The TIER on Spanish Banks

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Abstract

This paper studies the determinants that have affected the solvency of Spanish credit institutions. Six hypotheses with data from the annual accounts of credit institutions that ranges from 2004 to 2011 are contrasted. Econometric panel data models are used. The results show that the dependence on wholesale financial markets, the NPLs and provisions for impairment, contribute negatively to the solvency. The increase in: portfolio of assets, real estate investments, leverage, staff costs and administrative and interest margin and other income, serve to strengthen solvency.

1. Introduction

The reforms by the Spanish authorities and Basel III are aimed at strengthening the solvency of financial institutions. That is why we consider that solvency and its determinants are important for investigation.

The aim of this work is to study the determinants of the solvency. The results could be used not only to predict future situations that may lead to a significant reduction in the solvency of Spanish credit institutions but also to try to avoid them.

The methodology used in the research is econometric analysis with various regression models. The results indicate that real estate investments have not prejudiced solvency. The increase in leverage has improved solvency. However, the increase in finance from central banks and of the international financial markets has damaged solvency. Another important result is that banks that make greater efforts in investment in human resources gain greater solvency.

The work contributes to the literature with an econometric model that can determine and predict which variables of annual accounts are determinant in the solvency for the period 2004-2011. The model will be used to manage financial assets and liabilities in order to achieve the objective of solvency marked in the Basel III rules.

The paper is organized as follows. After this introduction, in the second section, aims and hypotheses are presented. The third section presents the methodology used. The fourth proceeds to explain the results and the fifth presents the conclusions.

2. Hypothesis

Six hypotheses are contrasted in order to study the effect that each one has on solvency.

All variables are constructed as a ratio in which the numerator is the variable described, and the denominator is the asset.

1. Portfolio. Composed of non-credit investments.

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An investment should produce benefits that contribute to increased solvency. However, when considering a period of crisis, losses may occur, and therefore the aforementioned investment may lower solvency. In respect to crisis periods in the portfolio, Rossignolo, Duygun and Shaban (2013) found that the solvency decreased as a result of the stock market crash of 2008.

H1. Market developments have contributed to the decline in value of the investment portfolio of Spanish credit institutions. Therefore, a specific sign of regression model coefficients is not expected a priori.

2. Risks estate. Real estate investments.

According to Carbo and Maudos (2010) construction activity is responsible for the decrease in the solvency of Spanish credit institutions.

H2. The large investment in real estate by Spanish credit institutions upon the bursting of the housing bubble has contributed to the decline in solvency. It is expected to have negative coefficients.

3. Leverage. Ratio deposits - credit customers.

There are two possible situations. i) By increasing credits it is expected that the risk will increase while solvency will decrease (Foos, Norden y Weber 2010). ii) Increasing leverage and maintaining equity, increases profitability and therefore solvency.

H3. The growth based on increased leverage should strengthen the solvency. However, the increased leverage may decrease the level of risk. It is expected that the sign of this coefficient is undetermined.

4. Dependence wholesale markets. Funding from central banks and wholesale markets.

To increase funding for international wholesale markets should increase profits and solvency. However, after the close of these markets in 2008 those entities that were financed by these markets have experienced problems that have diminished solvency.

H4. The increase in international funding in the wholesale markets has contributed to the decline in solvency. It is expected to have negative coefficients.

5. NPLs. Provisions for insolvencies.

The increase in unemployment and falling GDP increases NPLs, (Fernández de Lis et al, 2000; Brent et al 2011, Esteban y Estrada 2012) and this increase in NPLs has caused the decline in profits and solvency.

H5. - The socioeconomic situation is one of the factors that have caused the increase in defaults and thus the increase in provisions, reducing the solvency. The expected sign of the

coefficients of this indicator will be negative.

6. Incomes and expenses. Returns on capital. Investee result. Administrative expenses. Commissions and interest margin.

It is expected that credit institutions more efficient, will have a greater solvency. (Liua y Wilson 2010) Carbó y Maudos (2010) y Carbó, Márquez y Rodríguez (2012).

H6. - the evolution of items of incomes and expenses you cannot predict a priori. The expected sign of the coefficients should be different in the accounts of incomes and the expenses. In the expenditure it will be negative and in the income it will be positive.

3. Methodology

The data used for the study are the financial statements and the Annual Report (of the companies included in the sample, from 2004 year of high growth, until 2011 practically completed financial restructuring.

The dependent variable is called solvency and it is constructed as a ratio of equity in respect to assets. In the Standards based on Basel II the concept of "equity" is quite broad. Financing that is not equity, is included in the Tier I and Tier II. In addition, there have been many changes during the period studied. So, in order to standardize the data equity has been used, Shareholders' equity, as the numerator, especially given that one of the objectives of Basel III is to increase the quality of equity.

