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A Methodology for Building a Risk Based Premium System

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Introduction

The international financial crisis of 2007 reopened the debate about how implicit or explicit government guarantees constitute a source of moral hazard. The main idea behind this debate is that these guarantees could lead banks to take excessive risk. Deposit insurances are guarantees offered by governments and are not exempt from this behavior. Indeed, the existence of deposit insurance reduces the incentives for depositors to monitor the institutions where they deposit their money, and can stimulate institutions to take additional risk.

Differential premium schemes (DPS) seek to solve this paradox by appropriately pricing the insurance offered. DPS aim to determine the "fair" price of risk, so that entities with a higher probability of using the insurance, or to be subject to any resolution mechanism, tend to have higher premiums than those with a lower probability (lower premiums).

A well-defined DPS generates incentives for institutions to improve their risk profile. In the same way, DPS eliminate the cross-subsidy between entities with a low risk profile and entities with a high risk profile.

One of the most difficult challenges deposit insurers (DI) face when defining a DPS is quantifying the risk of insured institutions. This process begins by evaluating the different risk dimensions that could affect the performance of an institution in the near future, and continues with the quantification of these dimensions, commonly done using financial ratios. Once financial indicators have been selected, the weight for each of them needs to be selected in order to obtain an aggregate score.

From the aggregate risk rating score, DI need to define the premium associated to each bank risk profile. At this point, they must decide between a discrete and continuous scale premium system. For each of these alternatives, they need to also define the premium differentiation mechanisms; in the case of a continuous alternative, DI must define the slope(s) of function(s), and for discrete systems, they need to set the number of categories and the spread between them. Schemes with more categories present less differentiation.

These decisions should be framed within the characteristics of the financial system where the scheme is implemented, and should be reviewed periodically, since the structures of financial systems are dynamic and face permanent regulatory, supervisory and market changes.

This paper presents a statistical approach to define a DPS, reducing the level of subjectivity in the decision-making process. This approach emerges from a review of the literature and is exemplified using variables from Colombia's financial system. An important part of the methodology is the definition of the steps required for the entire process.

Besides this introduction, the document is divided in four sections. The second presents a literature review about risk-adjusted premiums. The third section describes the methodology proposed to differentiate the risk profile of insured entities and to associate this risk profile to the premium charged. The fourth section applies the proposed methodology to the Colombian case. The fifth section concludes.

1. Literature review.

The literature about the valuation of deposit insurance premium can be categorized in three approaches: the first focuses on the actuarial valuation of the premium; the second uses structural models and the third uses reduced-form models.

In the actuarial valuation method, the deposit insurance premium is defined as the rate that equals the present value of the expected cash flows of the DI and the premiums paid by the insured entity (inflows). Although this approach is consistent with the calculation of premiums in the insurance industry, it should be noted that the risks that DI faces are distinct. In periods of economic crisis, systemic risk increases and the correlations of the probabilities of default among insured institutions tend to rise, increasing the cost of the deposit insurance. This increase in

correlation is highlighted in Viral V. Acharya, João A. C. Santos, and Tanju Yorulmazer (2010). Therefore, the deposit insurer requires compensation that exceeds the actuarial calculation.

Regarding the structural models, which are based in the analogy between the value of the deposit insurance premium and the value of the debt premium that a company pays in the financial markets, specialized literature in the valuation of risky debt has been developed.

Most of the models developed under this approach are based on the Merton model (1977) which replicates the payment of the deposit insurer in terms of a European put option on the insured bank assets. This model assumes that financial markets are complete and perfect, and that the deposit insurer contract (option) can be replicated using a portfolio of marketable financial assets. In the absence of arbitrage opportunities, the contract price can be calculated according to the option valuation model of Black and Scholes. According to Laeven (2008), Merton's model (1977) is attractive because it is a theoretical approach that directly links the value of the insurance contract and the value of the asset, and is based on information from the stock market rather than on financial statements.

The classic Merton model (1977) has been refined to be applied to different particular cases; for example, Merton (1978) models the deposit insurance premium as a put option with infinite maturity, eliminating the time limitation of Merton (1977). Pennacchi (1987) compares the flat rate premium scheme and the differential premium systems, and identifies structural improvements associated to adjusted premiums schemes. This author highlights that DI provide adequate incentives to institutions to improve their risk profile when using DPS.

