Mergers between Spanish credit cooperatives as a mechanism to prevent insolvencies (1996-2016)

Antonio Madera del Pozo PhD.
Head of Sovereign /sub-sovereign rating at Axesor rating
Natalia Cassinello Plaza PhD.
Finance professor at Universidad Pontificia Comillas
Antonio Rua Vieites PhD
Quantitative methods professor at Universidad Pontificia Comillas

Abstract

The objective of this research is to determine if the mergers between Spanish Rural Savings Banks is the usual strategy of the management team to avoid a future insolvency.

In this sense, within the scarce academic research on the insolvencies of credit cooperatives, the different authors agree that insolvency processes within the credit cooperative sector are not common. In fact, Porath (2006), Cabo et al (2010), Lima (2012) and Madera (2017) observe that merger processes between credit unions are more common, asking us whether these mergers are indeed a strategy to avoid situations of future insolvency.

Both discriminant analysis and the estimation of logit model in its traditional version and the variation proposed by Shumway (2001), confirm that mergers of rural banks in Spain were motivated not only by business factors, but factors related to short-term sustainability played a decisive role and a strategy.

Keywords: Consolidation, insolvency risk management, discriminant analysis, Logit analysis, Financial Sustainability strategy.

JEL Classification: C51, G21, G32, G33, G34

1. Introduction

Since Secrist (1938), the volume of academic research about bank failures has been extensive and has been focused primarily on determining the causes through probabilistic models that allowed them to determine the different variables that explain those processes, even to anticipate them.

However, this line of research has forgotten the credit cooperative sector (part of the Spanish financial system) based on its small importance, despite the important role they have played in the economic development of small territories traditionally dependents of agricultural activity.

In this sense, publications about credit union insolvencies are limited: mainly Simon (1980) in the US, Dabos (1996) and Pille (1998) in Argentina, Gama et al. (2004), Braga et al. (2006), Gama et al. (2011) and Carvalho et al. (2015) in Brazil, Porath , (2006) in Germany, Cabo et al. (2010) and Lima (2012) in Portugal , Fiordelisi (2013) in Italy, and Madera (2017) in Spain.

Most of those researches affirm that insolvency processes within the credit union sector are not usual, in contrast to banks in which the number of processes has been higher, an important limitation for the estimation of the probabilistic models given the smaller dimension of the sample due to the lack of information regarding the dependent variable.

To solve it, Porath (2006), Cabo et al (2010), Lima (2012) and Madera (2017) consider the mergers between credit cooperatives as the dependent variable,basically due to the high recurrence observed, thereby strengthening the size of the sample and improving the results of the estimated probabilistic models.

Focusing on Spanish “cajas Rurales” (credit cooperatives linked to the agricultural sector), we have analyzed if mergers between 1990 and 2016 responded to a strategy to avoid insolvency of one (or both) of the entities.

The term management strategy in this sense is in accordance with Sutton's definition in 1980 when it refers to the concept of strategy as the long-term survival objective of an entity and the growth of the business. The strategy includes all the necessary decisions to achieve this goal knowing that the future is not predictable but uncertain and it is necessary to plan to be prepared for the unexpected, maintaining a competitive advantage for it.

Studies on strategies for long-term survival of financial institutions through mergers have been studied extensively for commercial banks, much less for savings banks and very scarce for credit unions.

The studies on merger processes in the sector of credit cooperatives that include cooperatives highlight the relevance of improving management through obtaining a larger size that allows being better positioned to compete better. In the case of mergers between smaller entities, economies of scale would be obtained by increasing the size. (Sutton, 1980; Wheelock and Wilson, 2001).

On the other hand, it has also been analyzed in the literature on how to increase the efficiency of financial institutions through the improvement of management. In contexts of high-interest rates and fewer competition entities could afford a percentage of inefficiency being profitable. But the situation has changed since the 1990s with new regulatory frameworks that implied an increase

in competition and a reduction in margins with decreases in interest rates, which has made it increasingly relevant to maximize efficiency at each step of management.

The mergers and acquisitions are a form of business reorganization that allows making the necessary changes to improve the management and therefore the result and the viability (Sanfil ippo S., Garcí to Olalla M. and Torre Olmo B. 2007).

These authors, using a multilogit analysis, analyze the fusion operations from 1993 to 2001 in continental Europe, concluding that fusion processes are relevant as a mechanism to improve management and increase size as a defence to continue to condition under better conditions.

This study was conducted for commercial banks, savings banks and credit unions. The conclusions of the study confirm the positive influence in the processes of fusion of the size measured through the variable ASSET as the defensive strategy although the economies of scale are of little relevance.

This article contributes to the literature in the study of the merger process as a management strategy that allows the survival of the entities when one of them has financial problems that would lead to insolvency in the sector of the 74 Spanish credit cooperatives from 1990 to 2016.

For this, it has been specified and estimated a logit model in its traditional version and in the variation proposed by Schumway (2001), from a dichotomous dependent variable that considers the merger event of the Rural Savings Bank (value 1), and from 25 explanatory variables that measure capitalization, assets, profitability, management, indebtedness, liquidity and macroeconomic situation of each of the 74 Rural Savings Banks that make up the sample analyzed.

Both discriminant analysis performed prior, as the results of the model estimation puts n show that most mergers of rural banks in Spain were motivated not only by factors associated with the business itself, by factors associated with the financial sustainability of the entities involved, specifically profitability, efficiency, asset quality, management team, size, geographical location and macroeconomic environment, with a global percentage of correct answers that in the best case approximates 96% in the sample of estimation and 80% in the validation sample, confirming in turn the greater robustness of the logit model proposed by Schumway (2001) for the study and prediction of insolvencies.

This research is organized as follows. In the second section, a review of the state of art. In the third section, the methodology to be followed for estimating the models will be explained. In the fourth section will be presented the results of the application of the models, to end with a fifth section that includes the main findings of our research.

- The state of the art

The volume of research about insolvencies of credit cooperatives is small and, with few exceptions such as the recent research carried out by Madera (2017), they are mainly limited to other countries characterized by its novelty, being Simon (1980) and Dabós (1996) pioneers in the use of linear regressions for determining the causes associated with credit cooperative's defaults in US and Argentina, respectively.

