The Edward I. Altman's Model of Bankruptcy and the Implementation of it on the Greek Cooperative Banks

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Abstract
The global economic crisis that has broken in the Eurozone area is an important event which has created stifling and stressful situation in the Southern Eurozone countries and especially in Greece, and to the Greek banks as well as to the companies. The weakness of Greece and the Greek banking system to borrow directly from financial markets has led to a lack of liquidity, which is transported to the cooperative banks and also to the companies that borrow money from commercial banks
This paper aims to present the bankruptcy prediction model of Edward I. Altman and the implementation on the cooperative banks of Greece in the decade 2000-2009 The year 2001 is the year that the euro became the national currency of Greece. The year 2007 is the year that financial crisis started and the year 2008 is the year that financial crisis "enters the door of Greece".
In the first chapter a description of the Cooperative Banks in Greece and the structure of their work are presented.
In the second chapter, we made an analytical description of corporate bankruptcy prediction models with extensive reference to the model of Edward Altman.
Finally in the third chapter, we apply the bankruptcy prediction model in finding Edward Altman's Z-Score on Cooperative Banks of Greece, and an analysis of its results.

Keywords: *Banks, banking, profitability, liquidity bankruptcy*

JEL Classification Codes: *G34 - Mergers; Acquisitions; Restructuring; G21 - Banks; Other Depository Institutions; Micro Finance Institutions; Mortgages*

Greek Co-operative Banks

The Cooperative Credit in Greece actually started to grow in the last decade under Law 2076/92. The Association of Cooperative Banks of Greece, was founded on 22/07/1995 at the initiative of cooperative Bank of Lamia, Ioannina, and Pancretan Achaean and Credit Cooperative Corinth "The Hermes". The Association of Cooperative Banks of Greece is a member of the European Association of Cooperative Banks (GEBC)

and the International Association of Cooperative Banks (ICBA). Credit unions that obtain authorization to operate as a credit institution do not alter the legal personality and may use as their name the term "cooperative bank", having a minimum paid up capital of 6 million Euros. The cooperative banks deal only with their members and can carry out all banking operations except for the underwriting. Exceptionally they deal with non-members when it comes to banking of mediator and secondary character or when the transaction involves a member of the bank.

Structure and Function

The cooperative banks in their short time of operation have played an important role at local level by interfering complementary and by improving the banking system by introducing a new type of bank known for the central concept clientele that supports and is supported by local productive forces and enhances local development. The cooperative Greek banks have as main target the Small Enterprises (SMEs) and individuals with competitive banking products tailored to local conditions and their operating characteristics that establish them as reliable, friendly, flexible and sociable banks. Customers who are members of cooperative banks are treated on a basis of trust and long-term prospects for cooperation, which contribute to the continuous upgrading of the provided banking services and products. The decentralized structure of cooperative bank enhances customer and bank personal relationship, increases its effectiveness in combination with low operating costs, modern computer systems, the positive results and benefits they achieve from their members (dividend, capital gain portion trading profit) and gain the trust of local communities and create conditions for dynamic development and perspective. It is worth noting that for the last 10 years the total equity presents an increase of 18.9% and assets by 24.0% while for the financial figures that reflect the transactions, loans have increased by 24.7% and 23.4% of deposits. In other figures that are indicative of the dynamics of cooperative banks we observe that stores increased by 12.2%, staff by 12.9% and members by 8.0%.[1]

Financial Crisis and Cooperative Banks

One of the characteristics of this global financial crisis is the risk of bank collapse from rumors, the selling of them to others at a very low price and the monetary policy by central banks in order to rescue the financial system and not to guarantee price as traditional they must do. Lost systems are now turning to a new state interventionism, along with plans to resolve the crisis before it spreads to the broader economy of the Nations that were affected. The results of the current financial crisis in Greece is the increase in lending rates (increase in the cost of money) due to the lack of liquidity, insecurity and no-confidence of banks and large financial institutions together.[2] The Global financial Crisis affected the Public Sector of Greece and afterwards affected the Greek Banking System both commercial banks and co-operative banks. The deterioration of domestic macroeconomic environment affected the

