

# **ADEQUACY OF THE MINIMUM SOLVABILITY RATIO IN THE PORTUGUESE BANKING SECTOR**

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## **ABSTRACT**

The efficient control by the banking sector's supervising authorities of the methodologies adopted by banks in the measurement of their assets' risks is a key determinant of solvency. Such task has stressed the need to evolve and adopt improved techniques, contained in the Basle Accord II, for the calculation of minimum levels of own funds that individual banks have to guarantee in order to safeguard the risks incurred in their activities.

The assessment of the suitability of the minimum solvency ratio, currently of 8%, for the Portuguese banking sector, is the aim of this empirical research, developed with techniques of multivariate analysis (factorial analysis, clusters analysis and canonical correlations analysis) to classify and condense data in a multidimensional context. These techniques allowed the study of the relationships between banks' economic and financial performance and their levels of solvability, as well as the hierarchical segmentation of the banking sector, which uncovered the existing asymmetries of credit quality, dimension and solvability.

The study suggests that the minimum solvency ratio is not adequate, given the variety of banking institutions operating in Portugal, and that a differentiation, respecting the identified clusters and the distinct levels of risk, is needed to enhance solvability.

**Keywords:** solvability, hierarchical segmentation, canonical correlations, Basel Accord II.

## 1. STUDY PRESENTATION

Financial institutions in general and banking in particular, are specialized in risk-taking and can only survive if they make an adequate risk management. A proper risk assessment is a key aspect of the bank solvency. Therefore is natural the Portuguese authority's concern oversight on this issue and the efforts developed in order to align our system with international best practices, considering the Basel Accord II.

The performance of the banking sector affects country's economy and occupies a prominent place in the concerns of depositors, investors, analysts, managers, regulators and governmental institutions. In fact, a decrease in the level of confidence in any of these entities may result in a sudden run on deposits, causing a banking crisis with effects increasingly extended.

The supervising authority tries to make an effective control over the levels of financial system solvency, in order to ensure that it achieves the minimum stipulated in terms of the relationship between capital and risk-weighted assets. The pursuit of this objective led Banco de Portugal to give the Instruction No. 15/2007 on the ICAAP (Internal Capital Adequacy Assessment Process), which establish rules for the evaluation and accurate determination of the level of internal capital, underlying risk profile of each institution. As a consequence banks with higher rates of failure have a higher level of internal capital.

Given the relevance of this question, the supervision authority has to ensure that the financial system meets the minimum stipulated solvency. Considering that the level of risk must be understood as a subjective factor, it's becomes relevant to analyze in this work the adequacy of the indicator minimum 8% solvency to the reality of the Portuguese banking institutions. To achieve this goal, we developed this research in two steps: (i) to select homogeneous subgroups to identify profiles, through which it is possible to characterize the banks both in dimension and level of credit quality (ii) to analyze the impact of solvency ratio in the organization of the clusters identified above.

The base of the first stage relies on the implementation of the LACP, with SPSS 16, to reduce the initial set of variables (characterizing the bank's dimension and credit quality) only in two components. It is possible by cluster analysis, to obtain homogeneous groups of banks with

similar characteristics in terms of dimension and credit quality. It is possible, even not considering the solvency ratio, to analyze how banks are grouped according to their characteristics of credit quality and dimension. As it will be demonstrated below, we can reach a reduction in the number of clusters, over the six years under review, that show the trends of increasing concentration in certain sectors of banking activity.

With these data, we analyze the impact of the indicator of solvency in the formation of the indicated groups using the analysis of canonical correlations. It was verified that over the six years some banks appear isolated. These institutions have very high solvency ratios, are very specialized and have high credit risks, targeting a population with extremely specific characteristics. Given the diversity of agents operating in the country should be asked a universal indicator of solvency. In fact, higher the risk, higher it should be the requirements of the supervisory authority with regards to the solvency indicator.

### 1.1. Population Target

The population target was defined by a directed non-probability sample of twenty banks listed in the table below, and operating over a time horizon of six years (from 2002 to 2007) in the Portuguese market. These banks represent approximately 98% of the domestic banking sector in Portugal.