In Spain, it has only been found the research by Redondo et al (2014) and Madera (2017). Specifically, Redondo et al (2014) analyze, in an aggregate way together with the rest of the members of the financial sector, the factors associated with the insolvency processes of these entities between 2008 and 2010. Madera (2017) shows that the reduced volume of research found on credit unions would be justified by practically nonexistent processes within this sector, being usual merging with other credit unions in line with what was observed by Porath (2006), Cabo et al (2010) and Lima (2012) internationally.

On the other hand, and outside of Spain, there are investigations in the USA (Simon, 1980), Argentina (Dabos , 1996 and Pille, 1998), Brazil (Gama et al., 2004, Braga et al., 2006, Gama et al, 2011, and Carvalho et al., 2015); Germany (Porath , 2006), Portugal (Cabo et al, 2010; and Lima, 2012) and Italy (Fiordelisi, 2013).

Specifically, Dabos (1996) focused his research in Argentina between 1994 and 1995, years in which he observed the bankruptcy of nine credit cooperatives on the thirty-eight existing. Combining a probit model with key figures defined by the CAMEL system and using economic and financial information from the year immediately prior to the declaration of insolvency, they were able to estimate a model that correctly classified 89% of the bankrupt and non-bankrupt entities.

Gama et al. (2004) proposed a logit model for the study of the insolvency of credit unions in Brazil between 1998 and 2001, providing a sample of 103 companies of which 11 met the condition of insolvency considered by the authors. Based on a series of variables previously used in the business sector, they observed the significance of the variables that measured capitalization, liquidity and business growth, building a model that successfully classified 82% of insolvent cooperatives and 98% of solvent credit unions.

Subsequently, these same authors refined the previous study with the publication of Gama et al. (2011), maintaining the technique, but increasing both the sample (up to 112 cooperatives) and the study period (from 1995 to 2008). On this occasion, the model's inputs came from the financial indicators proposed by the World Council of Credit Unions, known as the Pearls System. However, the results obtained were slightly lower than those of Gama et al. (2004), since the new model only correctly classified 72% of the insolvent cooperatives and 96% of the solvents.

For its part, and while maintaining the use of the logit technique, Lima (2012) focused its study on Portuguese credit cooperatives between 1999 and 2006. For this, it turned to CAMEL and used financial information from the two years prior to the bankruptcy, in addition to macroeconomic variables that measured GDP and unemployment rate, noting that only ratios that measured the quality of assets, efficiency of the management team (operating expenses/ gross income) and the size were significant. Macroeconomic inputs lacking importance. With all this, his model correctly classified the totality of the credit cooperatives analyzed.

Porath (2006) compares the situation of credit cooperatives with that shown by German savings banks from 1993 to 2002. For this purpose, he studied the causes that explained the bankruptcy of both types of entities through the use of non-public accounting information of two years before the declaration of insolvency, using a binary model for panel data, specifically an improved version of the logit regression with dependent variables that vary over time, all from financial information of 15,456 cooperatives and supplemented by macroeconomic inputs. With all this, he observed that the same type of ratios served to explain bankruptcy in both cooperatives and

savings banks, although, by the very nature of this last group of entities, the effects of financial changes were more pronounced in the savings.

With regard to the use of techniques based on survival analysis, Maggiolini et al. (2005) the pioneer in using it on the credit cooperatives of Italy in the decade of 1990, comparing the survival times of the cooperatives that were created in the period of study in relation to those created in previous years. They observed that the high competitiveness existing in the market together with the presence of other credit cooperatives in the territories of the new cooperatives constituted the two main threats to the survival times of the new entities.

On the other hand, Braga et al. (2006) focus on the insolvency of credit cooperatives in Brazil. For this, they used six-monthly accounting information from 2001 to 2003, with which they calculated nineteen ratios, of which only six were found to be significant, constructing a model that correctly classified 83% of the solvent entities and 79% of the insolvent ones.

Cabo et al. (2010) applied survival analysis for the study of the bankruptcy of credit unions in Portugal between 1995 and 2009, a period in which they noted that the number of cooperatives decreased from 220 in early 1990 until 91 entities at the end of 2009. They used 12 financial variables previously used in previous research, with which in the end they turned out to be significant only two, what they call transformation ratio, or also known as loan to deposits (credit investment / customer deposits) and other structural expenses (administrative expenses / total assets), although they do not indicate anything about the predictive capacity of the model and the situation of Type I and Type II errors.

Fiordelisi (2013) focuses its study on the insolvency of credit cooperatives in Italy between 1997 and 2002, where they observed that the bankruptcy rate was four times higher than that presented by the rest of the financial entities of the system, which is because they asked if the efficiency and the management team was configured as one of the main causes. To answer this question, they used a survival model based on a series of inputs that measured efficiency, profitability and macroeconomic aspects. They concluded that cooperatives with the highest profitability and capitalization denoted the highest survival rates.

Finally, Carvalho et al. (2015) studied the determinants of the insolvency of credit cooperatives in Brazil between 1995 and 2009 through different types of survival analysis, concluding that the Cox regression is the one that offers the best results. They ask whether profitability explain the bankruptcy, observing that there was not enough empirical evidence to affirm this hypothesis, mainly because this type of entities promote efficiency rather than profit since their clients are also their partners Of the 38 financial ratios initially considered, finally 15 turns out to be significant in the study, mainly those related to funding, size and investment policy, observing differences among them according to the different types of insolvencies considered.

Regarding studies about mergers processes in the Spanish credit cooperative sector, some authors who study different implications of these restructurings are Palomo Zurdo and Sanchis Palacios analyzing the effects of mergers in the banking efficiency by analyzing the case of rural banks in 2009 following the financial crisis. The work makes a study of the merger of rural banks from 1998 to 2007. The results focus on analysis and better profitability ratios with melting processes concluding that these processes have not been improved profitability and that the ratio of credit to deposits is not correlated with profitability or efficiency.