These methodologies, despite being robust from a theoretical point of view, are difficult to implement in practice. In countries where capital markets are not liquid and well developed, there is less information regarding the stock and the debt market value of the insured institutions. This characteristic inhibits its implementation, although some research papers have focused on finding solutions to the lack of market information. Cooperstein, Pennacchi and Redburn (1992) try to correct the limitation of market information through a structural model, which includes financial ratios calculated from balance sheet and income statement information, linking the book value of the insured institution with the hypothetical market value of assets.

Finally, the approach based on reduced-form models considers that the value of the premium must be proportional to the spread of the debt of each entity over the risk-free asset. These models assume that the intensity of failure follows a process that depends on exogenous parameters, such as credit ratings, macroeconomic conditions, among others (Jarrow and Turnbull (1995)). One of the most representative models for the valuation of deposit insurance premium was developed by Duffie, Jarrow, Purnanandam, Yang (2003). Like the structural models, reduced-form models may have limitations in terms of implementation, because of the lack of market information for some insured institutions.

2. Methodology of risk profile differentiation and risk premium definition.

As presented in the previous section, the three methodologies that have been developed in the literature present some theoretical advantages and some implementation difficulties, depending on the characteristics of the financial system being analyzed.

For Colombian data, the structural model developed by Cooperstein, Pennacchi and Redburn (1995) has several advantages; the main one is the use of balance sheet information to assess the deposit insurance premium. Other approaches described in the previous section have limitations due to the difficulty in quantifying future deposit insurance payments, and to the lack of market value information of equity and debt for all member institutions.

The methodology presented in this paper takes some elements of Cooperstein, Pennacchi and Redburn (1995), in the sense that we define the value of the deposit insurance premium based on

information from the financial statements of member institutions.

The proposed methodology is divided into two parts: the first is the procedure to identify the risk profile of insured institutions, and the second defines the level of deposit insurance premium depending on the risk profile of each institution.

2.1. Methodology of risk differentiation.

To identify the risk profile of member institutions, the following steps are proposed:

I. Differentiate risky from non-risky entities.
II. Determine the risk dimensions to assess.
III. Select the indicators that best characterize the risk dimensions.
IV. Define ranges for the selected indicators and associate them to a score that reflects risk levels.
V. Calculate the weight of each indicator to get the overall score.

The following sections describe each of these steps in detail.

i. Differentiate risky from non-risky entities.

For countries that have had recurrent failures of insured institutions, the identification of risky entities is a simple task, since this characterization corresponds to entities that failed in the past, and it is an observable variable. However, most DI do not have a database with recurrent bankruptcy events, restricting the development of statistical and econometric exercises. In these cases, one can work with a sample of risky and non-risky entities (which are not necessarily bankruptcy events), which are differentiated based on financial criteria. The main objective is to have a *dummy variable* that identifies risky entities; this dummy will be used as the dependent variable in the econometric models.

ii. Determine the risk dimensions to assess.

The document *General Guidance for Developing Differential Premium Systems* (IADI (2011)) mentions that the most common dimensions for identifying the risk profile of member entities are the appropriate level of capital, leverage, credit risk, liquidity risk, market risk and qualitative rating, among others.

The review of international experience is very useful in selecting these dimensions; however, they must be closely related to the characteristics of the banking sector and the development of the financial system in each economy.

iii. Select the indicators that best characterize the dimensions of risk assessment.

Once the risk dimensions are defined, the financial indicators that best characterize each of the dimensions defined must be selected.

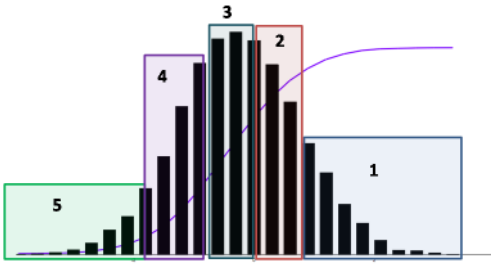
This process starts with the selection of a set of financial ratios that can be used to characterize each dimension. Then, this set is filtered to select a subsample of indicators that are uncorrelated among them and better predict the fragility of the risky entities. This procedure is performed using a correlation analysis and estimating econometric models (*probit*, *logit*, duration or OLS) where the dependent variable is the dummy selected to differentiate risky entities and the independent variables are potential financial ratios. The independent variables should be included iteratively and the significance and sign of the coefficient should be evaluated each time in order to discard variables that do not contribute to fit the models.

iv. Defining the ranges of the selected indicators and associate them to a score that reflects the risk level.

