

# **Analysis of procyclical effects on capital requirements derived from a rating system**

by Corcóstegui, González-Mosquera, Marcelo,  
and Trucharte (Banco de España)

Discussion by

Mark Levonian, Federal Reserve Bank of San Francisco

20 March 2003

# Objectives of paper

- Determine whether required bank capital is likely to be cyclical under IRB, using data from Spain.
- Consider a possible modified approach to internal ratings to possibly mitigate cyclical effects.

# Basic methodology

- Construct a realistic portfolio of bank obligors.
- Create a rating system similar to one that might be used internally by a bank under IRB.
- Create a time series of obligor ratings and required IRB capital.
- Examine the time series behavior of capital over an economic cycle.

# Outline of discussion

- Is the rating system constructed in the paper credible?
- How large are the cyclical effects?
- What should be done about it?
- What further work would be valuable?

# Rating system

- Credit scoring model constructed for large sample of Spanish corporate obligors.
- Logistic regression using financial and non-financial variables.

TABLE 5

## MULTIVARIATE MODEL (a)

<u>Variable</u>	<u>Coefficient</u>	<u>Variable</u>	<u>Coefficient</u>
Constant	-4.268 (0.220)	Equity / Assets	-0.533 (0.029)
GDP growth rate	-0.051 (0.015)	Cash / Assets	-0.107 (0.012)
Sectoral dummies	(b)	Sales / CPI	-0.009 (0.003)
Guarantee	0.815 (0.050)	Short-term liabilities / Total liabilities	-2.375 (0.097)
Net income / Assets	-0.013 (0.002)		

(a) Logistic regression of the *Default* variable on one-period lagged variables. Number of observations: 73,321. Period: 1992-2000. In parenthesis, the standard error of the coefficient. All variables are significant at the 99% confidence level.

(b) 15 dummy variable coefficients have been estimated (one of them has been left out for collinearity reasons) for each economic sector, being 11 of them statistically significant. No estimates are provided for confidentiality reasons.

# Is this a credible model?

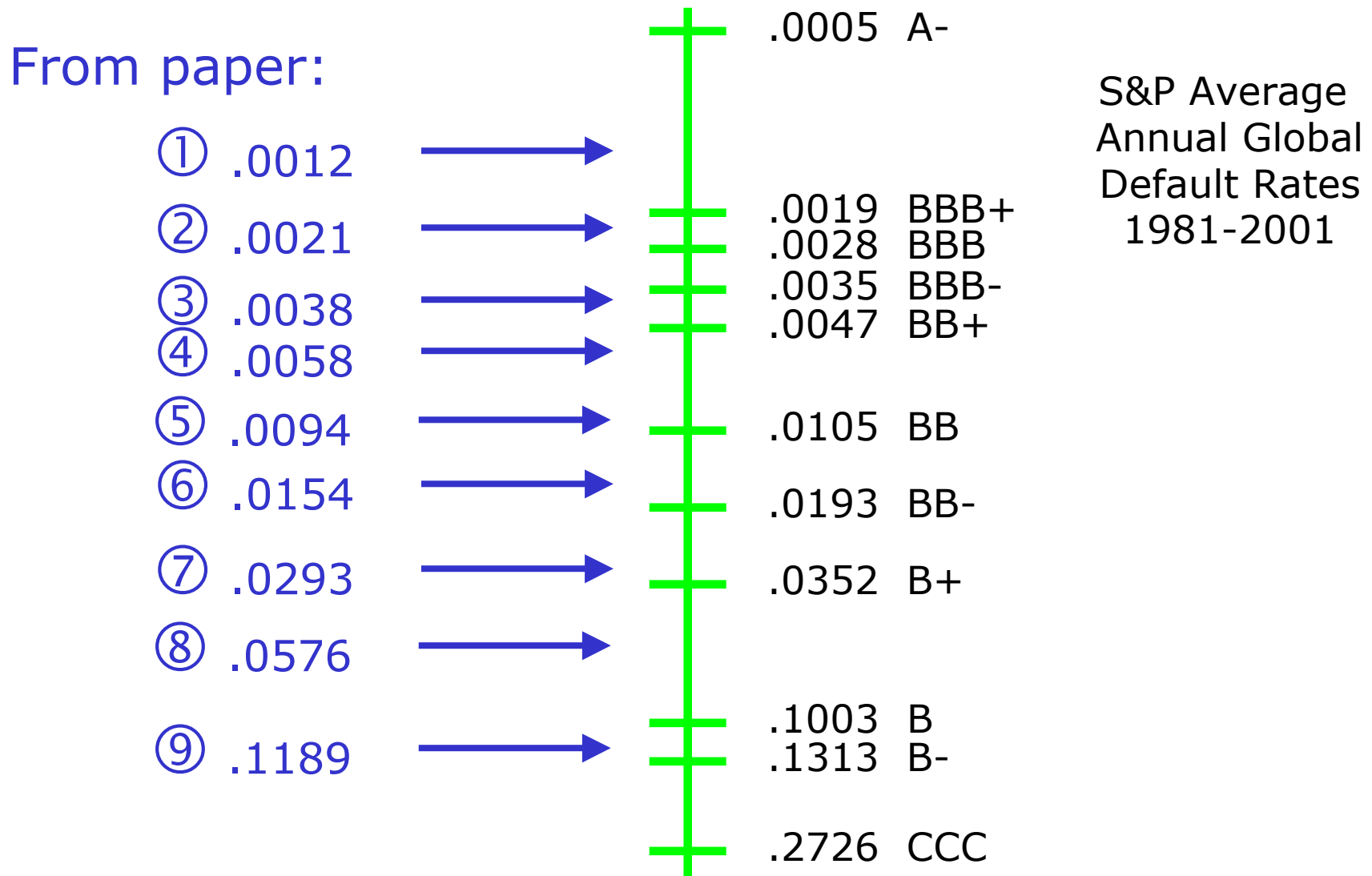
- Banks would be unlikely to treat the presence of guarantees in this way.
- Financial variables are measured relative to annual medians for each sector.
  - All cyclical variation is captured in the GDP variable.
  - Industry sectors differ only in intercept, not in cyclical sensitivity.