On the other hand, the article by Sanfilippo S., García Olalla M. and Torre Olmo B. in 2007 on mergers and acquisitions from 1993 to 2001 in continental Europe using a multilogit analysis methodology. The merger is analyzed as a form of business reorganization that allows making the necessary changes to improve the management and therefore the result and the viability of the entities.

Our proposal analyzes also merger processes but with an objective and innovative methodology. With respect to the objective, this work focuses on confirming whether the merged companies are the result of the concentration of a solvent entity with others with financial problems that place them close to insolvency. This would imply that the merger is the adopted strategy to avoid bankrupt processes.

And on the other hand, it incorporates into the literature the use of the combination of the discriminant analysis and the logit model in its traditional version and in the variation proposed by Shumway (2001).

2. Methodology

In Table 1 we have summarized the main techniques used in credit union insolvency research. We can observe that in them the use of probabilistic regressions (logit / probit) and survival analysis (Cox regression) have been usual.

Table 1: Techniques used to study the insolvency of credit cooperatives in the literature review.

Technique	Researches
Discriminant análisis	Simon (1980)
Logit / Probit	Dabós (1996), Gama et al. (2004), Porath (2006), Gama et al. (2011) y Lima (2012),
Survival	Maggioglini et al (2005), Braga et al. (2006), Cabo et al. (2010), Fiordelisi et al. (2013) y Carvalho et al. (2015)

Sources: Own

Therefore, to achieve the objective of our research , that is, to determine the factors that influence the merger processes of credit cooperatives in order to determine if the mergers respond to a corporate strategy to avoid a subsequent insolvency, will be resorted a series of explanatory variables that measure aspects related to both the solvency and the business of the rural banks analyzed, and that will subsequently serve to estimate a logit model in its traditional definition and in its variation proposed by Shumway (2001).

We discard the use of survival models because we do not need to know the time (main information provided by these models).

Simply note that the binary logistic regression, as a variation of the linear probability model, allows to functionally relate a dichotomous variable with a set of independent variables, being used in those cases in which a simple regression cannot be used, linear or not (Silva et al., 2004) for not fulfilling the basic assumptions, that is, the non-normality of the errors, heteroscedasticity, values of the probability outside the interval [0,1] and the presence of a coefficient of determination that is not adequate as a measure of adjustment of the model (Ramajo et al, 2002) , its general expression being the following:

$$P = \frac{1}{1 + e^{-\alpha - \beta_1 X_1 - \beta_2 X_2 - \cdots - \beta_k X_k}}$$

To estimate the parameters of the model, the maximum likelihood method is used, since it allows obtaining those values of the coefficients that maximize the sum of the squares of the residuals.

However, the use of logit models for the study of the bankruptcy of companies and financial institutions has been criticized for ignoring the dynamic nature of financial economic structures of firms analyzed (Shumway, 2001; Nam et al. , 2 008 and Nuñez et al., 2 011), since most of the investigations resort to economic and financial information prior to the insolvency situation (or solvency) of the individual, without considering the fact that the insolvency is a process of continued deterioration in time (Nam et al .; 2008).

Shumway (2001) showed that the investigations into business and banking insolvencies that consider the bankruptcy event as a dichotomous event face problems in the preparation of their sample (usually the number of insolvencies that occur in a single year is less than of individuals who continue to be solvent), which is why many authors usually include in the sample insolvencies of previous years, paired with solvent individuals of the same exercises, to improve the sample quality, although the loss of the temporary character of the information would continue.

Therefore Shumway (2001) proposed a variation of the logit model with which improved predictions of prior researches, observing that those explanatory variables that had been significant under the logit models static, ceased to be using this new technique.

Formally logit models multi-period are based on the definition of the static logit model, but including covariables that depend on time.

In this sense Shumway (2001) indicates that most of the databases that are used to create models of insolvency forecast include information of *n* individuals that exist between t = 1 to t = T, period during which a company can break, survive or simply leave the study, therefore defines a variable t_i for each individual that collects the time that elapses until its insolvency occurs or until you leave the study.

The continuous random variable t_i follows a density function $f(t_i, x_i, \beta)$ with its cumulative density function $F(t_i, x_i, \beta)$, from which it can be stated that the probability that an individual survives t is expressed by the following survival function $S(t_i, x_i , \beta)$:

$$S(t_i, x_i, \beta) = 1 - \sum_{j<t} f(t_i, x_i, \beta) = 1 - F(t_i, x_i, \beta)$$

Additionally, the model incorporates a risk function $h_0 (t_i, x_i, \beta)$ that expresses the probability of insolvency at time t, given the survival to t:

$$h_0(t_i, x_i, \beta) = \frac{f(t_i, x_i, \beta)}{S(t_i, x_i, \beta)}$$

As it is done for the estimation of the parameters of the static logit model, in the case of the logit multiperiod this estimate is also based on maximum likelihood, being, in this case, the following:

$$L = \prod_i h_0(t_i, x_i, \beta)^{y_i} S(t_i, x_i, \beta)$$

Shumway (2001) showed that the likelihood function of a logit model multiperiod is similar to that of a static logit model with risk function $h_0(t, x) = F(t_i, x_i, \beta)$, so it can be easily estimated using logistic regression techniques (Schmidt et al., 2 010):

$$h_0(t,x) = \frac{1}{1 + e^{-(\beta'_1 k_t + \beta'_2 x_i)}}$$

Where k_i it is a time-dependent variable, also called the basal kidney function, which for Shumway (2001) corresponds to the logarithm of the survival time of the individual, although there are various forms of specification, including macroeconomic variables (Nam et al., 2008; and, Schmidt et al., 2010) or of another type of time dependence; On the other hand, $\beta'_2 x_i$ corresponds to the characteristics of the individual, covariates that are also dependent on time.

As indicated by Shumway (2001) with this system, the volume of cases to be introduced into the model is improved, since unlike what happened with the static logit models , this time for each of the individuals all the observations are introduced, differentiating them in the value of the dependent variable (y = 1 or y = 0) as if it were from different individuals, thus allowing to introduce the dynamic character of the observations.