Once the financial indicators with the greatest predictive power of risky entities have been selected, it is necessary to define the limits of each of the variables and associate these limits to a rating that reflects the risk level. To find these ranges, percentiles or a methodology based on standard deviations can be used.

In the first method, the empirical distribution of each indicator is divided into different percentiles and to each part of the distribution a score is assigned (Figure 1).

Figure 1: Setting Limits with Percentiles



In the second approach, the time series of each variable is standardized by subtracting the mean and dividing by its standard deviation[1]. Finally, a rating is assigned to each range (Table 1).

Table 1: Setting Limits with deviations with respect to the media

Standardize deviation value	Score
(… , -0.75]	1
(-0.75, -0.25]	2
(-0.25, 0.25]	3
(0.25, 0.75]	4
(0.75, …)	5

To select between the above two methods, two *probit* models can be estimated:

$$y_t = \beta_0 + \beta_i \mathbb{X}_{t-12} + e$$
$$y_t = \alpha_0 + \alpha_i \mathbb{Y}_{t-12} + \varepsilon$$

Where y_t corresponds to the dummy of risky and non-risky entities, $\mathbb{X}_{t-12}$ is the vector of scores of the variables calculated with the methodology of deviations and $\mathbb{Y}_{t-12}$ is the vector of scores of the variables calculated using the percentiles methodology; the model that minimizes the prediction errors is selected.

v. Calculate the weights of each indicator score to get the overall score.

Once the financial indicators have been selected and their limits defined, the weights assigned to each of them to get the total score need to be determined. For this task, a regression is estimated where the dependent variable is the dummy of risky and non-risky entities, and the independent variables are the scores associated with financial indicators. The coefficients obtained in the regression should be normalized in the range [0,1] and assigned a weight equal to the normalized value of the coefficient in the regression[2].

Finally, the overall rating of the insured institutions corresponds to the weighted average score of each indicator.

2.2. Methodology for defining the premium associated with the rating.

The second phase aims to associate the level of risk of the member institution, which is reflected in its overall score, with the level of the premium it must pay. According to IADI (2011), to generate incentives to make structural improvements in the risk profile, it is necessary to group entities into categories and establish a large enough spread between them.

To create categories one must distinguish entities depending on the likelihood of falling into a risky state in a certain period. An entity with a low score presents a higher probability of remaining or falling into the fragility state than an entity with a high rating score.

One alternative to categorize entities is building a transition matrix, based on the ratings obtained in the first stage. For each member institution a time series consisting of score ratings is calculated and based on this database a one-year transition matrix is built. Then, a fragile score

[1] Independent variables, that do not have a positive relationship with the dependent variable, are multiplied by -1, so that all variables affect the risk variable in the same direction.

[2] In the calculation of risk-adjusted premiums, the Federal Deposit Insurance Corporation (FDIC) applies this methodology of standardization in the multipliers method.

threshold is defined and the probability of falling below this threshold from different scores is calculated. At this point, there is a set of fragility probabilities for all different score levels, and scores can be divided into categories based on the similarity of probabilities among them.

The main disadvantage of setting a discrete scheme is that entities do not have incentives to present marginal improvements in their risk profile within each category, and the incentives are focused in big improvements associated to movements among categories. Therefore, it is useful to define incentive schemes within categories.

3. Application of the methodology.

In this section, the methodology described in the previous section is applied to the Colombian case.

3.1. Risk differentiation

i. Differentiate risky from non-risky entities.

Given that the latest financial crisis in the Colombian economy was at the end of the nineties, and the transformations experienced by the Colombian financial system since then, risky entities were not selected based on observed bankruptcy events, but on financial criteria.

