APPLICATION OF "SOLVENCY II FROM E.U. DIRECTIVE" FOR SPANISH LIFE INSURANCE INDUSTRY

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SUMMARY

One of the most important targets in the insurance business is the determination of their risk. The importance of this is supported by the EU directive called Solvency II. In this directive the estimation of the insolvency risk is regulated and also the resource requirements and required solvency levels for these companies. Because of their social impact this risk is a major concern in the current financial system. For everyone, in this study is analyzed the solvency of institutions through different accounting relationships in a sample of more than 400 Spanish insurance companies by the correlation (coefficient r). Furthermore we also analyze the existence of a sustained trend of such correlations in the period (2008-2011). For this we used data available in the System of Iberian Balance Analysis (SABI).

Key Words: Risk Analysis; Risk Management; Solvency indicators; Credit Rating; Life Insurance.

JEL classification: M41, M21, M00.

RESUMEN

Uno de los objetivos más importantes en el negocio asegurador es la determinación y cuantificación de su riesgo. La importancia de ello se encuentra avalada por la directiva de la UE denominada Solvencia II. En esta directiva se regula la estimación del riesgo de insolvencia así como las necesidades de recursos y niveles de solvencia exigidos de estas empresas. Debido a su impacto social, este riesgo es una preocupación importante en el sistema financiero actual. En este estudio se analiza la solvencia de las instituciones aseguradoras a través de diferentes magnitudes contables, considerando una muestra de más de 400 compañías de seguros españolas. El coeficiente de correlación r es la magnitud estadística considerada para el estudio cuantitativo. Además también se analiza la existencia de una tendencia sostenida de tales correlaciones en el periodo (2008-2011) empleando los datos disponibles en el Sistema de Análisis de Balances Ibéricos (SABI).

Palabras clave: Análisis de Riesgos; Gestión de Riesgos; Indicadores de solvencia; Calificación crediticia; Seguro de Vida.

JEL classification: M41, M21, M00.