As indicated by Schmidt et al. (2010) not all authors agree that the estimation of logit models multi-period are better than those obtained by static models, basically due to the fact that these new models may present parsimony problems that justify the greater predictive capacity observed in the tests on individuals who were not part of the initial sample.

Fantazzini et al. (2 009) in a study of the bankruptcy of small corporations observe that the static logit models demonstrate a greater predictive capacity in the case of individuals not included initially in the sample, a conclusion that is also reached by Schmidt et al. (2 010) in its comparison of the predictive power of both types of models based on 102 listed companies in the US, corroborating similar findings of Fuertes et al. (2006).

As it has become clear, there is not enough consensus among the group of researchers on whether the static logit model works better than the logit multiperiod , especially in what refers to the application of the model for the subsequent estimation of probability on individuals who were not part of the initial sample, for this reason in this work both models will be evaluated on the sample of data referring to the Rural Savings Banks Spanish

3. Sample

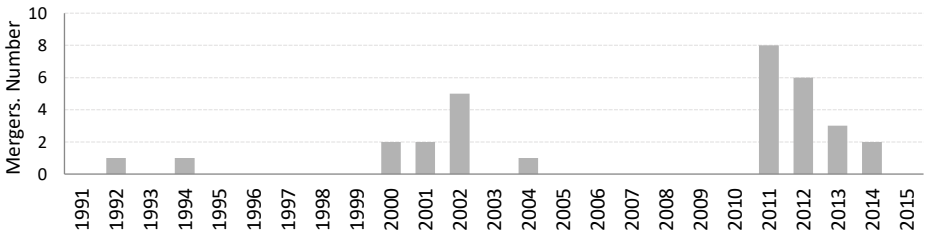
The sample is made by a data panel of financial information about each caja rural between 1991 and 2016. For model estimation, as is usual within this line of research, we will use the information corresponding to the year prior to the merger event. This information has been obtained from the Bank of Spain, the National Union of Credit Cooperatives (UNACC) and the Cajamar Cooperative Group.

Cajas rurales are a type of Spanish credit cooperative that combine the features of a credit institution with a cooperative society, being subject therefore both the regulations applicable to credit institutions, as to the regulations that regulate cooperative activity, at the state and regional level. They are very regionalized, offering traditional banking services closely linked to agricultural and livestock population sector.

At present, the segment of Spanish credit cooperatives is made up of a total of 62 cooperatives, of which 59 correspond to Rural Savings Banks, grouped in turn around the National Union of Credit Cooperatives (UNACC), the Spanish Rural Savings Banks and the Cajamar Cooperative Group. They have been discarded l study of the three credit unions that are not Caja Rural.

We have defined a dependent variable of a dichotomous type that takes the value 1 in case the rural cash has disappeared due to the merger, and 0 if it remains operative at the date of the study. In order to determine its value, the Entity Registry of the Bank of Spain has been used. In Figure 1, we have summarized the temporal distribution of the cases in which the dependent variable takes the value 1, observing three different periods: 1992-1994, 2000-2004 and 2011-2014.

Graph 1: Dependent variable



Source: own

About the explanatory variables, for our study, we have include variables that measure the financial health and business. They are summarized in Table 2. We have selected them following other studies about bankruptcies in the credit cooperative sector, in addition to some indicators used in financial analysis and financial institutions supervisors.

Finally, and following the criteria followed by most of the authors (Kumar, 1995, Anastasi , 1998, Lane, 1999, Magalhaes , 2001, Serra, 2002, Ayala, 2007a, Li, 2011, Poghostan , the samples have been elaborated through a random process.

Thus, the estimation sample comprises 2/3 of the rural banks that have merged during the study period, and the validation sample is constructed from the remaining 1/3 of Rural banks These will

correspond to samples of panel data in which observations will be available for each Rural Bank from 1991 to 2016.

4. Results

Prior to the estimation of the logit model, we have carried out a univariate analysis of the explanatory variables in order to determine the degree of significance of each of them in order to optimize selection and avoid problems of parsimony in the models, which results are summarized in Table 3, confirming that merger credit cooperatives showed more aggressive investment, with business ratios, ESFUERZOPROV and COSTERIESGO slightly higher than those presented by entity set unfused, and far from the sector average.

In terms of efficiency, both groups remained in line, and although it is true that in relation to assets, profitability was lower in the group of merged entities, considering the profitability of equity, the situation was different, with a higher ROA in the group of merged entities.

In this sense it should be noted that the merged entities showed, on average, the highest levels of capitalization, with a degree of leverage and liquidity below their operating counterparts, partly justified by that more aggressive investment policy already commented, and LTD ratio which, despite being less than one, was above the average of the operating entities.

To confirm the differences observed in the calculated descriptive statistics we will use the analysis of equality and homogeneity of mean values between the two groups that determines the dependent variable (operative and merged) through a t-test of equality of means that contrasts the hypothesis of if the population means are equal (the mean of the dependent variable in each level of the independent variable), which means that the groups do not differ in the dependent variable, and therefore the factor (or explanatory variable) is independent of the variable dependent.

The results of Table 3 show the existence of differences in mean values only in CAPITALIZATION, LEVERAGE, SIZE, BUSINESS ESFUERZOPROV, EFFICIENCY, ROA, ROE, EMP, OF1 and OF2 variables, in which observe a value of significance (p-value) lower than the level of 0.05, in the rest of the variables no differences would be revealed between both groups of operative and merged Rural Savings Banks, so they will not be used in the estimation of the model.

In addition, a calculation of the linear correlations between the different explanatory variables has been carried out, results that have been collected in Table 4, in which the existence of reduced correlation coefficients among all of them can be observed.

By variables, the existence of the highest levels of correlation between the variables that measure the dimension (SIZE, EMP and OF1) and the business, with the risk management variables and the quality of the business (COSTERIESGO and ESFUERZOPROV) is verified, mainly, being the most of the significant correlation coefficients at a level of 0.05.