To differentiate the level of risk of member institutions a dummy variable was constructed using the core capital ratio (tier 1 to assets) and the return on equity ratio (ROE). This dummy variable takes the value of 1 when the ROE is less than 0% or the level of core capital ratio is less than 7%, and 0 otherwise. These two financial indicator were selected because during observed crisis periods the most risky institutions showed impairments in these two indicators. In addition, it was noted that entities with a negative ROE value or a core capital below7% were more likely to be subject to resolution mechanisms or enter into a liquidation process.

During the nineties' crisis, this dummy variable marked over 60% of the observations as risky entities, and reflects the systemic crisis scenario that Colombia faced at that time; by contrast, in 2013 risky entities have remained below 20% of the observations and correspond to entities with idiosyncratic risk characteristics.

ii. Determine the risk dimensions to assess.

The risk dimensions listed in Table 2 are the most relevant to characterize the risk profile of member institutions of the Colombian deposit insurance scheme. These dimensions were defined based on the dynamics of member institutions throughout the economic and financial cycle and on those used by other DI in the world, especially the US, Canada, France, and Kazakhstan, among others.

Table 2: Risk Dimensions Identified

DIMENSIONS TO EVALUATE	
CAPITAL	TIER 1 REGULATORY CAPITAL
	TOTAL REGULATORY CAPITAL
	LEVERAGE
ASSETS	LOANS GROWTH
	QUALITY AND COVERAGE OF LOANS
	MARKET RISK LEVEL
EFFICIENCY	SOURCE OF REVENUE
	SUPERVISOR QUALIFICATION
EARNINGS	EARNINGS LEVEL
	VOLATILITY OF NET INCOME
LIQUIDITY	LIQUIDITY GAP
DI EXPOSURE	INSURED DEPOSITS AMOUNT

iii. Select the indicators that best characterize the risk dimensions assessed

The process of selecting indicators begins with the classification of every possible variable in one of the dimensions previously defined. Over 100 financial indicators were preselected. Annex 1 shows a sample of the indicators used.

The selection process was done following two steps.

First, we calculated the correlation matrix between all variables and those with a high correlation were identified. By way of example,

Annex 2 shows the correlation matrix of a set of indicators used, the high correlation between *Value at Risk Market / Equity* and Exposure to the *Repo market / Equity* is highlighted.

In order to choose only one indicator between those with high correlation[3], the following *probit* model was estimated:

$$y_t = \beta_0 + \beta_i x_{i,t-12} + e$$

$$y_t = \beta_0 + \beta_i \mathbb{X}_{t-12} + e$$

y_t corresponds to the dummy that identifies risky entities and $\mathbb{X}_{t-12}$ is the vector of independent low-correlated variables, lagged one year. The significance and sign of the coefficients was assessed and those indicators that contributed to the predictive robustness (minimized the error type 1 and type 2) and whose coefficients were aligned with what was expected were retained in the estimation equation.

In Table 3 the identified risk dimensions and financial indicators that met the econometric filters are presented.

The aim of the two steps described above is to avoid including in the model highly correlated variables associated with the same dimension of risk, and to avoid problems of multicollinearity.

y_t corresponds to the dummy that identifies risky entities and $x_{i,t-12}$ are the highly correlated independent variables, lagged one year. The x_i variables were included iteratively and the ratio that minimized the statistical type 1 and type 2 errors was selected, ending up with a set of low-correlated indicators.

In the second step, the selected variables were jointly included in a *probit* model:

iv. Define ranges of the selected indicators and associate them to a score that reflects the risk level.

To define the range associated with each risk score for indicators selected in the previous section, the standard deviations methodology was used, given that it presented the lowest forecast error.

We assigned scores between 1 and 5 to each variable based on the mentioned methodology, where 5 is preferred over 1 because it is the score obtained by members institutions with the lowest risk profile. For those indicators with low statistical dispersion, the score assigned is 1 or 5 (dichotomy variable). This is the case of variables such as operating revenues as a proportion of operating expenses and supervisory fines and penalties.