[1] www.este.gr

[2] Angelopoulos Vassilis, (Proceedings of the Workshop: 18/11/2008), "The international financial crisis and Greece"

cooperative banks, resulting in a significant deterioration in loan portfolio quality and the decline in profitability. The ratio of NPLs to total loans increased, mainly due to the substantial increase in business loans in arrears, which constitute about 80% of loans of cooperative banks. Similarly, coverage of NPLs decreased, and the accumulated provisions increased at a slower rate than loans in arrears. It is also noted that net delays increased significantly. The need for increased provisions for credit risk contributed to the small decline in profit before tax of cooperative banks. Their operating revenue continued to grow, mainly due to higher net interest income and commissions, in contrast to that observed for the domestic operations of commercial banks. However, operating expenses of the cooperative banks grew at a faster rate than operating revenues due to the significant increase in the cost of money that these banks are using. Also the capital adequacy ratio of cooperative banks was reduced because the growth rate of adjusted asset based on risk was faster than the regulatory equity.[3] This has resulted in three cooperative banks (Evia, Lamia and Achaia) to suspend their operations in the year 2012. The state has guaranteed that depositors will not lose their money, but there was no guarantee for the unit-holders of cooperative banks.

Bankrupcy Models

In order to predict the bankruptcy of enterprises and banks there were numerous and significant accounting analyses. One of the classic studies in those accounts and failure analysis was conducted by Beaver (1976). Beaver found that a number of indicators could discriminate between matched samples of failed and non-successful companies for a period of five years prior to failure. In a subsequent study, Deakin (1972) used the same 14 variables analyzed by Beaver but applied in a series of multivariate most important models. Although Deakin has achieved a high classification accuracy in sample development (more than 95% for the first three years before failure) there has been substantial deterioration in classification accuracy for the sample being a year ago, a result that Deakin noted that cannot be explained by the presence of some particular events in the sample used.[4] The significance of this finding is that it is premature to conclude from the results of the test sample from a development that valid empirical relation has been detected. Generally, ratios measuring profitability, liquidity and solvency appeared to be the most important indicators in the variables studies. The ranking order was unclear, because almost every study cited a different ratio as a more efficient indicator of impending problems. An appropriate extension of the study variables was therefore to build up their conclusions by combining various measures in an important predictor model. In constructing a system of many variables, the key question is:

1 What proportions are important in detecting a possible bankruptcy?
2 What weight should be attached to these selected ratios?
3 How should the weights be objectively established?

[3] www.bankofgreece.gr
[4] Deakin, Edward B. (1972), «A discriminant analysis of predictors of business failure»

The E. Altman's Z-score model for Bankruptcy

The standard Z-Score of Altman is based on a multivariate approach based on the values of both accounting and analysis of categorical variables measures. These values are combined and weighted to produce a measure (standard credit risk) to make better distinctions between companies or banks that fail and those who do not. One such step is possible because the failure companies exhibit economic trends and proportions very different from those businesses that are financially healthy.[5] In a bank[6] utilizing such a model, loan applicants would either be rejected or subjected to increase scrutiny if their scores fell below a critical benchmark. The Altman's Z-Score model for Bankruptcy was constructed using multiple discriminant analysis, a multivariate technique that analyzes a set of variables to maximize the difference between-group differences and minimizes within the group. This is typically a sequential process in which the processor includes or excludes variables based on various statistical criteria. It should be noted that if the groups were not very different to the variable level, a multivariate model would not be able to add much discriminatory power. The Altman and Narayanan, (1987) showed a second-generation model with several improvements that have come to the original Z-Score. The aim was to construct a measure that directly reflect the recent developments related to business failure and changes in accounting reports, such as the capitalization of the lease. The optimal rate of ZETA score is equivalent to:[7]

$$ZETA_c = \ln \frac{q_1 C_1}{q_2 C_2} \qquad (1)$$

where q1, q2 = prior bankruptcy (q1) or non-bankrupt (q2) and C2 C1 = cost of Type I and Type II errors, respectively.
The Altman and Sabato (2005) built a Z-Score model for type Small and Medium Enterprises. This model employs five financial indicators:
1) Short-term debt / Book value of equity (leverage)
2) Cash / Total assets (liquidity)
3) Earnings before interest and taxes / Total assets (profitability)
4) Retained earnings / Total assets (cover)
5) Earnings before interest and taxes / Interest paid (account)

Explaining the Altman's Z-score model

E. Altman after several studies and research arrived at the following Z-Score Model:

$$\mathbf{Z = 0{,}717X_1 + 0{,}847X_2 + 3{,}107X_3 + 0{,}420X_4 + 0{,}998X_5} \qquad (2)[8]$$

X_1 = Working Capital / Total Assets
X_2 = Retained Earnings / Total Assets
X_3 = Earnings before Interest and Taxes / Total Assets
X_4 = Market Value of Equity / Book Value of Total Liabilities
X_5 = Sales / Total Assets

[5] Warren Miller, (2009), «Comparing Models of Corporate Bankruptcy Prediction: Distance to Default vs. Z-Score»
[6] Altman, E.I., and P. Narayanan. (1997)
[7] Allen Steven, (2003) «Financial risk management: a practitioner's guide to managing market and credit risk»
[8] Altman, E.I. and G. Sabato. (2007)

1) X_1 = Working Capital /Total Assets : The working capital / total assets ratio, frequently found in studies of corporate problems, is a measure of a firm's net liquid assets relative to its total capitalization. Working capital is defined as the difference between current assets and current liabilities. Liquidity and size characteristics are explicitly considered.

