THE RIMINI CENTRE FOR ECONOMIC ANALYSIS

WP 30-07

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"CREDIT RISK AND BASEL II: ARE NON-PROFIT FIRMS FINANCIALLY DIFFERENT?"

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Credit risk and Basel II:
Are non-profit firms financially different?

Barbara Luppi, Massimiliano Marzo, Antonello E. Scorcu

Abstract
We estimate a model of credit risk for portfolios of Small and Medium-sized enterprises, conditional on being a non-profit or for-profit firms. The estimation is based on a unique dataset on Italian firms provided by a large commercial bank. We show that the main variables to identify creditworthiness are different for non-profit and for-profit firms. Traditional balance sheet information seems to be less crucial for non-profit firms.

JEL Classification: G21, G28

Key words: SME finance; Basel II; Retail banking; Non-profit

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I. Introduction

The New Basel Capital Accord, known as Basel II, introduces capital requirement rules for banks depending on the borrower's riskiness. Credit ratings will play a crucial role in the future, as shown in Czarnitzki et al. (2007). Each borrower receives a credit score on the basis of bank's internal credit risk rating system, designed to assess creditworthiness on the basis of objective criteria.

Basel II makes more urgent the need to establish a sound method to estimate the probability of default (PD), providing both good prediction and explicative capabilities. However, a great heterogeneity characterizes credit risk modelling and no standard and robust models emerge. It is therefore important to assess the role of firm's specific characteristics in determining credit risk.

The present work investigates whether non-profit (NP) and for-profit (FP) firms differ in terms of characteristics that play a significant role in the prediction of PD. Credit risk models for NP and FP firms might not coincide. It is often claimed that NP firms aim at maximising social value and have therefore a different objective function with respect to FP organizations. Some of the standard measures of economic performance might not be relevant in the evaluation of NP organizations. The standard credit risk models developed for FP firms might not capture these specific characteristics and not assess adequately PD, probably inducing inefficient credit rationing for NP firms.

Moreover, since 2002 Italian NP firms are allowed to issue financial bonds on capital markets[1], the possibility to raise funds on capital markets in plain competition with FP firms makes the evaluation of riskiness of non profit organizations even more important, given their peculiar characteristics and operating methods.

The structure of the rest of the note is as follows. In section II the methodology is discussed, in section III the data are described. In section IV we present and discuss our results. Conclusions are presented in Section V.

II. Model and Methodology

We estimate credit risk models specific for a retail portfolio of loans granted to NP Small and Medium enterprises (SME), and FP SMEs.

According to the nature of data available and the methodological results in Crouchy, Galai and Mark (2001), a logit regression is applied to the population of firm, conditioning on firm's type (for-profit and non-profit). For each firm, indexed i=1,…n, the values of a binary response variable Y_i and a

[1] Bond issues by non-profit firms are allowed under conditions stated in Deliberazione of 3/5/1999 of CICR published in 8/7/1999.

vector of K covariates $x_i = (x_{i1}, x_{i2}, ..., x_{iK})$ are known. In the logit framework, the response variable is distributed according to a Bernoulli distribution:

$$p(x_i) = \Pr(Y_i = 1 | X = x_i) = \frac{\exp(x_i'\beta)}{1 + \exp(x_i'\beta)_i}$$

where $p(Y_i = 1)$denotes the PD of firm i, and the logit regression coincide with the linear predictor:

$$\ln\left(\frac{p(x_i)}{1 - p(x_i)}\right) = x_i'\beta = \beta_0 + \beta_1 x_{i1} + ... + \beta_K x_{iK}$$

where β_0 represents the overall intercept and $\beta = (\beta_1, ...\beta_K)$ a vector of K regression coefficients.

The estimation procedure relies both on firm's quantitative and qualitative information. For each firm type we implement a stepwise variable selection process, based on a likelihood-ratio test with significance level set at 5%.

We perform a series of robustness tests. Restricted versions of the model are estimated conditional on being a FP or a NP firm. Three alternative restricted models are estimated including only a subset of explanatory variables: economic performance ratios, liquidity measures and debt structure proxies. We perform likelihood ratio tests on restricted models and we always reject the null hypothesis that the omitted variables in the general model have no impact on PDs. Moreover we reject the hypothesis that models for FP and NP firms are not significantly different.

The estimated model is robust to alternative specifications (explanatory variables in levels instead of ratios and probit specification). We check for heteroskedasticity in errors in the probit estimation, with heteroskedastic variance in the form Var(_)=exp(__z) where z indicates the vector of variables included in the variance specification. We perform the variance heteroskedasticity test under different specifications of z, including all explanatory variables and subsets of them, measuring liquidity or economic performance.

III. Data

The analysis is based on a data base provided by a large Italian commercial bank. The sample consists of about 4,000 firms having annual sales of less than 10 million Euros, classified as Small and Medium enterprises according to Basel II. One eighth of the sample is represented by NP firms[2].