# Creating grades from scores

- Ranges of scores from the model are grouped to create nine grades.
- Probability of default (PD) calculated for each grade.



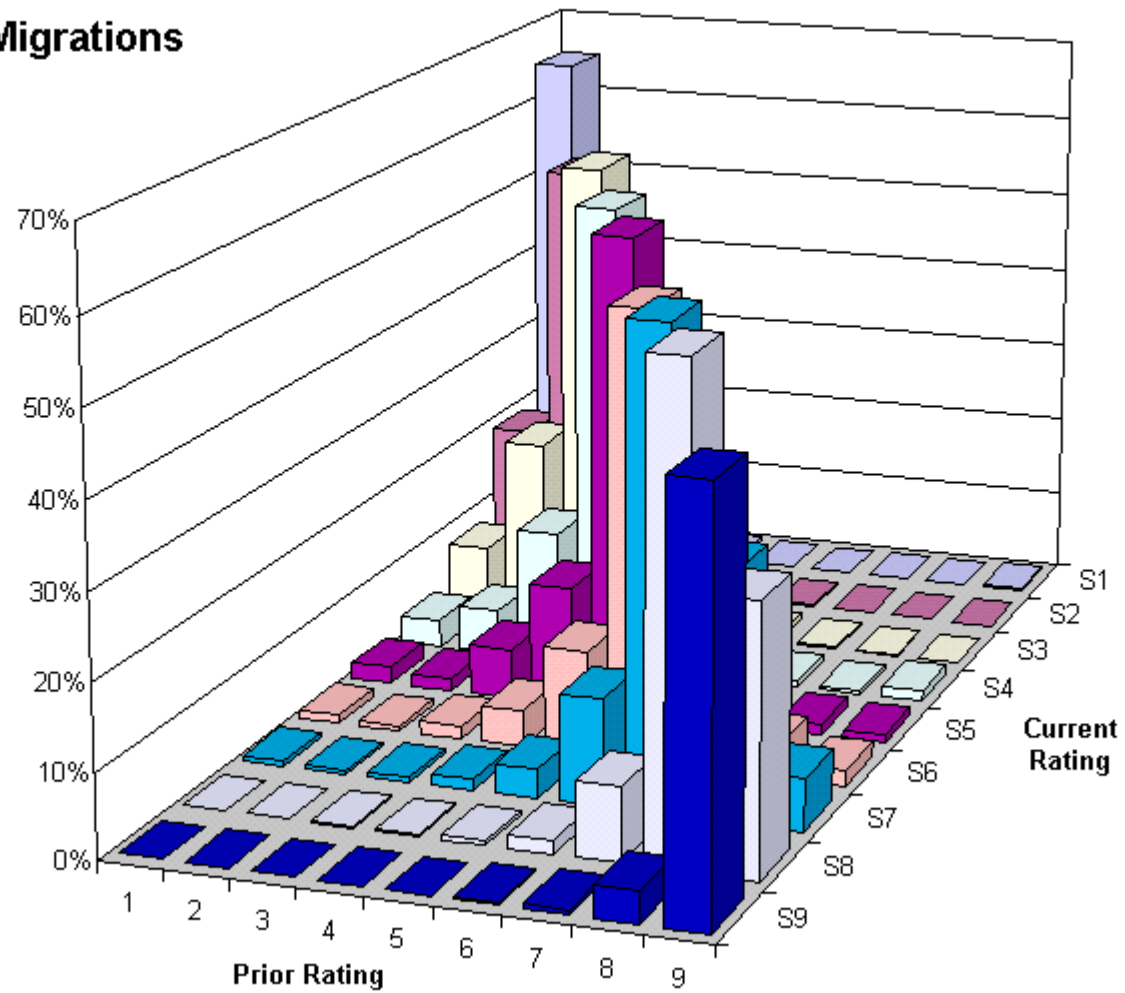
# Compare to S&P scale



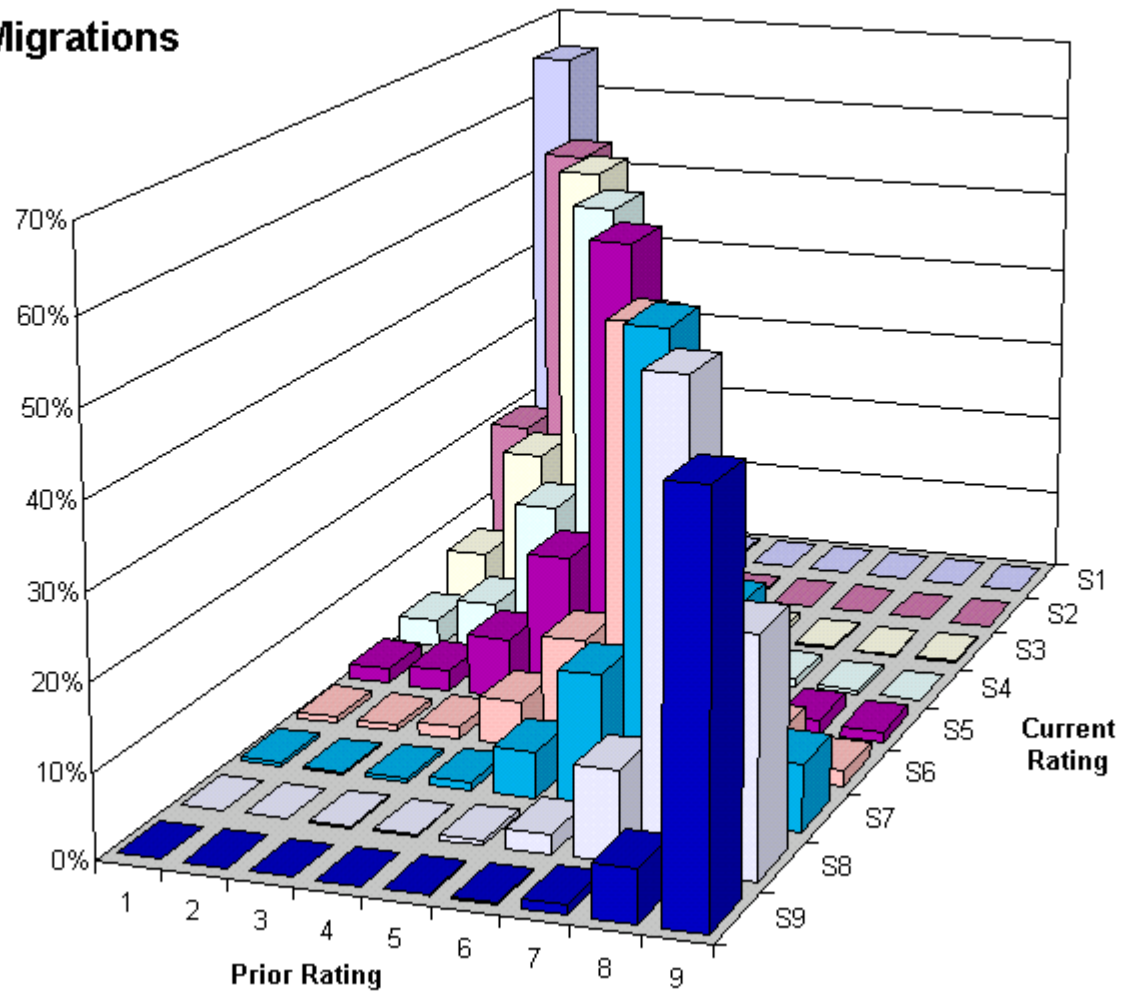
# Ratings migration

- Ratings derived from credit scoring model for all obligors and all years.
- Annual grade-change frequencies summarized in migration matrix.
- Sample divided into two parts:
  - “recession” (pre-1996)
  - “expansion” (post-1996)
- Do the migration patterns differ?

## Expansion Migrations



## Recession Migrations



# How different are the patterns?

- Magnitude of migration can be summarized using “Euclidian distance” between the observed matrix and the stable-ratings case (the identity matrix).
- Can be scaled to measure “equivalent average migration” (following Jafry and Schuermann).

# Results (excluding default state)

	Euclidian distance metric	Equivalent average migration
Expansion	.484	.061
Recession	.480	.060
S&P Avg.	.207	.030