Table 3: Risk dimensions and financial indicators

DIMENSIONS TO EVALUATE		Tier 1	Regulatory Capital	Equity / Assets	Loans Annual Growth	Unprovisioned non performing loans	VaR / Equity	Operating Inc / Operating Exp	Supervisory fines / Equity	ROE	Stand Dev of net income	LRI*	Ins Dep / Total Dep
CAPITAL	TIER 1 REGULATORY CAPITAL	X											
	TOTAL REGULATORY CAPITAL		X										
	LEVERAGE			X									
ASSETS	LOANS GROWTH				X								
	QUALITY AND COVERAGE OF LOANS					X							
	MARKET RISK LEVEL						X						
EFFICIENCY	SOURCE OF REVENUE							X					
	SUPERVISOR QUALIFICATION								X				
EARNINGS	EARNINGS LEVEL									X			
	VOLATILITY OF NET INCOME										X		
LIQUIDITY	LIQUIDITY GAP											X	
DI EXPOSURE	INSURED DEPOSITS AMOUNT												X

LRI*: Liquidity Risk Indicator is reported by entities to the Fianancial Superintendency of Colombia on Form 458

[3] For example, we selected only one of variable that explains the quality of the loan portfolio such as non-performing loans to total loans and unproductive loans over total loans.

Table 4: Financial ratios weights

DIMENSIONS TO EVALUATE		FINANCIAL RATIO	COEFFICIENT	WEIGHT*
CAPITAL	TIER 1 REGULATORY CAPITAL	TIER 1 LEVERAGE RATIO	-0.0119	6.3%
	TOTAL REGULATORY CAPITAL	TOTAL REGULATORY CAPITAL	-0.0119	6.3%
	LEVERAGE	EQUITY / ASSETS	-0.0238	12.5%
ASSETS	LOANS GROWTH	LOANS ANNUAL GROWTH	-0.0152	8.0%
	QUALITY AND COVERAGE OF LOANS	UNPROVISIONED NON PERFORMING LOANS	-0.0114	6.0%
	MARKET RISK LEVEL	VaR / EQUITY	-0.0114	6.0%
EFFICIENCY	SOURCE OF REVENUE	OPERATING INC / OPERATING EXP	-0.0186	9.8%
	SUPERVISOR QUALIFICATION	SUPERVISORY FINES / EQUITY	-0.0100	5.3%
EARNINGS	EARNINGS LEVEL	ROE	-0.0285	15.0%
	VOLATILITY OF NET INCOME	STAND DEV OF NET INCOME	-0.0190	10.0%
LIQUIDITY	LIQUIDITY GAP	LRI	-0.0190	10.0%
DI EXPOSURE	INSURED DEPOSITS AMOUNT	INSURED DEPOSITS / TOTAL DEPOSITS	0.0001	5.0%

* Some weights are rounded and adjusted by expert judgment

v. *Calculate the weights of each indicator score to get the overall score*.

The weight of each variable in the total score was obtained through an OLS econometric model, where y is the dummy of risky entities and X is the vector of variables chosen, lagged one year. For this regression, the score of the independent variable (1-5) were used instead of their value; this is done because it is the score that will be weighted rating rather than the value of each indicator. The results are presented in Table 4.

3.2. Definition of premiums

To define the level of premium that banks should pay, four risk categories were established based on a relative risk analysis.

In order to quantify the relative risk among categories, a transition matrix was calculated using the historical data of scores since 1997. From this matrix, the probability to reach a fragility state was found. The fragility state of an entity is defined as score lower than 3. Annex 3 shows a summary of the transition matrix used.

Given the distribution of the probability of fragility, four categories were defined. The first category is comprised of member institutions with a 99% of probability of getting a score below 3 in the following year and according to the results those would be institutions that have a score rating lower than 1.5.

The next category consists of member institutions with a probability between 50% and 99% of getting a score rating below 3 in the following year –institutions with a score rating between 1.5 and 3.0 based on the data we used.

The third category has member institutions with a probability between 1% and 50% of getting a score rating below 3 in the following year, and according to the results those institutions have a score between 3.1 and 4.5.

Finally, member institutions with a probability of 1% of reaching the state of fragility in the following year correspond to institutions with a score higher than 4.5.

Two potential incentive schemes were identified to improve the risk profile of member institutions. The first is using spreads between categories according to the relative risk among them; these could be calculated using the average fragility probability in each category.

The second is establishing a differential premiums system inside each category through a linear function. The slope of these lines can be defined based on the relative risk relation of the fragility probability between the institutions with the lowest and highest score within each category.