BANK	Sigla de Identificação
Banco Comercial Português	BCP
Banco Português de Investimento	BPI
Banco Espírito Santo	BES
Banco Santander	SANT
Caixa de Crédito Agrícola	SIC
Caixa Geral de Depósitos	CGD
Banif	BAN
Finibanco	FIN
Montepio Geral	MON
Banco Português de negócios	BPN
Banco Popular Portugal	BP
Banco Bilbao Vizcaya Portugal	BBV
Banco Mais	BMA
Banco de Investimento Global	BIG
Banco Finantia	FINA
Banco Cetelem	CET
Banco Itaú Europa	ITA
Banco Africano de Investimentos	BAI
Doutshe Bank Portugal	DB
Credifin	CRED

## 1.2. Variables Selection

This study is based on data collected in the Annual Reports and Accounts for the years 2002 to 2007 for the twenty banks identified. We selected the sets of variables that are listed below:

<b>Metric Variables</b> <b>Dimension</b>
1. Total Assets 2. Equity 3. Credit 4. Staff expenses 5. Net Profit 6. Tangible Asset 7. Interest Income

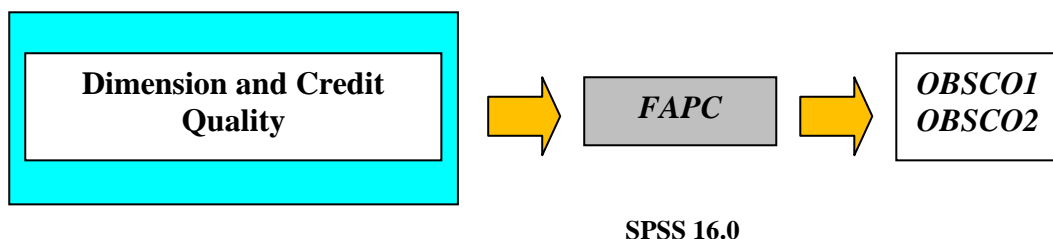
<b>Metric Variables</b> <b>Credit Quality</b>
1. CVCC: Default credit/ Total Credit 2. IPCV: (Impairment/Provisions) / Total Credit

<b>Independent Variables</b> <b>Performance</b>
1. ROE: Return on Equity 2. ROA: Return on Assets 3. CVCC: Default credit/ Total Credit 4. IPCV: (Impairment/Provisions) / Total Credit 5. CPPB: Staff Expenses/ Bank Product 6. CTin: Cost income ratio 7. RL: Liquidity ratio

<b>Dependent Variables</b> <b>Solvability</b>
1. RS: Solvability Ratio 2. TIER I

## 2. STUDY DEVELOPMENT

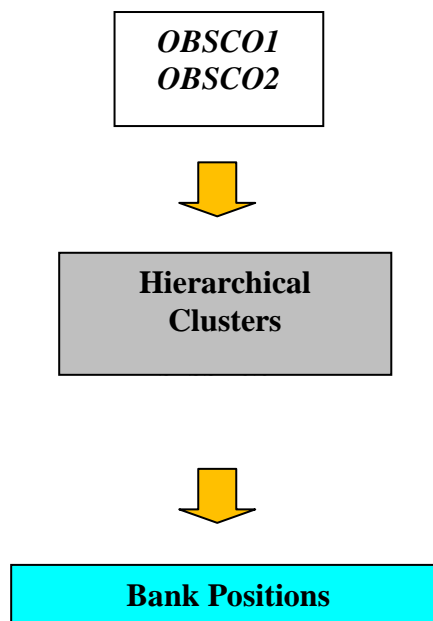
### Factorial Analysis of Principal Components



Based on the first and second set of variables selected for this study (consisting of nine variables that characterize the dimension and credit quality of banks), using the FAPC (Factorial Analysis of Principal Components) with the SPSS 16 software. The purpose of this procedure is to reduce the original set of variables to a smaller set of components, assuring the characteristics of the original variables. The aim is to reduce the initial variables in two components (Object Score 01 and Object Score 02).