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1. CONTEXT OF THE STUDY

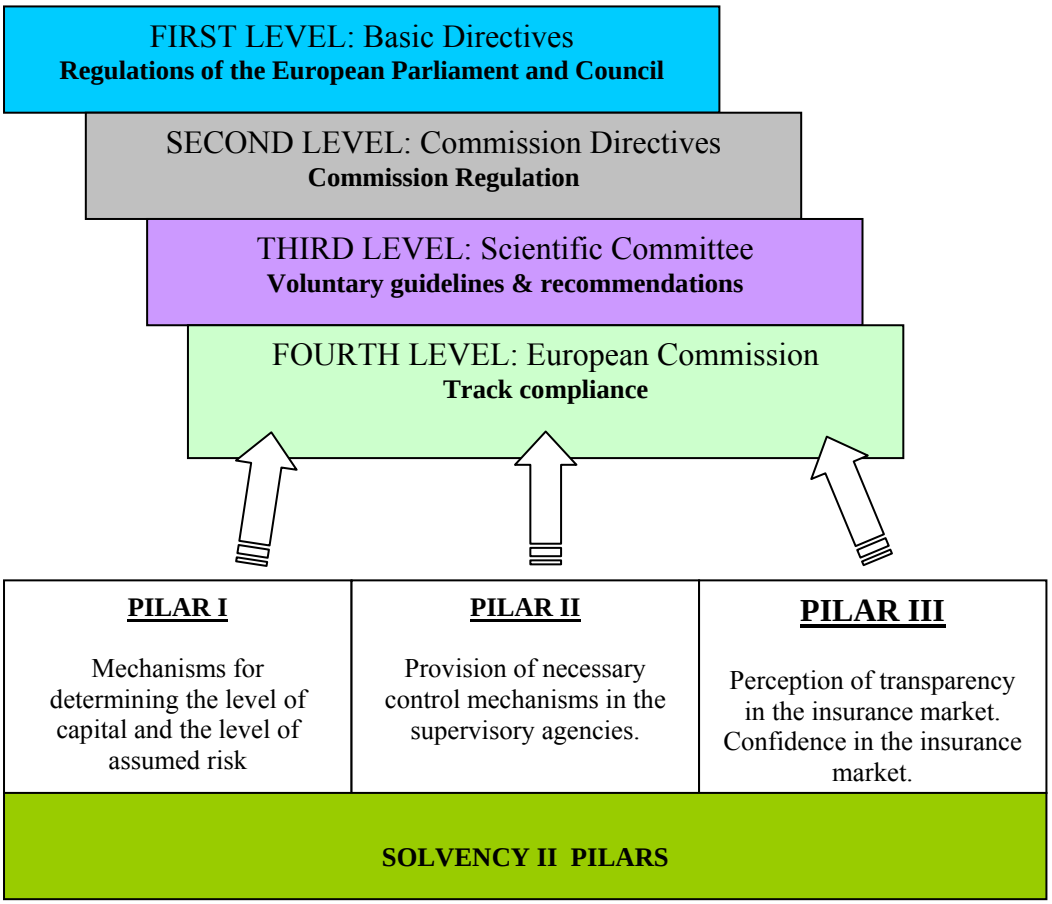
The risk associated with random events is the most important factor in the insurance environment, both in the field of life as well as in non-life. The risk concept is fairly generic, understood differently depending on the perspective of the person doing the consideration (Donati, 1960). Focusing on insurance as a tool, it is a case of being a preventive measure of an uncertain event, which in the case of life insurance it is known to occur but it is not known when that might come about and that in accounting terms is called estimated liabilities, and which are recognized by the provisions. It is an appropriate legal instrument to address the coverage of social security needs, which are growing in the quantitative area and changing in the qualitative area (Tapia, 2006). As in life insurance it is not always feasible to avoid risks, when they occur they usually result in a loss of revenue. This is why there is risk quantification and assurance. Given the situation that we are experiencing in recent years, as one of their priorities, insurance companies have to know how to correctly quantify the risks that affect them and with the appropriate mathematical-statistical techniques (techniques of univariante and multivariante regression, especially those based on generalized linear models and the copulas theory, for analyzing the nonlinear correlations between variables), in order to get a level of equity that is consistent with the carrying out of the activity. They conduct periodic analysis of their financial (solvency) capacity to deal with such risks. The risk measurement that these entities face is becoming increasingly important, especially following a policy that affects European Union countries, known colloquially as <<Solvency II>>. Its objective is to achieve a better defence of the European insurers through proper risk assessment. The principles that fall under this policy will mean a major change in the *modus operandi* of life insurance companies, as they will boost risk measurement tools for determining their own financial resource needs, as well as the design of systems for risk-based capital (Otero, 2005).

The origin of Solvency II was set out in the year 2001 with reports prepared by KPMG and by the conference on the supervisory activities of the EU member states. These reports have provided the basis for the development of the three core issues of Solvency II:

- The fixing of the three basic pillars on which the EU directive, similar to Basel II for credit institutions is based;
- The specification of solvency problems that insurance companies are facing, as well as their anticipation; and
- The establishment of quantitative capital requirements in order to address company risks, so that in this way they can be monitored.

The technical reports drawn up as the Solvency II development are called <<QIS>>. It has several chapters (QIS1, QIS2, QIS3, QIS4 and QIS5), the sixth being the one currently under development. Meanwhile, Solvency II is divided into four levels, shown in the following table 1.

Table 1. Levels & pillars of Solvency II



Source: Author, and from Solvency II, Alvarez (2006) & Romera (2011)

Solvency II works in Directive D.2009/138/CE, a framework directive that studies measures to develop further, and laid out in the second level. The objective sought is to achieve a level of significance of 0,5% and a time horizon of one year, that insurance companies have sufficient own resources in order to cope with the risks assumed *(*QIS5 Technical Specifications, 2010). With the establishment of these three pillars, three objectives are pursued. On one hand fostering and improving the integration of the single European insurance market, and also trying to make the sector competitive, to achieve convergence, and finally, monitoring among supervisors.

The insurance business is made up of, firstly, the payment of the premium by the insured party to transfer their risk to the insurer, and secondly, the acceptance of risk by the insurance company. The main source of income from a company comes from collected premiums that have to be optimal and efficient. These revenues are linked to financial profitability for the insurer by the investment of the premiums until the time of benefit pay outs arrives. The problem lies in which assets are desirable for the insurance company to invest the income, while maintaining a given pair solvency margin. Through the QIS5 technical report, certain standards of required capital are established and set down for life insurance companies. This minimum or legal margin of solvency is generally calculated, depending on the volume collected for each of the classes (general industry and life insurance), and particularly depending on the volume of established mathematical provisions.