4. Conclusions

Like any insurance scheme, deposit insurance increases moral hazard. In this sense, it is necessary to have mechanisms to mitigate it and the most common policy tool for this is using well-designed risk-adjusted premiums.

This paper presents a methodology to design a differential premium scheme based on structural models. In general, these models suggest that the probability of failure of an insured institution depends on information from its balance sheet.

The methodology proposed in this document uses econometric models, transition matrices and follows a statistical procedure that aims to reduce the subjective decisions when a differential premium system is designed and implemented. Presenting its application to Colombian data helps illustrate its usefulness as well as the way to use expertise and innovation to overcome difficulties presented by data or the lack of it.

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Annex 1.

Dimension	Financial ratio
Capital	Core capital / Equity
	Tier 1 leverage ratio
	Equity / assets
	Total regulatory capital - 9%
	Tier 1 leverage ratio - 4.5%
Assest (Loans)	Non performing loans / total loans
	Unproductive loans / total loans
	Unprovisioned unproductive loans
	Unprovisioned non performing loans
	Consumer loans / assets
	Mortgage loans / assets
	Concentration
	Annual growth of total loans / annual growth of core capital
	Annual growth of nonperforming loans
	Annual growth of loans / asset growth
Assests (Investments)	Public debt / assets
	Total interest rate risk
	VaR / equity
	Value at risk by modules
	Passive and active positions in the monetary market / equity
Efficiency	Non-interest expenses / operating profit
	Operating income / operating expenses
	Operating margin / interest income
	(Administrative and labor expenditure + depreciation) / operating margin
	Administrative and labor expenses / equity
	Spending on operational risk / equity
	Annual growth in spending on operational risk
	Net expense in fines and lawsuits / equity
	Accounts payable and accrued of fines and lawsuits / equity
	Accounts payable and accrued of supervisory fines and lawsuits / equity

Annex 1.

Dimension	Financial ratio
Earnings	Profit / Equity
	Profit / Assets
	Semideviation or standard deviation of the average adjusted ROA
	Profit - one two semidesviaciones
	Profit /12 months average of risk-weighted assets
	Interest income / total income
	Semideviation growth of interest income
	Growing interest income - one or two semidesviaciones
	Information Ratio: annual return / return semideviation or standard deviation
Liquidity	Liquid assets / liquid liabilities
	Liquidity risk indicator
	Liability costs (ex post)
	Semideviation growth of deposits
	Deposit growth - one and two demideviations
	Deposits / liabilities
	Annual growth of deposits / annual growth of asset
	Annual growth of deposits
	(Average of loan rates of the sector - standard deviation) - loan rate of the entity
Deposit Insurance Exposure	Assets / total assets of the credit institutions
	Loans / total loans of the credit institutions
	Liabilities / total liabilities of the credit institutions
	Equity / total equity of the credit institutions
	Insured deposits / total insured deposits of the credit institutions
	Passive and active positions in the money market / total passive and active positions in the money market of the credit institutions
	Number of accounts / total nomber of accounts of the credit institutions
	Debt securities / total debt securities of the credit institutions
	Investments / total investments of the credit institutions
Complexity	Share concentration
	Cluster Analysis: parent and subsidiaries
	Share price behavior
	Living Will

Annex 2.