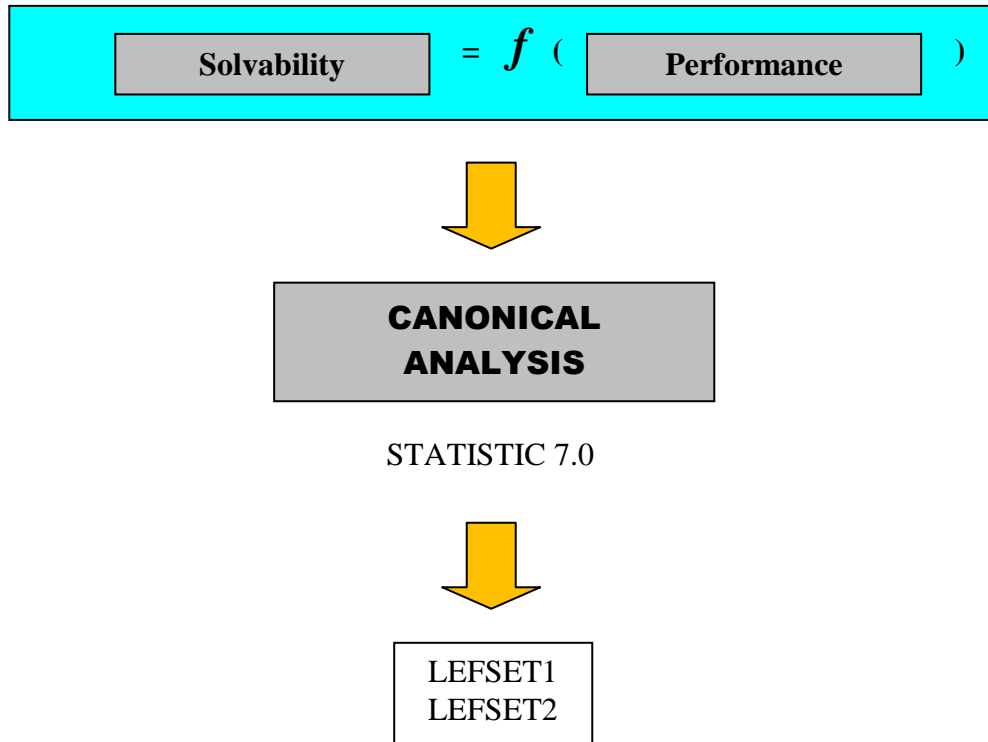
After obtaining the two components, we can present it in a two-dimensional representation for easy reading. The choice of FAPC is justified by the fact that it is a exploratory multivariate analysis technique that transforms a set of correlated variables into a smaller set of independent variables which are linear combinations of original variables, called principal components.

### **Hierarchical Segmentation**



The goal of the second stage of the study is to classify the banks under review, according to the Object Score obtained in the first step. To this end, we resort to cluster analysis as it allows the organization of a group of individuals for which information is known. The aim is to form homogeneous groups of banks, according to its characteristics in terms of dimension and credit quality.

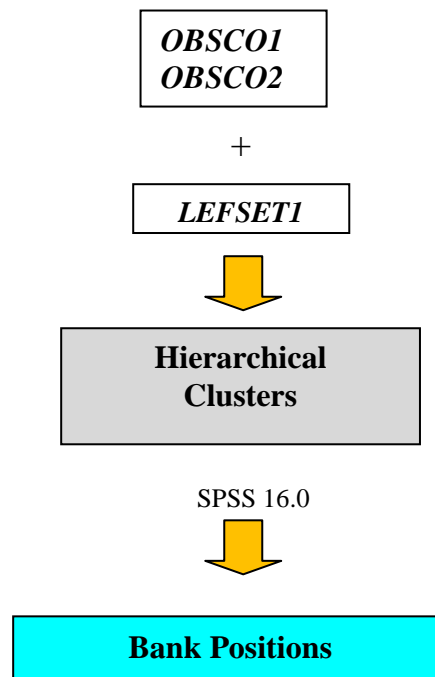
## Canonical Correlation Analysis



In this step, we analyze the relationship between the economic and financial performance of banks with the solvability variables. Thus, based on the third and fourth set of variables, consisting respectively of seven and two variables, we developed a canonical correlation analysis.