According to data provided by Eurostat (2011) life expectancy has a growth characteristic. The effect that this phenomenon has on the solvency of the insurance company is that it has to correctly estimate the technical provisions to avoid coming up short in the back payments of benefits (Pozuelo de Gracia, 2008).

Risk quantification is determined by the premium to be charged to the policyholder, which will be greater according to the assumed risk, and requiring that insurers clearly define it. (Rivas, Pérez-Fructuoso y Montoya, 2009).

2. ANALYSIS OF FINANCIAL SOLVENCY IN THE LIFE INSURANCE SECTOR: AIM OF STUDY

The crisis of the 80's in the insurance sector has led to the development of insolvency models for forecasting bankruptcy in Spanish insurance sector companies (Moreno, 1992), by means of univariate and bivariate models, which have been developed ad-hoc and previously applied in other countries like the U.S. (Barniv, 1990). But in addition to these studies, aimed at establishing models for insolvency prediction, other studies have been done in order to determine the existence (or not) of correlation between certain variables and the future solvency of the insurer. In this way, in the study of Mora Enguídanos (1994) on the Spanish insurance sector, up to 30 ratios were analyzed based on accounting figures, some of them used as well for different types of insurer solvency analysis, such as discriminate analysis by rough methodology (Segovia *et al.*, 2003). Specifically, for Spanish life

insurers there exist earlier studies based on the analysis of financial variables shaped by solvency indicators, applied to samples of around 80 companies (Sanchez & Ruiz, 2008). Essentially, all the studies mention a set of ratios that can be grouped into three categories, as explanatory variables of the financial solvency for life insurance companies, that revolve around the following accounting aggregates: Benefit, Premiums and borrowings, which are compared by ratio with other significant magnitudes. Afterwards, the existence or not of statistically significant relationships between the explanatory variables and the dependent or explained variable is studied, which in the majority of studies is solvency.

A primary problem is that a unanimous view does not exist on what is understood as <<varying solvency>> object of contrast. There is a margin of solvency <<legal or minimum>> for the insurers that were established in the Spanish law R.D. 996/2000 of 9th of June, amending certain provisions of the Regulation and Supervision of Private Insurance. It is well established that insurance companies must maintain a certain solvency margin and it was written that "of an uncommitted equity with respect to all their activities". Subsequently in the Spanish law R.D. of 20th February, the Regulation and Supervision of Private insurance was modified, passed by R.D. 2486/1998 of 20th November. This amendment establishes, in particular in article 59, what items make up the unencumbered net equity (NPSC)[1]. Finally, in the R.D. 1317/2008, of 24th of July, the accounting Plan of the Underwriters was approved. The EU directive which adopted our rules already established that the minimum solvency margin should be determined for the life insurance sector as: SM=f1V + f2 (SA-V), where the margin (SM) depends on two variables: Total passive of the insurer (V) and SA (Total capital to pay out the arrival of loans), with two weighting factors (f1 and f2), respectively associated with the financial and population-actuarial risk (Celma, 2003).