S&P 2001	.270	.039

## Ratio of recession frequency to expansion frequency

(ratio > 1 implies higher frequency in recession years)

	Next Period Grade									Default
	1	2	3	4	5	6	7	8	9	
1	<b>1.0</b>	1.0	0.9	1.0	0.9	0.8	0.8	0.0	NA	0.8
2	0.8	<b>1.0</b>	0.9	1.2	1.6	1.3	0.7	1.2	NA	1.9
3	0.7	0.8	<b>1.0</b>	1.2	1.2	1.0	0.9	1.2	0.0	1.6
4	0.7	0.9	0.8	<b>1.0</b>	1.3	1.2	0.7	0.6	NA	0.8
5	0.6	0.5	0.9	0.9	<b>1.0</b>	1.1	1.6	1.1	NA	2.1
6	NA	0.5	0.8	0.9	0.9	<b>1.0</b>	1.2	1.4	0.9	1.7
7	0.0	0.8	0.9	1.3	1.1	0.9	<b>1.0</b>	1.2	2.0	1.2
8	NA	NA	1.5	1.4	1.3	1.3	0.8	<b>1.0</b>	1.7	1.5
9	0.0	NA	NA	0.1	1.3	1.0	1.3	0.9	<b>1.0</b>	1.4

# Results (*including* default state)

	Euclidian distance metric	Equivalent average migration
Expansion	.463	.051
Recession	.550	.061
S&P Avg.	.237	.039
S&P 2001	.330	.055



# Cyclical effects?

- Most prominent difference between “recession” and “expansion” is in the vector of default probabilities.
  - Grade migration is less cyclical.
- Defaults do reduce bank capital, but this is not specific to the IRB framework.
- However, the net effect depends on the composition of the portfolio.

# Portfolio capital

- Authors consider the aggregate Spanish corporate credit portfolio in year 2000.
- Compute IRB capital for each year.
  - By construction, there is no flow into or out of the portfolio year to year.
  - Note that changes in grade composition are likely to be endogenous to the credit cycle in practice.
- Required capital fluctuates.

# What can be done?

- If obligors are assigned their average ratings, required capital is fairly stable.
- However, these ratings no longer contain much information about changing credit quality.
  - Both banks and supervisors may find this cure worse than the disease.
  - Creates problems for “use test”.

# What further work is needed?

- Creation by regulators of rating models and transition matrices for use in benchmarking under IRB.
- Greater understanding of use of credit scoring models for ratings.
- Additional work on transition matrices, including statistical tests for validating bank rating systems.