This method deals with the relationship between a set of independent variables and a set of dependent variables. The aim is to find the scores for each sample in a two-dimensional space (canonical scores), obtained through the statistically significant canonical function. Based on the two object scores obtained in the first stage, and the canonical score obtained in this step, we develop once again the hierarchical segmentation for the institutions studied.

## Hierarchical Segmentation

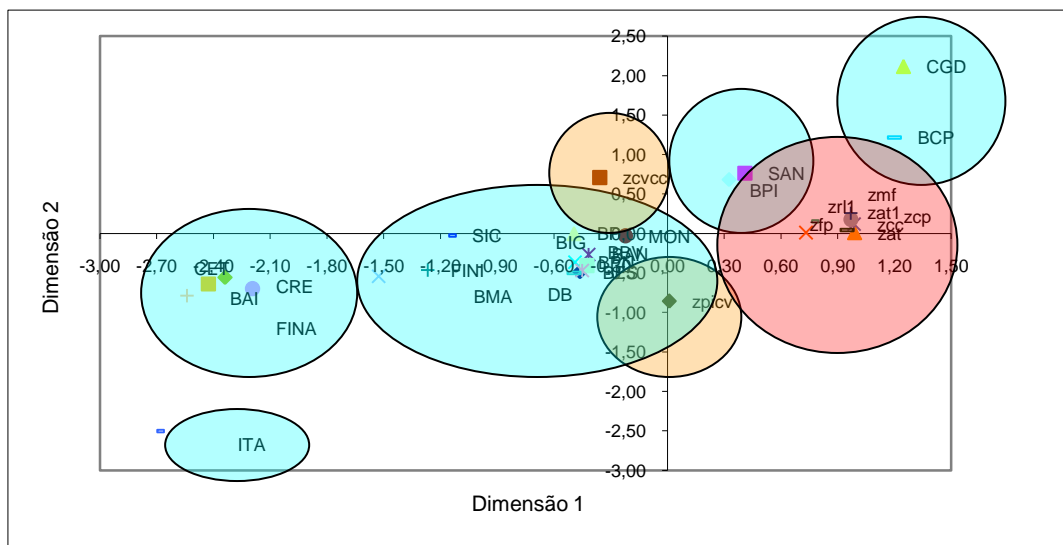


We intend to perform a hierarchical segmentation of banks, using the same procedures and criteria used in the second stage. Now, the main goal is to form homogeneous groups of banks, according to its characteristics in terms of solvency, dimension and credit quality.