FINANCIAL RATIO	*REF*	Ind 1	Ind 2	Ind 3	Ind 4	Ind 5	Ind 6	Ind 7	Ind 8	Ind 9	Ind 10	Ind 11	Ind 12	Ind 13	Ind 14	Ind 15
TOTAL REGULATORY CAPITAL	**Ind 1**	100.0%														
TIER 1 LEVERAGE RATIO	**Ind 2**	0.0%	100.0%													
EQUITY / ASSETS	**Ind 3**	0.0%	0.0%	100.0%												
LOANS ANNUAL GROWTH	**Ind 4**	-0.1%	-0.2%	-0.1%	100.0%											
UNPROVISIONED NON PERFORMING LOANS	**Ind 5**	-0.5%	-0.5%	-14.7%	-0.1%	100.0%										
VaR / EQUITY	**Ind 6**	0.0%	0.0%	3.8%	4.6%	-0.4%	100.0%									
POSITIONS IN THE MONETARY MARKET / EQUITY	**Ind 7**	-1.0%	0.0%	0.0%	-1.5%	-0.4%	91.2%	100.0%								
SUPERVISORY FINES / EQUITY	**Ind 8**	0.7%	-0.3%	-0.7%	-0.3%	-1.6%	-0.7%	0.3%	100.0%							
NET EXPENSE IN FINES / EQUITY	**Ind 9**	1.4%	-0.1%	-0.6%	-0.3%	10.6%	-0.5%	0.2%	62.3%	100.0%						
OPERATING INC / OPERATING EXP	**Ind 10**	-0.9%	0.6%	-3.1%	0.7%	-10.8%	7.5%	0.4%	-0.9%	0.2%	100.0%					
INFORMATION RATIO (PROFITS)	**Ind 11**	-1.1%	0.2%	-2.2%	-1.0%	-22.4%	-0.7%	-0.3%	0.9%	-0.6%	30.9%	100.0%				
ROE	**Ind 12**	-0.9%	0.0%	-3.5%	-0.7%	-19.6%	0.8%	0.1%	2.0%	1.0%	12.2%	15.9%	100.0%			
ADMINISTRATIVE AND LABOR EXPENSES / EQUITY	**Ind 13**	1.3%	-0.8%	1.7%	2.8%	10.4%	-2.2%	-0.7%	8.5%	2.0%	-12.5%	-12.4%	-66.3%	100.0%		
LIQUIDITY RISK RATIO	**Ind 14**	0.0%	21.2%	0.0%	-0.2%	-0.4%	0.0%	0.0%	-0.2%	-0.1%	0.8%	0.1%	0.0%	-0.7%	100.0%	
INSURED DEPOSITS / TOTAL INSURED DEPOSITS	**Ind 15**	0.2%	-8.1%	-0.8%	-4.3%	8.3%	-0.7%	-0.2%	14.1%	5.6%	2.9%	25.1%	3.6%	9.0%	0.0%	100.0%

Annex 3.

	1.0 - 1.5	1.6 - 2.0	2.1 - 2.5	2.6 - 3.0	3.1 - 3.5	3.6 - 4.0	4.1 - 4.5	4.6 - 5.0
1.0	7.7%	23.1%	53.8%	15.4%	0.0%	0.0%	0.0%	0.0%
1.5	7.0%	29.8%	36.8%	21.1%	5.3%	0.0%	0.0%	0.0%
2.0	6.8%	27.7%	30.4%	23.0%	9.4%	2.6%	0.0%	0.0%
2.5	3.7%	12.4%	23.6%	33.0%	18.7%	7.5%	1.1%	0.0%
3.0	0.8%	2.2%	17.4%	19.6%	39.0%	17.7%	3.3%	0.0%
3.5	0.4%	1.0%	5.9%	10.3%	34.8%	43.2%	4.3%	0.1%
4.0	0.2%	1.0%	2.7%	6.3%	15.9%	56.0%	17.4%	0.6%
4.5	0.0%	0.0%	0.0%	8.2%	14.3%	42.9%	34.7%	0.0%
5.0	0.0%	0.0%	0.0%	0.0%	0.0%	12.5%	50.0%	37.5%

The *(i, j)* matrix position corresponds to the probability that the rating will be within the range *j* (1.0 - 1.5; 1.6 - 2.0; 2.1 - 2.5; 2.6 - 3.0; 3.1 - 3.5; 3.6 - 4.0; 4.1 - 4.5 and 4.6 - 5.0) in t + 12 months since score *i* is obtained in month t. The matrix presented in this Annex shows only a sample of the completed matrix, rows *i* = (1.0; 1.5; 2.0; 2.5; 3.0; 3.5; 4.0; 4.5 and 5) was included; the full matrix uses the entire possible initial states (i = 1.1; 1.2; etc). For example, the position (1,1) of the matrix corresponds to the probability of moving to a rating between 1.0 and 1.5 at t + 12 months since a score of 1.0 was obtained in month t. Therefore, an entity with a rating of 1.0 has a probability of 7.7% of passing to a rating between 1.0 and 1.5 a year later.