staum, 2012) should be considered in reviewing the financing schemes of the DIS.

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