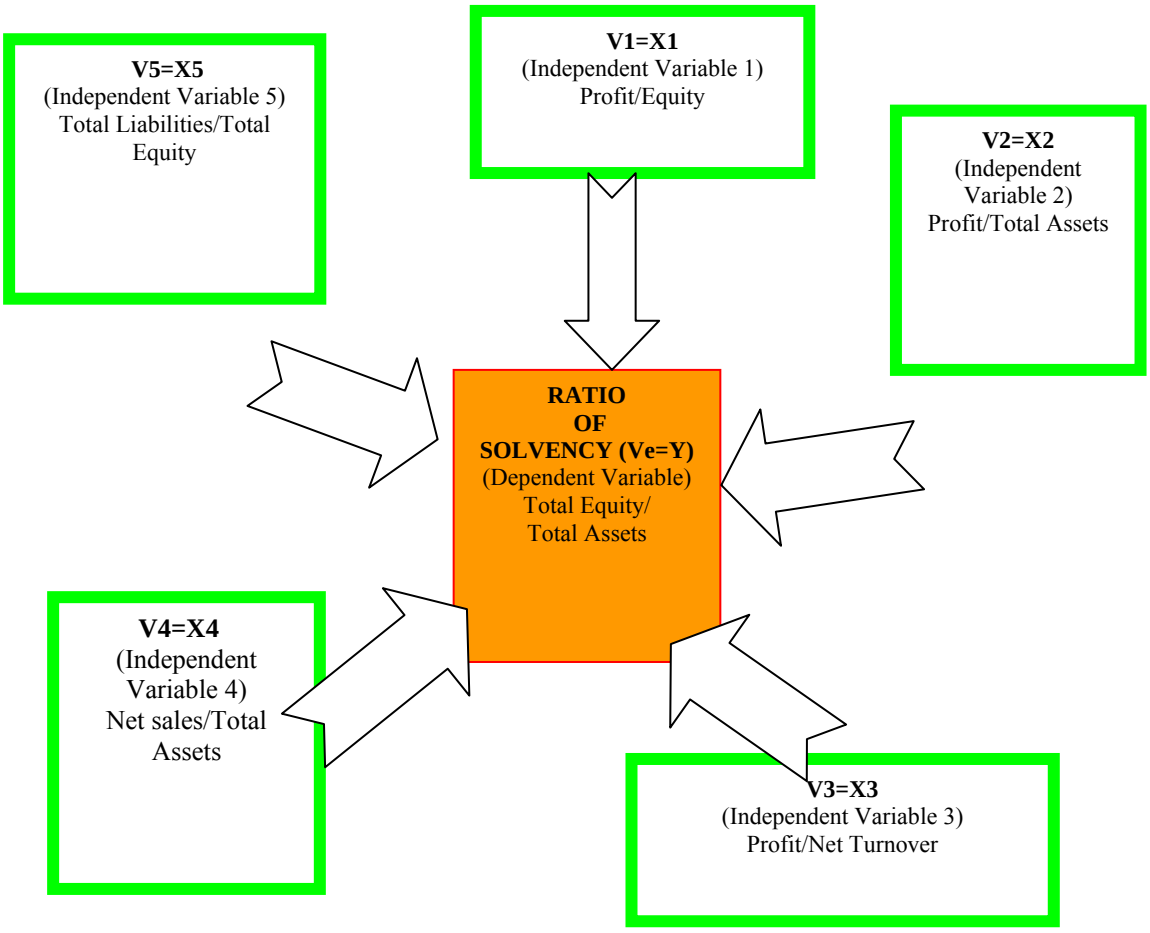
[1] In this sense, and in general terms: NPSC = Share capital paid out* + Revaluation reserve + emision Premium + Other equity reserves – Reserves art. 79.3.a amd 80.1 of the TRLSC – amount of own shares** -Unavailable reserves for pension plans and funds rules – Certain losses on regulated equity securites and part of the Remnant and part of the profit for the year aimed at incresing equity – Certain non-repayable contributions from partners and mutual.
*With qualifications for social and mutual fund equity holdings involving a control portfolio.
** Including the parent company and acquired for capital reduction.

In terms of financial indicators, due to the added processing of accounting information, an external user apart from the insurer would not have the necessary information to calculate the legal margin of solvency to use as an actuarial guarantee of future performance. Although this margin is usually available individually for each company in the Directorate General of Insurance and Pension Funds (DGSyFP), it is not shown compared to the sector. Moreover, it must be kept in mind that for financial solvency studies and continuity of the firm, it is not helpful to only use the legal or minimum solvency margin, because validity can only be checked at the end of the insurance, with the death of the insured or provision for the beneficiaries, but it is not useful to the insured party if the company will not be able to continue working, that is to say, if their continuity cannot be guaranteed (a reality from the start for a going concern). Therefore, in our study the financial solvency is adopted in terms of variable accounting and only minimal assets. Thus we have analyzed whether other variables can be used, strictly obtained with accounting magnitudes from statutory financial statements, from their obligation to file Annual Accounts. The analysis of the considered solvency, would take into account the stability of the firm over time, before reaching the insured risk to be addressed, allowing the beneficiary/insured party to select a company with projected continuity over time.

Thus these things are taken as the ability of the company to meet its payment obligations for a solvency ratio (Equity/Total Assets), It does not make sense to calculate if for the short term as inside the Accounting Plan for Insurance Companies (PCEA), approved by the Spanish law R.D. 1317/2008, of 24th July, following the route of the previous accounting plan, a boundary between current and non-current items is not fixed given the multi-year nature of the actual business of the insurers, as well as the relationship between the insurer activity and the investments where the income from premiums materializes (Millan, 2008).