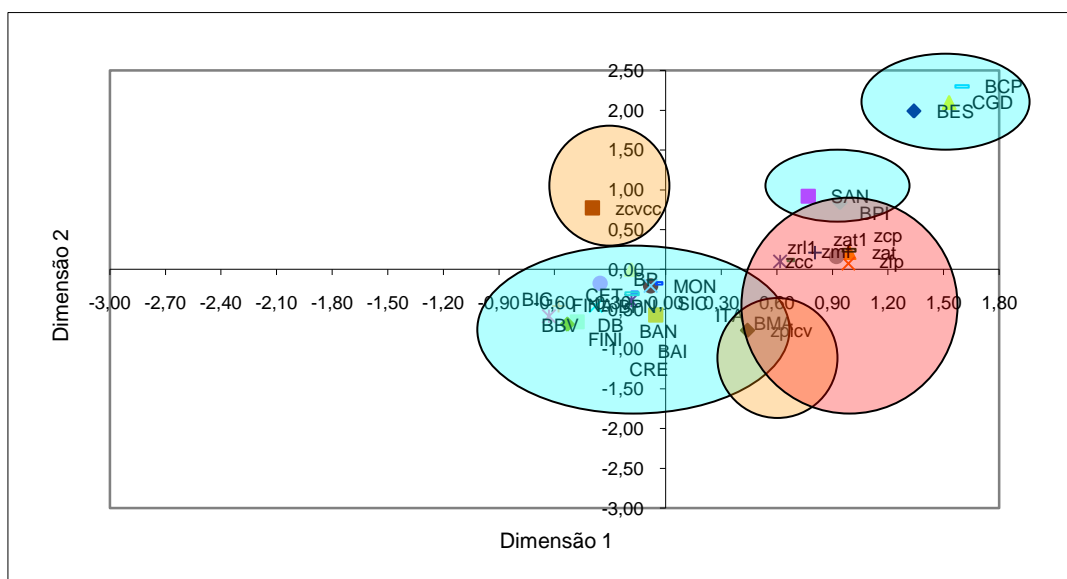
### 3. STUDY RESULTS

Then are present the Clusters Obtained:

First year (2002)



Last Year (2007)



Ano 2002	
With Solvability	Without Solvability
<b>Cluster 1:</b> FINANTIA, BAI, CETELEM e CREDIFIN <b>Cluster 2:</b> SANTANDER e BPI <b>Cluster 3:</b> FINIBANCO, BMAIS, SICAM, BPN, BBVA, BES, BIG, DB, BANIF, BP e MONTEPIO <b>Cluster 4:</b> ITAU <b>Cluster 5:</b> CGD e BCP	<b>Cluster 1:</b> FINANTIA, BAI, CETELEM e CREDIFIN <b>Cluster 2:</b> SANTANDER e BPI <b>Cluster 3:</b> FINIBANCO, SICAM, BES, BPN, DB, BANIF, BP, BBVA e MONTEPIO <b>Cluster 4:</b> BIG <b>Cluster 4:</b> CGD e BCP <b>Cluster 5:</b> BMAIS <b>Cluster 6:</b> ITAU

Ano 2003	
With Solvability	Without Solvability
<b>Cluster 1:</b> FINANTIA, BAI, CETELEM, BMAIS, FINIBANCO, MONTEPIO, SICAM, BPN, BANIF, BBVA, DB, BIG e BP <b>Cluster 2:</b> ITAU <b>Cluster 3:</b> CREDIFIN <b>Cluster 4:</b> SANTANDER, BPI e BES <b>Cluster 5:</b> CGD e BCP	<b>Cluster 1:</b> FINIBANCO, CETELEM, MONTEPIO, FINANTIA e SICAM <b>Cluster 2:</b> BBVA, DB, BANIF e BP <b>Cluster 3:</b> BPN e BIG <b>Cluster 4:</b> SANTANDER, BPI e BES <b>Cluster 5:</b> CREDIFIN e BAI <b>Cluster 6:</b> CGD e BCP <b>Cluster 7:</b> BMAIS <b>Cluster 8:</b> ITAU

Ano 2004	
With Solvability	Without Solvability
<b>Cluster 1:</b> BMAIS, CETELEM, FINANTIA, BAI, SICAM e CREDIFIN <b>Cluster 2:</b> BIG, DB, BBVA, BP, BPN, BANIF,	<b>Cluster 1:</b> BBVA, DB, BANIF, BP, MONTEPIO, FINIBANCO e BPN <b>Cluster 2:</b> SANTANDER e BPI