The estimation of the logit model has been made taking into account the temporal distribution of the dependent variable shown in Figure 1, that is, two logit models have been estimated (one for each period, eliminating the period 2000-2004 due to lack of sufficient data in relation to the dependent variable) as well as two additional logit models with full temporal distribution (one in its traditional version and another in the version proposed by Shumway (2001)).

Table 3: Explanatory variable

Type	Name	Ratio
Capitalization	CAPITAL	$\frac{\text{Equity}}{\text{Total Assets}}$
Assets	TAMAÑO	$\log(\text{total assets})$
	NEGOCIO	$\frac{\text{credit}}{\text{Total assets}}$
	COSTERIESGO	$\frac{Insolvency\ provisions}{\text{Credit}}$
Earnings	ESFUERZOPROV	$\frac{\text{insolvency provisions}}{Gross\ margin}$
Management	EQG1	$\ln\left[\frac{\text{Credit}_t}{\text{Credit}_{t-1}}\right]$
	EFICIENCIA	$\frac{\text{Operating expenses}}{Net\ revenues}$
Profits	RENTAB	$\frac{\text{Operating expenses}}{\text{Total assets}}$
	ROA	$\frac{\text{Results}}{Total\ assets}$
	ROE	$\frac{\text{Result}}{Equity}$
Leverage	APALANCAMIENTO	$\frac{\text{Equity}}{\text{Total Assets}}$
	LTD	$\frac{Loans}{\text{Deposits}}$
	FUNDING GAP	Loan – Deposits
Liquidity	LIQUID	$\frac{Treasury}{Deposits}$
Macroeconomics	PIB	GDP growth
	PARO	Unemployment rate
	INTcp	Long-term Interest rate
	INTlp	Short-term interest rate
Workers	EMPLEADOS	ln (workers)
Branches	OF1	ln (branches)
	OF2	$\frac{\text{Profit}}{\text{Branches}}$
Type	SECCIÓN	Local, regional or national.
Territory	UBICACIÓN	North, South or centre
FGD	FGD	Intervened
PORATH	PORATH	$\frac{\text{Results}}{Equity}$

Source: Own

Table 3: Discriminant analysis

Ratios	Dependent variable	Descriptive			t-statistic	
		Average	Min	Max	F	P-value
Capital	Operativa	0,0168	0,000	0,1711	2,91	0,004*
	Fusionada	0,0249	0,0034	0,0622		
	Total	0,0169	0,000	0,1711		
Apalancamiento	Operativa	0,0873	-0,002	0,2116	-2,09	0,036*
	Fusionada	0,0758	-0,0091	0,1586		
	Total	0,0871	-0,0091	0,2116		
Tamaño	Operativa	5,1379	3,0637	7,6015	3,16	0,002*
	Fusionada	5,5573	3,7057	6,9525		
	Total	5,145	3,0637	7,6015		
Negocio	Operativa	0,5423	0,0489	4,4747	2,62	0,009*
	Fusionada	0,6618	0,0689	0,8863		
	Total	0,5443	0,0489	4,4747		
CosteRiesgo	Operativa	-0,007	-0,299	0,000	-0,65	0,514
	Fusionada	-0,0085	-0,0952	0,000		
	Total	-0,007	-0,299	0,000		
EsfuerzoProv	Operativa	-0,1212	-5,9878	0,1665	-3,54	0,000*
	Fusionada	-0,2943	-3,8094	0,000		
	Total	-0,1241	-5,9878	0,1665		
EQG1	Operativa	0,0474	-1,1668	1,325	-1,22	0,219
	Fusionada	0,0212	-0,0949	0,2299		
	Total	0,047	-1,1668	1,325		
Eficiencia	Operativa	0,6265	-0,8787	7,6401	3,87	0,000*
	Fusionada	0,7996	0,5366	1,5166		
	Total	0,6295	-0,8787	7,6401		
RENTAB1	Operativa	0,0195	0,0024	0,2046	0,22	0,825
	Fusionada	0,0199	0,0102	0,0398		
	Total	0,0195	0,0024	0,2046		
ROA	Operativa	0,0088	-0,0796	0,1264	-6,14	0,000*
	Fusionada	-0,0003	-0,0863	0,0119		
	Total	0,0086	-0,0863	0,1264		
ROE	Operativa	0,1082	-1,1906	2,2444	-4,15	0,000*
	Fusionada	0,1203	-1,1284	0,2360		
	Total	0,112	-1,1906	2,2444		
LTD	Operativa	0,7059	0,0619	33,7324	0,71	0,477
	Fusionada	0,8252	0,0957	1,2829		
	Total	0,708	0,0619	33,7324		
FundingGAP	Operativa	-28054	-6639663	6231011	0,27	0,783
	Fusionada	-8768	-433949	1123408		
	Total	-27726	-6639663	6231011		
LIQUID	Operativa	0,0229	0,0016	1,1825	-1,10	0,269
	Fusionada	0,0152	0,0042	0,0536		
	Total	0,0228	0,0016	1,1825		
EMP	Operativa	3,7674	0,6931	8,7808	2,69	0,007*
	Fusionada	4,5901	1,0986	7,5517		
	Total	3,7814	0,6931	8,7808		
OF1	Operativa	2,2144	0,000	7,1831	3,13	0,002*
	Fusionada	3,3272	0,000	6,1924		
	Total	2,2333	0,000	7,1831		
OF2	Operativa	171,8222	-1527,5	1089	-8,62	0,000*
	Fusionada	-233,707	-7126	264,5		
	Total	164,9255	-7126	1089		