[2] We limit our attention to limited liability non-profit firms called "società cooperativa a responsabilità limitata" (SCRL).

The data set displays unique features[3] with respect to all the other studies on Italian firms, as Fabi et al. (2005), Bocchi and Lusignani (2004) and Quagliarello (2007). First, the data set is representative of a retail portfolio for a commercial bank; the sample is designed to replicate the distribution of exposures of the bank's overall retail portfolio geographically, by sector of activity and firm's size. The data base contains detailed information on firms, including financial variables coming from balance sheets and other firm specific variables. The dataset comprises variables regarding the quality of the customer-bank relationship, allowing to evaluate credit risk for retail portfolios, within the Basel II framework, using similar data available for the bank internal credit risk evaluation system.

However, with respect to Basel II our default measure includes not only loans classified as non performing, substandard and loans past due 90 days, but also delayed payments by the firm, as we observe even firms which are not up to date with payments of bank debts, but are not necessarily going bankrupt[4]. In the following we use the label "stress" instead of default.

Panel A of Table 1 shows the distribution of defaults across NP and FP firms and Panel B the summary statistics of variables used in the estimation, conditional on firm type.

IV. Results

Table 2 presents the results of the estimation conditional on being either a NP or a FP firm. Significant differences in the credit risk models emerge. Crucially standard measures of economic performances are not statistically significant in the prediction of PD of NP firms.

EBIDTA/TA and ROI do not influence PDs for NP firms, while they are highly significant and negatively correlated with PDs in the case of FP SMEs. An analogous result is obtained for measures of liquidity as CF/TA and for proxy of financial structure as SD/TD.

Only "structural" variables as S/TA and TD/TA have a significant impact on PDs for both NP and FP firms. The evidence indicates that NP firms do have peculiarities that are not captured by standard measures of economic performance. This implies that standard credit risk models that rely only on firm's profitability, liquidity and financial structure may imperfectly assess PD of a NP firm, incurring in the risk of credit rationing. We perform an out-of sample prediction of the model estimated for FP firms on the sample of NP firms. The model performance in terms of correct classification of sound and unsound firms is reduced by more than 10%, determining a higher average PD for NP firms.

The firm sector of activity and regional location affect differently PD estimates conditional on juridical structure. NP firms in northern and central Italy are less risky than the ones located in the South. From an historical perspective, the cooperative movement is more deeply rooted in North-Central Italy and

[3] Most of existing studies draw samples from national registers without direct reference to banks' portfolios.

[4] Because of the default definition, estimated PD can be interpreted as an early warning to the bank in order to detect future situations of stress in loan repayments. There are no reasons to expect the existence of differences between nonprofit and for-profit firm with respect to this feature. See Luppi *et al*. (2006).

seems to have a competitive advantage in terms of higher financial stability[5]. On the contrary, FP firms located in northern Italy are riskier. Only firms operating in transportation sector are riskier independently of juridical structure, while service sector is riskier for NP firms and manufacture in case of FP SMEs.

However, the credit risk models for NP and FP firms share some common features. PDs are inversely correlated with firm's size, measured in terms of number of workers (NW) and sale volume (S/TA)[6], confirming Basel II's assumptions. The dataset includes also a proxy of the quality of the firm-bank relationship, indicating whether the bank does not register any problem in the lending relationship in the year under scrutiny. The variable plays an important role in PD estimation: the better the quality of the relationship between the bank and a specific firm, the lower is firm's PD, especially in quantitative terms for NP firms.

An overall performance of these credit risk models is given by the accuracy ratio, equal to 83.89% for FP firms and 97.74% for NP firms – a value higher than the one found in other studies on Italian firms, as in Cannata et al. (2002) where it ranges between 50 and 70%.

V. Conclusions

We provide a comparative analysis of credit risk associated with loans granted either to NP or FP SMEs. Within the framework of Basel II, we provide striking evidence of the need to tailor the credit risk model in order to capture specific features of firms constituting bank's retail portfolio. Contrary to evidence for FP firms, NP firms present special features such that standard measures of profitability, liquidity and debt structure do not play any role in predicting PDs. This suggests also the opportunity to develop models able to capture at best the specific features of this group of firms.

We find also common effects on PDs for NP and FP firms in terms of structural variables, sales, total debts. Additionally, size matters also within the retail segment.

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[5] A share of non distributed earnings of the non-profit firms is compulsory allocated as reserves.

[6] Saurina and Trucharte (2004) provided similar evidence for Spanish economy.