FINIBANCO e MONTEPIO <b>Cluster 3:</b> ITAÚ <b>Cluster 4:</b> SANTANDER, BPI e BES <b>Cluster 5:</b> CGD e BCP	<b>Cluster 3:</b> FINANTIA, CETELEM, SICAM e BAI <b>Cluster 4:</b> CREDIFIN <b>Cluster 5:</b> BES, CGD e BCP <b>Cluster 6:</b> BMAIS e BIG <b>Cluster 7:</b> ITAÚ
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Ano 2005	
With Solvability	Without Solvability
<b>Cluster 1:</b> FINANTIA, BAI, CETELEM, BMAIS, FINIBANCO, MONTEPIO, SICAM, BPN, BANIF, BBVA, ITAU, BP e CREDIFIN <b>Cluster 2:</b> BIG <b>Cluster 3:</b> CGD e BCP <b>Cluster 4:</b> SANTANDER, BPI e BES	<b>Cluster 1:</b> BPN, DB, BANIF, MONTEPIO, BP, CETELEM, FINIBANCO e BBVA <b>Cluster 2:</b> SANTANDER, BPI e BES <b>Cluster 3:</b> CREDIFIN, BAI, SICAM, FINANTIA e BMAIS <b>Cluster 4:</b> CGD e BCP <b>Cluster 5:</b> ITAU <b>Cluster 6:</b> BIG

Ano 2006	
With Solvability	Without Solvability
<b>Cluster 1:</b> FINANTIA, BAI, CETELEM, CREDIFIN, FINIBANCO, BMAIS, SICAM, BPN, BBVA, BIG, DB, BANIF, BP, ITAU e MONTEPIO <b>Cluster 2:</b> SANTANDER, BPI e BES <b>Cluster 3:</b> CGD e BCP	<b>Cluster 1:</b> BBVA, DB, BP, CETELEM, BANIF, FINIBANCO, BPN, FINANTIA, e MONTEPIO <b>Cluster 2:</b> BAI <b>Cluster 3:</b> SICAM e BMAIS <b>Cluster 4:</b> BIG e ITAU <b>Cluster 5:</b> BES e SANTANDER <b>Cluster 6:</b> CGD e BCP <b>Cluster 7:</b> BPI <b>Cluster 8:</b> CREDIFIN

Ano 2007	
With Solvability	Without Solvability
<b>Cluster 1:</b> FINANTIA, BAI, CETELEM, BMAIS, FINIBANCO, CREDIFIN, ITAU, BIG, MONTEPIO, SICAM, BPN, BANIF, BBVA, DB, e BP <b>Cluster 2:</b> SANTANDER e BPI <b>Cluster 3:</b> BES, BCP e CGD	<b>Cluster 1:</b> BPN, FINIBANCO, BP, BANIF, MONTEPIO, CETELEM, DB e FINANTIA <b>Cluster 2:</b> CREDIFIN, BAI, BMAIS e SICAM <b>Cluster 3:</b> BPI <b>Cluster 4:</b> BES, BCP e CGD <b>Cluster 5:</b> SANTANDER <b>Cluster 6:</b> BBVA, ITAU <b>Cluster 7:</b> BIG

After grouping the institutions of the financial system according to their dimension and credit quality (credit defaults), it was possible to verify a reduction in the number of clusters, which decreased from five in 2002 to just three in 2007. The third cluster includes the three largest banks, the second is made up of the two institutions of medium/large dimension and the first one consists of the other institutions of middle and small dimension.

The initial identification of clusters, made in the first and second stages of the study, is complemented with an extensive analysis of solvability variables. It was found that, in some years, the identified clusters did not change significantly. However, there is a new scenario with a large number of outliers. Some of the institutions that had previously integrated a cluster then appeared as isolated institutions in other words (no longer as part of a cluster) as a result of solvability variables.

The comparison of clusters with and without solvability variables enabled us to observe a change in the position of banks in the clusters. This revealed a mismatch between the level of risk of the institution and its solvability indicator. If one compares 2002 to 2007, one can notice that in 2002 there were no major changes in the formation of clusters, except in the cases of BMAIS and BIG, which became outliers as a consequence of the atypical solvability ratios. Thus, in 2002, one can observe a match between the evident risk level of the financial institutions and their solvability indicator. In the case of the last year considered in this study only the cluster made up of larger institutions (BES, CGD and BCP) remained the same. In the other clusters there was not such correspondence between the institutions' risk level and their solvability.