* Significativa al 0,05

Source: Own

Table 4: Correlations

	Capital	Apalancamiento	Tamaño	Negocio	CosteRiesgo	EsfuerzoProv	EQG1	Eficiencia	RENTAB1	ROA	ROE	LTD	FundingGAP	LIQUID	PIB	Paro	INT1	INT2	EMP	OF1	OF2
Capital	1	-,133**	,054*	,114**	-,053*	-,036	,048*	,076**	,277**	,127**	,029	-,010	,071**	,095**	,099**	,003	,092**	,090**	,129**	,202**	-,135**
Apalancamiento	-,133**	1	-,366**	,110**	,161**	,094**	-,047*	-,222**	-,201**	,161**	-,212**	,007	,034	-,137**	-,267**	-,158**	-,319**	-,330**	-,474**	-,517**	,361**
Tamaño	,054*	-,366**	1	,371**	-,008	-,166**	,017	,197**	-,073**	-,248**	-,071**	,150**	,087**	-,137**	-,278**	-,066**	-,283**	-,286**	,943**	,901**	-,176**
Negocio	,114**	,110**	,371**	1	,093**	-,156**	,114**	,129**	,122**	-,018	-,203**	,257**	,162**	,001	-,415**	-,304**	-,514**	-,534**	,329**	,280**	-,089**
CosteRiesgo	-,053*	,161**	-,008	,093**	1	,767**	,071**	-,041	-,128**	,157**	,027	,026	,013	-,009	-,060*	-,221**	-,170**	-,196**	-,058*	-,065**	,241**
EsfuerzoProv	-,036	,094**	-,166**	-,156**	,767**	1	,071**	-,131**	,043	,370**	,194**	-,058*	-,097**	,075**	,218**	-,176**	,124**	,101**	-,130**	-,119**	,405**
EQG1	,048*	-,047*	,017	,114**	,071**	,071**	1	-,022	,074**	,117**	,099**	,036	,165**	-,156**	,183**	-,101**	,094**	,080**	,042	,043	,049*
Eficiencia	,076**	-,222**	,197**	,129**	-,041	-,131**	-,022	1	,498**	-,264**	-,117**	,061*	-,020	-,026	-,075**	,012	-,064**	-,070**	,251**	,267**	-,279**
RENTAB1	,277**	-,201**	-,073**	,122**	-,128**	,043	,074**	,498**	1	,245**	,118**	-,016	-,059*	,201**	,260**	,088**	,287**	,295**	,143**	,166**	-,170**
ROA	,127**	,161**	-,248**	-,018	,157**	,370**	,117**	-,264**	,245**	1	,659**	-,075**	-,043	,155**	,356**	-,067**	,292**	,281**	-,171**	-,171**	,555**
ROE	,029	-,212**	-,071**	-,203**	,027	,194**	,099**	-,117**	,118**	,659**	1	-,065**	-,060*	,045	,400**	-,007	,368**	,360**	,011	,024	,223**
LTD	-,010	,007	,150**	,257**	,026	-,058*	,036	,061*	-,016	-,075**	-,065**	1	,087**	,188**	-,120**	-,090**	-,144**	-,147**	,130**	,120**	-,050*
FundingGAP	,071**	,034	,087**	,162**	,013	-,097**	,165**	-,020	-,059*	-,043	-,060*	,087**	1	-,017	-,060*	-,011	-,039	-,040	,053*	,030	-,010
LIQUID	,095**	-,137**	-,137**	,001	-,009	,075**	-,156**	-,026	,201**	,155**	,045	,188**	-,017	1	,194**	-,032	,153**	,155**	-,006	,001	-,046
PIB	,099**	-,267**	-,278**	-,415**	-,060*	,218**	,183**	-,075**	,260**	,356**	,400**	-,120**	-,060*	,194**	1	-,216**	,832**	,781**	-,093**	-,065**	,079**
Paro	,003	-,158**	-,066**	-,304**	-,221**	-,176**	-,101**	,012	,088**	-,067**	-,007	-,090**	-,011	-,032	-,216**	1	,172**	,258**	-,049*	-,030	-,139**
INT1	,092**	-,319**	-,283**	-,514**	-,170**	,124**	,094**	-,064**	,287**	,292**	,368**	-,144**	-,039	,153**	,832**	,172**	1	,986**	-,105**	-,075**	,023
INT2	,090**	-,330**	-,286**	-,534**	-,196**	,101**	,080**	-,070**	,295**	,281**	,360**	-,147**	-,040	,155**	,781**	,258**	,986**	1	-,108**	-,077**	,008
EMP	,129**	-,474**	,943**	,329**	-,058*	-,130**	,042	,251**	,143**	-,171**	,011	,130**	,053*	-,006	-,093**	-,049*	-,105**	-,108**	1	,973**	-,262**
OF1	,202**	-,517**	,901**	,280**	-,065**	-,119**	,043	,267**	,166**	-,171**	,024	,120**	,030	,001	-,065**	-,030	-,075**	-,077**	,973**	1	-,331**
OF2	-,135**	,361**	-,176**	-,089**	,241**	,405**	,049*	-,279**	-,170**	,555**	,223**	-,050*	-,010	-,046	,079**	-,139**	,023	,008	-,262**	-,331**	1

**. La correlación es significativa en el nivel 0,01 (bilateral).

*. La correlación es significativa en el nivel 0,05 (bilateral).

Source own

In all cases, the samples were matched randomly with individuals who kept operative through the period of study.

In Table 5 we have summarized the explanatory variables that have been significant in the estimates of the different logit models

It can observe how the models show that the merger processes can be explained both by variables associated with business development (as size, branches or geographical location), and variables would be related to the medium-term sustainability of the credit cooperatives affected, such efficiency, ROA, having received financial assistance from the FGD or the macroeconomic environment measured as of unemployment.

Table 5: Significant explanatory variables in the logit models.

Significant variables	Logit (2000-2002)	Logit (2011-2014)	Logit (1991-2016)	Logit variación Shumway (2001)
TAMAÑO	X	X	X	
NEGOCIO				X
EFICIENCIA	X			
ROA	X		X	X
OF1	X	X	X	
OF2	X			
EMP	X			
UB			X	X
FGD				X
PARO				X

Source: Own

To evaluate the presence of Type I Errors (incorrectly classifying an operating entity) and Type II Error (incorrectly classifying a merged Rural Fund) we follow the optimal cutoff criterion of the Youden Index (Sources, 2003) which results are summarized in Table 6.

We can see that, as a rule, the degree of correctness in all models has been raised mainly in the case of the operating entities in the initial or estimation sample, and in the case of the merged entities in the validation sample, with global percentages of success in practice all the models exceeds 70%.