And so the aim of this study is to identify whether a data panel can contrast the explanatory correlation between determined accounting variables and the financial solvency of the company, as if there was a sustained trend of such correlations in the period studied. The contrast of correlations is to be done using the data available in the Analysis System for Iberian Balances (SABI) for the analyzed period. A set of ratios as indicators of the solvency has been selected for the purpose (table 2).

Table 2. Indicator Solvency Variables



Source: Author

3. METHODOLOGY AND RESULTS

For insurance companies, reinsurance and pension plans, the number of Spanish companies stands at 4,102 according to the CNE-2009 65 code, contained in SABI. Their geographic distribution is reflected by percentage in Figure 1. Of these 4,102 companies, 49.6% are companies whose activity is purely in insurance, 3.4 % in reinsurance and 47% are companies in pension funds. Taking just the insurance companies, we are provided with

data broken down into life and general insurance areas. Life insurance represents 45.2%, with a total of 944 companies.

Our study, being based on the content of Solvency II, has been limited to companies dedicated strictly to insurance. Moreover we will consider the QIS5 report, dedicated to life insurance companies; therefore we will only select this field. Of these, the Spanish autonomous regions where around 15% is concentrated of the total volume of Spanish territory are C. A. de Andalucía, C.A. Catalana and C.A. de Madrid. Most take the form of a limited liability company (84.3%). Finally, our sample includes a total of 444 companies which make up the Spanish insurance sector with credit ratings assigned by SABI with a minimum level of 99% confidence. In turn, the sample is divided into three subsectors, according to the credit rating they were given beforehand in the data used, as shown in Table 3.

Table 3. Sampling Distribution Life Sector By Rating

Subsector	Percentage
High Quality Credit Rating (*Investment Grade*)	41.7%
Low Quality Credit Rating (*Non Investment Grade)*	45.5%
Risk	12.8%

Source: Compiled by Author from SABI

For each of these credit rating category subsectors we will analyze whether the explanatory variables are correlated with the solvency.

The statistical analysis was based on linear regression, taking the dependent variable <<solvency (Ve)>> and as independent variables which are shown in Table 2. The time interval considered for the analysis includes from 2008, when the Accounting Plan for Insurance Companies entered into force and until 2011. First, It was applied an analysis by simple linear regression and after by multiple linear regression. So, we can verify the individual weight of each independent variable in isolation. After by the multiple regression we can measure the combined effect of all independent variables.

3.1. Simple Linear Regression

The obtained correlations results by the **simple regression** is shown in the table 4.

Table 4. Linear Dependence

Catg/Year	2008	2009	2010	2011
Correlation Ve & V1				
A	-0.216	-0.246	-0.073	-0.302
B	-0.023	-0.017	-0.047	-0.005
C	-0.001	-0.103	-0.063	-0.087
Correlation Ve & V2				
A	0.189	0.008	-0.018	-0.110
B	0.27	0.349	0.948	-0.319
C	0.984	0.921	-0.038	0.911
Correlation Ve & V3				
A	0.005	0.152	0.004	0.042
B	-0.540	0.049	-0.057	-0.090
C	0.390	0.910	-0.033	0.265
Correlation Ve & V4				
A	-0.035	-0.176	-0.292	-0.204
B	-0.199	-0.501	-0.367	-0.537
C	-0.112	0.105	-0.655	-0.436
Correlation Ve & V5				
A	-0.215	-0.607	-0.340	-0.947
B	0.010	0.018	0.035	-0.045
C	0.053	0.106	0.118	0.007

Source: Author, Compiled from SABI

Regarding the existence of correlation between the solvency (Ve) and the proportion that saves the result on the equity of the company (V1), the low negative correlation can be seen. The variables evolve at different rates and inversely, and only for category A is the correlation more significant.

For Ve considered in function of V2, only in credit rating category C can it be seen that the evolution of earnings on assets has a positive impact on the solvency of the company, so that the higher value of the highest solvency ratio, with the exception of 2010. This may be due to the accentuation of the

crisis in that year which meant that the minor activity of the insurers in addition to implying a lower result implied such an excessive economic structure (active) for the volume of business.