If we analyze the six years in study, one can notice that solvency ratios were of 8% in the case of institutions such as CGD, 20% in the case of institutions like BMAIS, or ITAU, or up to 30% in the case of BIG, which shows a lack of correlation between dimension and the solvability indicator. What one can notice is a possible relationship between high solvability ratios and atypical and / or highly specialized institutions, whose risk levels are much higher than the average, as we can see in the provided examples.

A large cushion of capital, well above the minimum required by the supervising authority, results mainly from these institutions' need to safeguard higher risk levels or from the difficulty in quantifying them. This situation can be justified by the low diversity of their assets and by the fact that they specialize in very limited business areas. Thus, they seek to strengthen their solvency ratio as a result of internal management decisions and not by imposition of the supervising authority. In this context, as these institutions' solvability ratios are higher than the required minimum (even though they could operate with ratios of only 8%), one can consider that the current supervision system does not promote the necessary stability of banking institutions because it does not distinguish different types of banks with different risk levels.

Due to the large number of agents operating in the country, in terms of dimension, credit quality and solvability, the idea of a common solvability ratio should be questioned by the supervising authority. This indicator should be adequate to the reality of each institution. If this does not happen, the role of the supervising authority may become weaker.

Considering what was mentioned above, it is highly recommended that the supervising authorities control not only the minimum solvability ratio of 8% but also its adequateness to the risk level of each institution. Therefore, one can stress the importance of this study, which enabled the grouping of banks in clusters according to their dimension, credit quality and solvability.

Also Boucinha (2007) states in his study that, although own funds are the most expensive source of funding, in general terms, banks must maintain solvability ratios well above the required minimum, ie banks with the highest risk must hold higher capital reserves.

In his study Boucinha proves that higher capital reserves are a significant tool to avoid their insolvency. However, larger banks are the ones that tend to be less concerned with their cushion of capital due to the fact that they feel to be somehow more protected by the supervisory authority. The results confirm the idea that banks adjust their capital reserves in response to changes in their risk levels.

#### **4. CONCLUSIONS**

As a result of the first two phases, one can conclude that the number of clusters initially identified decreased over time, revealing increasing stability and consistency and reflecting an apparent concentration of certain banking sectors. In the last year of this study, the twenty institutions included in the sample were grouped in only three clusters, two of which comprising only five institutions, which represent over 70% of the banking product sector. The remaining fifteen institutions, which specialize mainly in consumer credit activities, are grouped into a third cluster of little relevance in our financial banking system.

These results suggest that in the period under review, the Portuguese banking system has, , evidenced increasing concentration, and there is a trend for large groups to absorb some less

competitive institutions. However, the study indicates that there are exceptions regarding the concentration trend, which may be justified by the fact that some smaller institutions are of little interest to larger ones, because they are institutions which specialize in very specific areas with higher risk levels. That is the case of BIG, BMAIS, CETELEM and ITAU.

The introduction of the solvency indicator in cluster analysis led to some significant changes, including the changes in the position of banks in clusters, suggesting a mismatch between the risk level of each institution and its solvability indicator. Moreover, it became evident that the solvability ratio is not associated with dimension criteria, because some institutions of large dimension present a solvability ratio of only 8% (e.g. CGD and BCP) and there are some small institutions with solvability ratios of approximately 30% (e.g. ITAU and BIG). What one can notice is the possible existence of a relationship between high solvability ratios and atypical institutions specialized in very specific areas. Therefore, it can be concluded that the cases in which solvability ratios are approximately 20% or 30% (which can be identified as outliers) result from the need of some institutions to protect themselves from higher risk levels, which are usually uncertain and difficult to quantify.

However, according to the supervising authority, these institutions could operate with a ratio of only 8%. So one can conclude that, on the one hand, higher cushions of capital do not provide more solvability to these institutions; on the other hand, it becomes evident that the minimum ratio of 8% is not suitable to all institutions, due to the fact that they decide to operate with higher solvability ratios levels as a result of internal management policies.

This study leads us to conclude that the minimum value of the solvability ratio should be established by the supervising authority considering the characteristics of each institution. The higher the possibility of risk variation, the more demanding the supervising institution should be as regards solvability ratios.

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