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Table 1. Data

Panel A: Structure of the sample

Dependent variable: stress	Non-profit	For-profit	***Total***
0	271	2,287	3,558
1	18	318	336
Total	289	3,605	3894

Panel B: Summary statistics

	Non-profit				*For-profit*			
	Mean	Std Dev.	Min.	Max.	Mean	Std Dev.	Min	Max
BFR	1.7855	0.4112	0	2	1.7587	0.4279	0	2
AGE	2.4049	1.2299	1	5	2.6175	1.2462	1	5
NW	1.1419	0.5809	1	4	1.085	0.4306	1	4
SD/TD	0.79	0.2261	0.0125	1	0.8151	0.2031	0	1
TD/TA	0.9571	0.8358	0.0702	9.8524	0.903	0.6047	0	7.3333
NSF/ TA	-0.0018	0.0933	-4.3634	0.875	0.0033	0.370	-13.9565	3.5806
NSF_P	0.0316	0.1749	0	1	0.4528	0.4978	0	1
CF/TA	-.0209	0.6393	-9.2	0.6154	0.031	0.3563	-13.9565	3.8548
S/TA	0.2221	1.4640	0	46.153	1.9168	2.2406	0	62.5
XS	0.0239	0.1527	0	1	0.2313	0.4217	0	1
S	0.0149	0.1211	0	1	0.1740	0.3792	0	1
EBIDTA/TA	-0.024	0.3422	-4.3634	0.875	0.0887	0.4038	-13.587	6.1396
ROI	-0.154	0.2150	-91.54	50.75	-0.123	0.2567	-45.16	48.15

BFR is 0 if no quality lending relationship, 1 if high quality for one year and 2 for at least two years.
AGE: firm's months of activity (5 classes: <23 months; 24-71; 72-143;144-288; >288).
NW: firm's workers (4 classes: 0-3 workers; 4-10;11-20; >20)
SD/TD : short-term debt on total debt. TD/TA: total debt on total asset value.
NSF/TA: net self financing flow on TA. CF/TA: cash flows on TA. S/TA: annual sale volume on TA. XS and S are dummies with value 1 in case of firm's annual sale respectively less than 250.000 and 500,000 euro.
EBIDTA/TA is EBIDTA on TA.
North and South are regional dummies. Transport, Service and Manufacture are sectorial dummies.

Table 2. Logit estimation results

Dependent variable: stress	Non-profit		***For-profit***	
	Coefficient (standard error)	Elasticity (standard error)	Coefficient (standard error)	Elasticity (standard error)
BFR	-4.474***	-7.988	-2.379***	-4.001
	(1.349)	(2.410)	(0.141)	(0.248)
AGE	0.607*	1.460	0.458***	1.138
	(0.391)	(0.940)	(0.057)	(0.143)
NW	-1.427 *	1.630	-0.479 ***	-0.502
	(0.930)	(1.062)	(0.198)	(0.206)
SD/TD	-3.344*	-2.641	1.165***	0.891
	(2.057)	(1.625)	(0.363)	(0.283)
TD/TA	5.463***	5.228	0.357***	0.298
	(1.553)	(1.487)	(0.104)	(0.088)
NSF/ TA	8.929 ***	-0.218	1.304 ***	0.004
	(3.355)	(0.082)	(0.359)	(0.001)
NSF_P	-4.072***	-1.733	-0.344***	-0.168
	(1.674)	(0.712)	(0.144)	(0.067)
CF/TA	-0.134	0.003	-0.883**	-0.027
	(0.634)	(-0.013)	(0.405)	(0.012)
S/TA	-1.597***	-4.782	-0.178***	-0.354
	(0.491)	(1.471)	(0.047)	(0.092)
XS	4.022 ***	1.049	0.011	-0.008
	(1.494)	(0.362)	(0.171)	(0.041)
S	5.226***	-0.03	0.097	-0.015
	(1.804)	(0.674)	(0.179)	(0.032)
EBITDA/ TA	-0.279	-0.004	-0.439**	-0.035
	(1.731)	(0.028)	(0.218)	(0.018)
ROI	-0.00005	-0.716	-0.001***	-0.305
	(0.001)	(0.309)	(0.0002)	(0.119)
North	-2.687 **	0.716	-0.191	-0.054
	(1.162)	(0.309)	(0.152)	(0.043)
South	4.950***	0.704	-0.024	-0.017
	(1.614)	(0.229)	(0.203)	(0.024)
Transport	7.810**	0.919	0.224**	0.013
	(2.331)	(0.274)	(0.287)	(0.013)
Services	2.697 ***	1.185	-.0136	-0.003
	(1.355)	(0.596)	(0.198)	(0.041)
Manufacture	2.084 ***	0.274	0.488 ***	0.135
	(1.588)	(0.209)	(0.156)	(0.047)
Constant	-6.497**		-0.022**	
	(3.298)		(0.507)	
Log-likelihood		-26.1191		-808.0937
Pseudo R^2		61.25%		24.84%
Number of observations		389		3599
Area under ROC		97.74%		83.89%

Notes: *** indicates statistical significance at 1% level; ** indicates statistical significance at 5%;
* indicates statistical significance at 10%