To test the hypotheses we followed the methodology used by Tarus et al (2012) in the extension of the model of Ho (1981).

The availability of information for a sample of 72 credit institutions and 8 time periods allows for the exploitation of the double dimension, temporal and cross section, through an econometric model of unbalanced panel data.

Regression is performed by means of an ordinary least square model, OLS with fixed effects and generalized least squares for the model with random effects. After studying the regressions and performing the homogeneity test and the Hausman test, the model with higher quality is the one which is done with fixed effects. Therefore, it is considered that there are specific characteristics of each entity, constant over time, but not measurable or observable, that could affect this relationship, α_i, so the fixed effects model is specified:

$$\text{Solvency} = \alpha_i + \sum \beta_x \, var_{it} + \omega_{it}$$

"var_{it}" are the variables that configure the indicators described in the previous section.

Some of the variables could be expected to have indirect effects on each other, which would entail a problem of multicollinearity. To evaluate this potential problem between

the variables were calculated the correlations verifying that there are no problems of this nature. In addition, the Variance Inflation Factor has also been obtained and it has been confirmed that there is no multicollinearity problem, see column 4 and 8 of Table 2.

All models have been estimated by the estimator of robust standard errors heteroskedasticity consistent. As a result of data, the statistical Durwin-Watson, it is possible that there is autocorrelation of the first order in the residues. To correct this situation, two new regressions have been estimated, one with MCO including the dependent variable with an delay of a year and another by Arellano and Bond's general method of moments (GMM).

For the estimation of the models the EViews econometric program in its version 7 is used.

4. Results

4.1. Descriptive Results

In Table 1 the descriptive statistics of the variables used in the model are shown.

Table 1. Descriptive statistics of the variables.

	Mean	Median	Maximum	Minimum	Std. Dev.	Ob.
Equity	0.0605	0.0573	0.1670	-0.1321	0.0247	425
Assets portfolio	0.0475	0.0286	0.2631	0.0000	0.0482	425
Short-term debt portfolio	0.0747	0.0679	0.3015	0.0000	0.0485	425
Portfolio short-term shares	0.0267	0.0192	0.1811	0.0001	0.0270	425
Investment Property	0.0099	0.0053	0.0803	0.0000	0.0119	425
Real estate adjudications	0.0044	0.0005	0.0552	-0.0275	0.0082	425
Leverage	1.1562	1.0570	2.9770	0.7473	0.3222	425
Central bank financing	0.0222	0.0075	0.2576	0.0000	0.0329	425
Negotiable debits	0.1226	0.1014	0.7205	0.0000	0.0990	425
Subordinated liabilities	0.0228	0.0222	0.4327	0.0000	0.0238	425
Provisions for bad debts	0.0058	0.0039	0.1817	-0.0026	0.0101	425
Capital returns	0.0009	0.0005	0.0121	0.0000	0.0011	425
Investee result	0.0008	0.0001	0.0363	-0.0050	0.0041	425
Administrative expenses	0.0130	0.0124	0.0245	0.0004	0.0037	425
Commissions s	0.0048	0.0046	0.0151	-0.0031	0.0020	425
Interest margin	0.0166	0.0159	0.0309	-0.0147	0.0050	425

4.2. Econometric Results

The results indicate that all three models have a significant level of prediction / explanation for the determinants of solvency, because the adjusted R^2 is 0.89. See Table 2. This could also lead us to believe that there is a problem of over-parameterization and noise being modeled in the data. To dispel this doubt and following the philosophy of machine learning (Bishop, 2006) the sample was randomly divided into two sets, one of modeling (learning group), with 80% of the observations, and another the evaluation (test group), with the remaining 20%. The test results showed an excellent predictive ability of the model; consistent with the observed in the R^2.

In all three models the signs remain constant, and the coefficients have very similar values, indicating that the models are consistent and robust.

Of the three, the MGM Arellano and Bond model gets statistically better significance in the variables and has no problems of correlation between the residuals. That is why this is the main model that we use for discussion of the results.

The results of the hypotheses to be tested are:

H-1. Portfolio. In examining the coefficients of the three variables, we found that despite the crisis the increase in portfolio investment contributes to increased solvency. Therefore we can say that the impact of the crisis has not affected the portfolio of credit institutions, contributing to increased solvency

Table 2. Econometric model.

