Chapter 49
Using Self Organizing Maps for Banking Oversight
The Case of Spanish Savings Banks

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ABSTRACT

This chapter combines two methods based on neural networks (trait recognition and self-organizing maps) to develop a model of bankruptcy prediction. The authors apply the method to the Spanish savings banks, most of them rescued by the Government between 2008 and 2013 in a costly massive process. First, the authors detect the combinations of variables (performance, asset structure, and capitalization) that best describe the profile of the rescued savings banks. Then, the authors use these combinations on a yearly basis to generate bi-dimensional maps in which banks are placed according to their risk and similarities. This method provides a visual tool that can improve the oversight of policy makers on the whole financial system and enable time pertinent answers to some threatens to the country financial stability. The maps are useful means to detect and understand how the financial threats emerge over time too.

1. INTRODUCTION

In the latest decade Spain has witnessed how the recent world financial crisis has evolved into an economic crisis with devastating effects on the households' wealth, the labor market, and the State national accounts. Between 2007 and 2012, the financial wealth of Spanish households has decreased by € 167 billion, the rate of unemployment has jumped from 8.8% to 26.2%, and the 2% public surplus has turned into a 10.6% public deficit. As a consequence of this distressing scenery, the risk premium on the Spanish Treasury Bill reached a troublesome 610 points peak in the summer of 2012. The international concerns on the stability of the whole Spanish financial system led to the so-called Memorandum of Understanding on financial-sector policy conditionality, as a response to the request of the Spanish Government for

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external financial assistance. The financial authorities committed to take all the necessary measures to implement a far-reaching program of restructuring and recapitalization of the Spanish banking sector under the close scrutiny of the International Monetary Fund (IFM), the European Commission, and the European Central Bank.

As stated in the Memorandum of Understanding, with the exception of a few large and internationally diversified credit institutions, Spanish banks had lost access to wholesale funding markets on affordable terms. As a result, these banks had become highly dependent on Eurosystem refinancing. Moreover, the borrowing capacity of Spanish banks had been severely limited by the impact of rating downgrades. And, if this applies to most of the Spanish financial institutions, the savings banks were the most troublesome ones and played a prominent role in this crisis episode (Cardenas, 2013).

The origin of savings banks can be found in the old thrift institutions (*Montes de Piedad*) from the 19th century, whose main objective was to channel people's savings toward investments and to perform a social task in their territories. The savings banks evolved into financial institutions that did not distribute profits, with no formal owner and pursued a wide array of competing (if not conflicting) goals, including the fulfillment of social functions. As stated by the IFM (2012), since savings banks did not have any share capital, their ability to raise external equity capital was limited. In the absence of shareholders, the control exercised over these entities was not coupled by the legal ownership of shares, and therefore their corporate governance model differed considerably from that of commercial banks. Furthermore, savings banks were characterized by a significant involvement of local governments and political parties, with the obvious conflict between the public sector as regulator and the presence of public stakeholders in the governance bodies. In this way, the allocation of responsibilities in the regulation and supervision of the savings banks was grounded on a delicate balance between central and local powers.

During the deregulation process of the Spanish financial markets from the 70s in after, the savings banks became solid competitors of the commercial banks to the point that in 2011 they accounted for 46 percent of the deposits market share and 40 percent of the loans market share of the whole Spanish banking system.

Recently, the limited ability to raise equity capital, the heavy concentration on the mortgage market, and the prospect of more demanding Basel III capital requirements further complicated the situation, so that the need to restructure the savings banks sector became evident. The capacity of the system, in terms of branches and employees, needed to be rationalized. Capital and provision buffers needed to be strengthened, and these entities had to adopt a corporate governance structure to retain or attract the confidence of third-parties.

This process has let to staggering reform of the savings banks industry. Through mergers and acquisitions, the number of institutions has dramatically declined from 45 to 11, and it is bounded to fall to 9 in the coming months. Since mid-2008, the number of branches has been reduced by 17 percent and the number of employees by 14 percent. The average size of the "*new*" savings banks has tripled. This large scale bail-out has required huge amounts of public financial aid, over € 60 billion.

Some savings banks had become so pervasive and had reached such size that were considered "too big to fail" systemic institutions, so that their bankruptcy could result in the collapse of the whole financial system. But systemic risk is a complex issue, and up today there is no single method for assessment and monitoring. In this chapter we aim to provide an early warning system (EWS) to monitor the savings banks systemic risk; this system could have predicted possible bank failures and avoided such costly bank resolution.