In fact, the variation proposed by Shumway (2001) is the one that shows the highest proportion of hits in the validation sample, as one would expect.

Table 6: Correct classification.

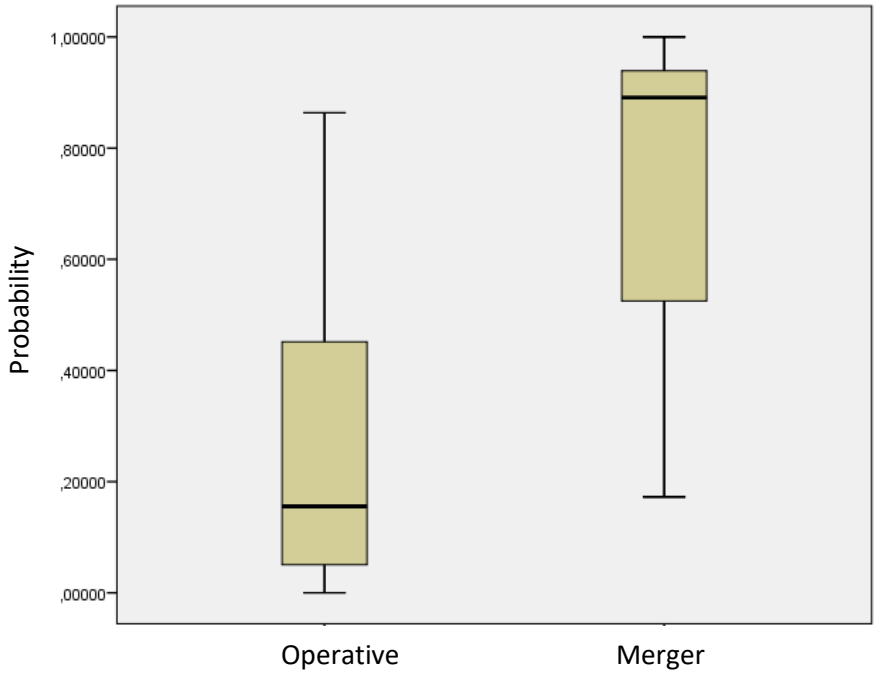
	Estimation sample			Validation sample		
Model	Operative	Merger	Global	Operative	Merger	Global
Logit (2000-2002)	97%	44%	91%	31%	84%	55%
Logit (2011-2014)	96%	11%	74%	58%	77%	67%
Logit (1991-2016)	80%	85%	82%	73%	70%	72%
Logit Shumway (2001)	98%	35%	35%	67%	90%	78%

Source: Own

At a graphical level, the situation is practically similar to that observed in Table 6, with clear differences between the operative Rural Funds and those merged into the results of all models.

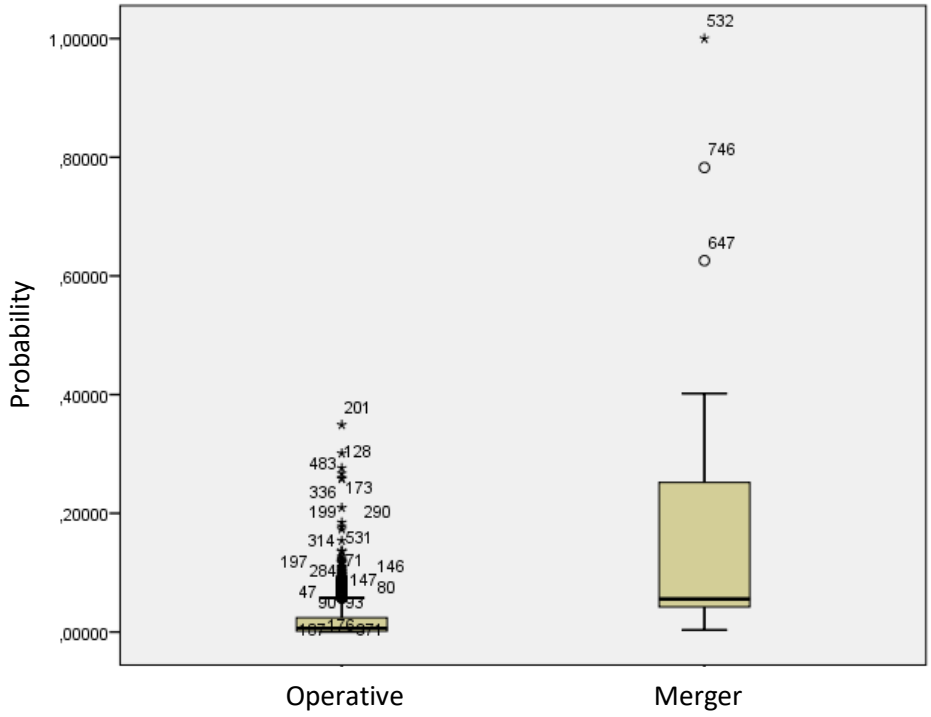
In this sense, Graph 2 and Graph 3 have drawn the charts of boxes that classify the different rural banks in relation to the probability of merging that assigned by the logit model (in the traditional version and in the version proposed by Shumway (20 0 1), respectively considering the complete temporal distribution because they are the ones with the highest percentages of correct answers in the validation sample

Graph 2: Classification of logit (1991-2016)



Source: Own

Graph 3: Classification of Logit (Shumway variation)

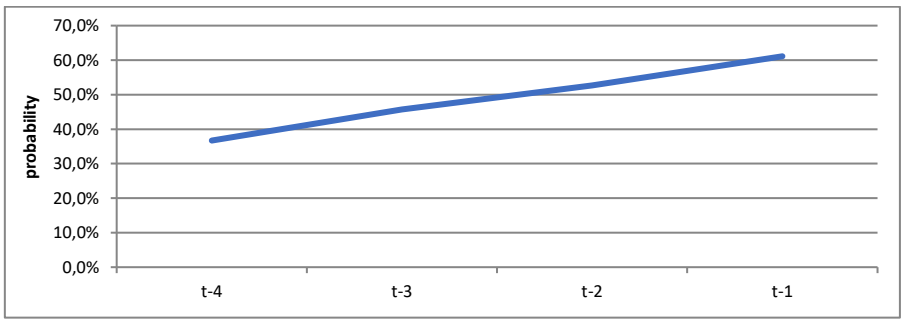


Sources: Own

One of the advantages of the multi-period logit model lies in the fact that, by using all available observations for the same Rural Bank, it allows us to know the anticipation with which it is possible to foresee its merger for solvency reasons.