	Variables	OLS with fixed effects	VIF	OLS fixed effects with a delay	GMM Arellano Bond	Elasticity	VIF
	C	0.037***		0.016*			
		(0.008)		-0,009			
Dependent variable with a delay	Equity previous year			0.493*** (0.009)	0.133*** (0.045)		5.389
Portfolio	Assets portfolio	0.022 (0.021)	2.012	0.011 (0.022)	0.019* (0.010)	0.015	4.388
	Short-term debt portfolio	0.014 (0.019)	2.287	0.009 (0.019)	0.020*** (0.007)	0.025	5.651
	Portfolio short-term shares	-0.067 (0.049)	1.626	-0.061 (0.057	-0.013 (0.017)	-0.006	2.655
Real estate risks	Investment Property	0.014 (0.063)	1.541	0.049 (0.045)	0.051* (0.028)	0.08	2.596
	Real estate adjudications	0.098 (0.078)	1.697	0.109 (0.087)	0.081** (0.039)	0.006	2.567
Leverage	Leverage	0.010*** (0.004)	2.637	0.010** (0.004)	0.008*** (0.003)	0.154	4.622
Dependence on wholesale markets	Central bank financing	-0.056*** (0.019)	2.379	-0.048** (0.022)	-0.039*** (0.009)	-0.014	3.374
	Negotiable debits	-0.025*** (0.013)	2.722	-0.017 (0.016)	-0.019*** (0.006)	-0.039	2.468
	Subordinated liabilities	-0.198*** (0.072)	1654	-0.061 (0.084)	-0.081** (0.040)	-0.031	4.310
NPls	Provisions for bad debts	-0.683** (0.265)	3.314	-0.509* (0.294)	-0.420*** (0.095)	-0.040	7.156
	Capital returns	1.190 (0.912)	1.221	0.904 (1.102)	1.177*** (0.367)	0.017	3.705
	Investee result	-1.046** (0.0432)	1.352	-0.506* (0.257)	-0.0989*** (0.154)	-0.013	1.565
Income and expenses	Administrative expenses	2.052*** (0.389)	3.846	0.677 (0.814	1.302*** (0.271)	0.280	5.484
	Commissions s	-2.653*** (0.765)	2.866	-1.976 (1.26)	0.037 (0.349)	0.003	2.121
	Interest margin	0.578** (0.0226)	2.180	0.558** (0.275)	0.649*** (0.077)	0.178	2.386
	R² adjusted =	0,892		0,894	33,37238	J-statistic	
	Durbin-Watson	1,196		1,721			

H-2. Real estate risks. The sign of the coefficients of the two variables that form it, investment property has been positive and statistically significant in the GMM model. That fact is consistent with the findings and opinions of the majority of authors of literature, because the credit institutions did not update the value of investments at market value. Here it is important to keep in mind that in 2012, a period that is not included in the sample, regulations were published in order to update the market price of the assets that were in balance Spanish credit institutions.

H-3. -Leverage. The sign of the coefficient is positive and statistically significant. Therefore, an increase in leverage contributes to increased solvency. In this case elasticity is 0.154, so, for every 1% increase in leverage, solvency increments by 0.154%. The first of the theories presented in the framework is fulfilled. The effect of the increased risk assumed by increasing solvency is less than the increase of income earned.

H-4. Dependence on wholesale markets. The increase of the three variables that constitute the indicator contributes to reducing solvency. The three variables have a negative sign and are statistically significant.

H-5. -NPls. It also meets expectations, since the provisions have the negative coefficient with a significance level of 1%. Therefore, the socio-economic environment has caused an increase in defaults and contributed to the decrease in solvency.

H-6. Income and expenses. Income returns to capital and margin are significant and with the expected positive sign, more income, and more solvent. However, income from investee companies is negative and significant in all models. The commissions are not statistically significant. Overall the most interesting fact is the positive sign of the coefficient of the variable administrative expenses. This result means that greater spending on personnel increases solvency, with an elasticity of 0.280. This result coincides with the

investigations of Claessens et al, 2001; Abreu y Mendes, 2003; Carbó y Rodríguez, 2007 y María y Agoraki 2010, and Climent y Pavía (2015).

Finally, the dependent variable with a delay included in the GMM has significant result with a coefficient of 0.133, so a certain inertia is observed in the model.

5. Conclusions

This paper has studied the potential determinants of solvency through the construction of econometric models

The results indicate that: 1) The increase in funding from wholesale markets, central banks and subordinated doubt decreases solvency. 2) The increase in defaults and therefore the provisions caused by socio-economic situation also decreases solvency. 3) The increase of current revenues strengthens solvency. Likewise investment in human resources increases the solvency. 4) Investment in real estate assets does not decrease solvency. 5) Investment in financial assets does not reduce solvency. 6) Finally, the increase the leverage increases solvency.

Acknowledgements

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