The outcome considered on net sales figure (V3) is explanatory of the solvency (Ve). Only in a few years for companies in category C. Therefore the existence of sustained correlation in the time cannot be affirmed.

The correlation between the solvency (Ve) and the proportion that holds the net sales figure for total assets (V4) shows a stable trend for companies with credit rating A, where the variables move in different proportion and different direction, although the level of linear dependence is quite low.

The correlation between the solvency (Ve) and the proportion that keeps the ratio of total liabilities to equity, called Financial Leverage (V5), in credit categories B and C make a stable trend in regard to the linear dependence existing between the studied variables. However, the category A has irregular situation in time.

3.2. Multiple Linear Regression

The results of the multiple regression are shown in the table 5. So we difference the "R" for each year and credit rating.

Table 5. Multiple regression

Model A	**R**	**R^2**	**Model B**	**R**	**R^2**	**Model C**	**R**	**R^2**
2008-A	0.879	0.773	2008-B	0.636	0.404	2008-C	0.920	0.847
2009-A	0.830	0.689	2009-B	0.420	0.177	2009-C	0.984	0.969
2010-A	0.830	0.689	2010-B	0.667	0.445	2010-C	0.826	0.682
2011-A	0.830	0.689	2011-B	0.375	0.141	2011-C	0.291	0.850

Author by SPSS, Data from SABI.

The results of the multiple lineal regression show that the global effect of all variables together is better than one to one in each rating. So we can say that the isolated effect for each independent variable is not representative to measure the Spanish life insurance industry's solvency. So each independent variable is not enough to explain the solvency. For all ratings the correlation

"R" is higher than in the simple regression. We can see that it has obtained higher results for "R" and "Squared R" in all ratings. The best results are for the A rating. This is a stronger indicator of the search. This is consistent with the rating of less likely to bankrupt this companies receiving. We can observe like the results for the two first years for the companies of C rating continue being high. The only possible explanation is the low assets volume maintained for these companies as we note in the simple regression.

So it is necessary to perform a complementary analysis by hypothesis testing of Beta coefficients.

3.3. Hypothesis Testing

The model to test is a mathematical expression like the one shown:
$Y=\beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \varepsilon$; where "Y" is the dependent variable (Solvency).

So the independents variables are X_1 to X_5. Where:
$X_{1=}V_{1;}\ X_{2=}V_{2;}\ X_{3=}V_{3;}\ X_{4=}V_{4\ and}\ X_{5=}V_5$

So we propose the follow hypothesis to test:

H_o: $\beta_{i=}0$ $_{(i=1\ldots5)}$
H_1: Some $\beta i_{\neq}0$

$\Leftrightarrow$

H_o: R=0
H_1: R≠0

Accepting H_o , this implies that the explanatory of independent variables taken together would not provide meaningful information to the regression analysis. So the "Y" variable is understood as a linear combination of a set of independent variables, so the graphical representation is unhelpful. From SABI data variables have been developed. We have made the data treatment using SPSS software. The abstract of the non standardized coefficients is shown in Table 6. This allows us to introduce the multiple regression equations for the A rating.

Table 6. Beta coefficients for A rating

Model A-2008		Unstandardized coefficients		Standardized coefficients		Sig.
		B	S error	Beta	t	B
1	(Constant)	0.235	0.173		1.355	0.247
	X1	-0.188	0.087	-0.667	-2.158	0.097
	X2	-0.225	0.230	-0.243	-0.975	0.385
	X3	0.143	0.078	0.508	1.845	0.139
	X4	-0.003	0.247	-0.006	-0.014	0.989
	X5	-0.014	0.025	-0.232	-0.550	0.612
Model A-2009		Unstandardized coefficients		Standardized coefficients		Sig.
		B	S error	Beta	t	B
1	(Constant)	-0.383	0.298		-1.285	0.289
	X1	-1.115	0.761	-0.968	-1.465	0.239
	X2	0.983	0.876	0.496	1.123	0.343
	X3	1.554	0.723	1.311	2.149	0.121
	X4	-0.109	0.529	-0.098	-0.205	0.851
	X5	0.042	0.035	0.498	1.210	0.313
Model A-2010		Unstandardized coefficients		Standardized coefficients		Sig.
		B	S error	Beta	t	B
1	(Constant)	0.100	0.522		0.192	0.857
	X1	0.383	0.438	0.306	0.873	0.432
	X2	-3.942	4.361	-0.625	-0.904	0.417
	X3	0.882	0.310	0.977	2.845	0.047
	X4	0.525	1.253	0.210	0.419	0.697
	X5	-0.004	0.099	-0.024	-0.045	0.966
Model A-2011		Unstandardized coefficients		Standardized coefficients		
		B	S error	Beta	t	Sig.
1	(Constant)	0.373	0.106		3.516	0.025
	X1	-0.656	0.321	-0.687	-2.044	0.110
	X2	-0.006	0.095	-0.026	-0.068	0.949
	X3	-0.428	0.198	-0.754	-2.159	0.097
	X4	-0.119	0.138	-0.341	-0.861	0.438
	X5	0.053	0.048	0.599	1.098	0.334