In this sense, Graph 4 graphically represents the average probabilities estimated by the model for the merged Rural Savings Banks, observing that the highest probabilities are reached using economic and financial data up to two years prior to the merger process, although the Data from three previous years would also offer acceptable results, although lower than previous ones.

Graph 4: Probability of merger up to four delays.



Source: Own

The study shows that the performance of entities with a lack of solvency are merged in all cases and therefore a way to manage the sustainability of the business through concentration, forming a larger group.

5. Conclusions

The objective of this research work is to determine if the mergers between Spanish Rural Savings Banks is a usual strategy of the management team to avoid the future insolvency of the entity involved.

In this sense, within the scarce academic research on the insolvencies of credit cooperatives, the different authors agree that the insolvency processes within the credit cooperative sector are not usual, in contrast to the banks in which the number of processes has been superior.

By contrast, Porath (2006), Cabo et al (2010), Lima (2012) and Wood (2017) note that the processes of mergers between credit unions are most common is, wondering why if indeed these mergers are a strategy to avoid situations of future insolvency.

To achieve the objective set we have used the same technique routinely used in the study and prediction of enterprise and bank failure, a model logit in traditional version and in the variation proposed by Shumway (2001) , with a dichotomous dependent variable that takes the value 1 in case of the merger event (0 in the rest) , and a series of explanatory variables that measure capitalization, assets, profitability, management, indebtedness, liquidity and macroeconomic situation of each one of the Rural Savings Banks.

The necessary financial and economic information has been obtained from public sources, mainly the Bank of Spain, the National Union of Credit Cooperatives and the Cajamar Cooperative Group, all for the period between 1991 and 2016.

Both the discriminant analysis performed previously, and the results obtained from the estimation of the model in its different versions and temporal distributions, show that most of the merger processes of Rural Savings Banks in Spain were motivated, in addition to factors associated with the improvement of the business itself (use of synergies or territorial expansion), by factors that measured the financial sustainability of the entities involved in the short term , which allows us to affirm that the Spanish rural savings banks have followed a merger strategy to avoid future insolvency situations.

More specifically , the different models allow us to conclude that mergers of rural banks in Spain were motivated not only for business reasons, but also the profitability, the efficiency, the quality of assets, the management team, the size, the geographical location and the macroeconomic environment, played a determining role, to the point that the models showed a high degree of success when it came to forecasting the rural banks that were merged in the validation sample.

According to the scarce merger literature in the credit cooperative sector and the analysis of bankruptcy processes, a joint study is presented that shows that entities with deterioration in certain ratios over time merge before reaching the bankruptcy. For this reason, there are no insolvency processes in the sector because the strategy followed is the merger as a defence of the position and sustainability. In addition, and in accordance with the existing literature regarding mergers in the financial sector, the variable size has a positive significance in the

processes, showing that size matters as a concentration decision to improve or maintain a strategic position in the market.

In addition, it is observed that the logit model in its variation proposed by Schumway (2001) improves the robustness of the results in the validation sample and in relation to the Fused Rural Savings Banks, even showing enough power to anticipate these situations with information financial economic of up to four years prior to l that the merger event occurred.

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7. Annexes

a) Output Logit 2000-2002

	B	Error	Wald	gl	Sig.
Tamaño	63,521	24,790	6,566	1	,010
Eficiencia	23,658	11,641	4,130	1	,042
ROA	2299,123	992,478	5,366	1	,021
OF2	-,262	,112	5,432	1	,020
EMP	-8,968	3,831	5,481	1	,019
OF1	-17,578	7,778	5,107	1	,024
Constante	-259,851	101,708	6,527	1	,011

	-2LL	Squared R Cox & Snell	Squared R Nagelkerke
	26,258[a]	,315	,617

b) Output Logit 2011-2014

	B	Error	Wald	gl	Sig.
Tamaño	-3,090	1,522	4,122	1	,042
OF1	1,451	,604	5,772	1	,016
Constante	12,070	6,800	3,151	1	,076

	-2LL	Squared R Cox & Snell	Squared R Nagelkerke
	75,186[b]	,116	,171

c) Output Logit 1991-2016

	B	Error	Wald	gl	Sig.
Tamaño	-4,588	1,925	5,683	1	,017
ROA	-196,085	95,479	4,218	1	,040
OF1	2,046	,804	6,479	1	,011
UB			5,171	2	,075
UB(1)	2,325	1,388	2,806	1	,094
UB (2)	2,534	1,207	4,410	1	,036
Constante	18,662	8,350	4,995	1	,025

	-2LL	Squared R Cox & Snell	Squared R Nagelkerke
	29,998[e]	,471	,628

d) Output Logit var. Shumway (2011)

	B	Error	Wald	gl	Sig.
Negocio	4,749	1,339	12,575	1	,000
ROA	-145,025	38,308	14,332	1	,000
Paro	12,829	5,309	5,838	1	,016
FGD(1)	-2,613	,797	10,737	1	,001
UB			14,642	2	,001
UB(1)	3,097	,845	13,446	1	,000
UB(2)	1,213	,711	2,914	1	,088
Constante	-6,859	1,601	18,357	1	,000

	-2LL	Squared R Cox & Snell	Squared R Nagelkerke
	7,079365	*	*

(*) To evaluate the goodness of the fit of the model, the statistician that measures distance is used (-2LL), although Shumway (2001) indicates the need to make an adjustment on it by the configuration of the sample, in which each of the observations do not correspond to a different individual, proposing their division between the average number of observations per entity included in the sample.