Author by SPSS, Data from SABI.

So with the results from table 4 we can conclude that the H_o is refuted in A category. Therefore the model is more explanatory for A and C categories of rating. While the significance measured by sigma is not good for some variables and years of search.

Similar results were obtained for B and C categories.

Keep in mind that these coefficients are not independent. Thus the interpretation for the X1 in 2008 (-0.188) implies that if X1 increased by 1 unit, on average increase solvency -0.188 units, assuming that other variables are held constant.

The relative importance for each independent variable in the equation is measured by standardized coefficients. The higher the value of these coefficients entails a greater effect in the solvency. Therefore, we can highlight in our model the importance of contribution of X3 (Profit/Net Turnover).

4. CONCLUSIONS

Social responsibility has also been extended to insurance companies, especially in the field of life insurance, because of the economic effects that possible insolvency may cause. The demand for more and better economical and financial information must be linked to the ability of potential users to interpret the meaning of this information. It must be kept in mind that there are multiple groups of users of such information, it being necessary to provide an informative common denominator, intelligible to users of the annual accounts.

As conclusions derived from the statistical analysis carried out, we can highlight that Spanish life insurance companies which have been assigned a higher credit rating (rating A) are shown that the weighted return on total equity has increased finding to determine its financial solvency situation, and so therefore the benefit thus considered could be used as an indicator of solvency. Solvency is also determined by its relation to the profit on the assets of the life insurance companies, the lower the credit rating. This cannot be due to profit growth, but because these companies maintain a minor economic structure (minor assets), with the lower cost involved.

It cannot be established that the part of the benefit is determined by the number of sales is the only variable in determining the solvency of

companies. Given that net sales in the life insurance companies will be composed basically by premiums charged to policyholders, it may be said that part of the result owing exclusively to those premiums is not shown as a determinant of solvency stability for life insurers. This indicates that looking to stability analysis of financial solvency for life insurers is not the most appropriate to take only the minimum or statutory solvency margin provided by the DGS and FP, which is determined around the premiums, but a broader concept, such as financial solvency (as a variable between accounting magnitudes). However, the volume of assets are indeed shown as a determinant.

The results of the multiple linear regression allow confirm that there is a significant correlation between independents variables and dependent variable. These can be used to explain the solvency in each rating classification considered. Although this model has a low significance for a lineal model for some variables. In this regard the high numbers taken for X2 (Profit/Total Assets) and X4 (Net sales/ Total assets) in some years can indicate that is necessary to apply another non linear model.

Also we want to emphasize that the ratio Profit/Net Turnover (X3) is what more explanation brings to the solvency to the Spanish life insurance companies.

Therefore, given the social significance that would accompany a bankruptcy of an insurance company it would be desirable to provide more information. Perhaps within the financial information that the companies issue. For example, the legal solvency margin set down by law, the relationship of certain financial variables with the solvency of the organization, understood as a continuation of the firm over time.

Thus it is proposed that for insurance companies, especially life branch insurers, that more detailed information on the correlation between certain accounting and solvency ratios is offered, unique information only accessible to the average user through the annual accounts.

Also is necessary to model more explanatory variables to measure the effects of accounting numbers in the tendency to the bankruptcy of the Spanish life companies.

Need to further study what are the variables that influence it. Just as what kind of relationship should be applied to the model. No rule analyzed in future studies if for some variables is better a nonlinear model.

In this sense we have only taken the first steps to meet the demand for more and better information requested by users (mainly insured people).

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