2) X_2 = Retained Earnings / Total Assets: Retained earnings are the account which reports the total amount of reinvested earnings and /or losses of a firm over its entire life. The age of a firm is implicitly considered in this ratio. A relatively young firm will probably show a low X_2 = Retained Earnings / Total Assets ratio because it has not had time to build up its cumulative profits.

3) X_3 = Earnings before Interest and Taxes / Total Assets: This ratio is a measure of the productivity of the firm's assets, independent of any tax or leverage factors. Since a firm's ultimate existence is based on the earning power of its assets, this ratio appears to be particularly appropriate for studies dealing with corporate failure. Furthermore, insolvency occurs when a firm's total liabilities exceed a fair valuation of its assets, as determined by the earning power of those assets.

4) X_4 = Market Value of Equity / Book Value of Total Liabilities: Equity is measured by the combined market value of all shares of stock, preferred and common, while liabilities include both current and long-term items. This ratio shows how much a firm's assets can decline in value before its liabilities exceed its assets and it becomes insolvent. Altman suggested that capitalized leases, both operating and financial, should be added to the firm's total liabilities.

5) X_5 = Sales / Total Assets: The capital –turnover ratio is a standard financial ratio illustrating the sales generating ability of the firm's assets. It is one measure of management's capacity to deal with competitive conditions. Based on the univariate statistical significance measure, it would not have appeared at all in the model. However, because of its unique relationship to other variables in the model, the sales/total assets ratio ranks second in its contribution to the overall discriminating ability of the model.

The Z-Score Model was constructed using multiple discriminant analysis, a multivariate technique that analyzes a set of variables to maximize the between-group variance while minimizing the within-group variance. This is typically a sequential process in which the analyst includes or excludes variables based on various statistical criteria. It should be noted that if the groups were not very different at the univariate level, a multivariate model would not be able to add much discriminatory power. In order to arrive at a final profile of variables, the following procedures were utilized:

1) Observation of the statistical significance of various alternative functions, including determination of the relative contributions of each independent variable.
2) Evaluation of correlations among the relevant variables
3) Observation of the predictive accuracy of the various profiles
4) Judgment of the analyst.

Based on the Altman's Z-Score Model we examined the cooperative banks of Greece as if they are companies in the decade 2000-2009 that borrow money from the commercial Greek banks The commercial banks in order to lend money to their customers-clients tested them with the Altman's Z-Score Model. Among commercial bank's customers and clients are also Greek cooperative banks.[9] Altman's Z-Score Model has the above three areas to study bankruptcy classification for firms:[10]

1) Problem Area under 1,20 points
2) Grey Area between 1,20 points and 2,90 points
3) Healthy Area upper 2,90

The Application of Altman's Z-Score Model in the Greek Cooperative Banks

In this section we will calculate the Z-Score of 6 Greek cooperative banks of Western Macedonia, the Dodecanese, Thessaly, Pancretan, Peloponnese and Pieria and comment on each bank per decade depending on the result and the'' zone'' that are under the model of Altman.

Analyzing the Cooperative Bank of Western Macedonia-Kozani

For the cooperative bank of Western Macedonia-Kozani we have the above results during the decade 2000-2009.

Table 1: The Z-Scores of the Cooperative Bank of Western Macedonia Kozani 2000-2009

Years	Z´-Score
2000	12,610
2001	0,463
2002	0,383
2003	0,387
2004	0,549
2005	1,513
2006	0,524
2007	0,396
2008	0,306
2009	0,171

Source: Published financial statement of cooperative bank of Western Macedonia-Kozani

[9] Kyriazopoulos G., Petropoulos D., "What are the advantages and disadvantages from banks mergers and acquisitions? Does Altman's z-score model for bankruptcy motivate banks for mergers and acquisitions? Evidence from the Greek banking system" ICOAE Athens 2010

[10] Altman, E. I., (1968), (2000), (2002)

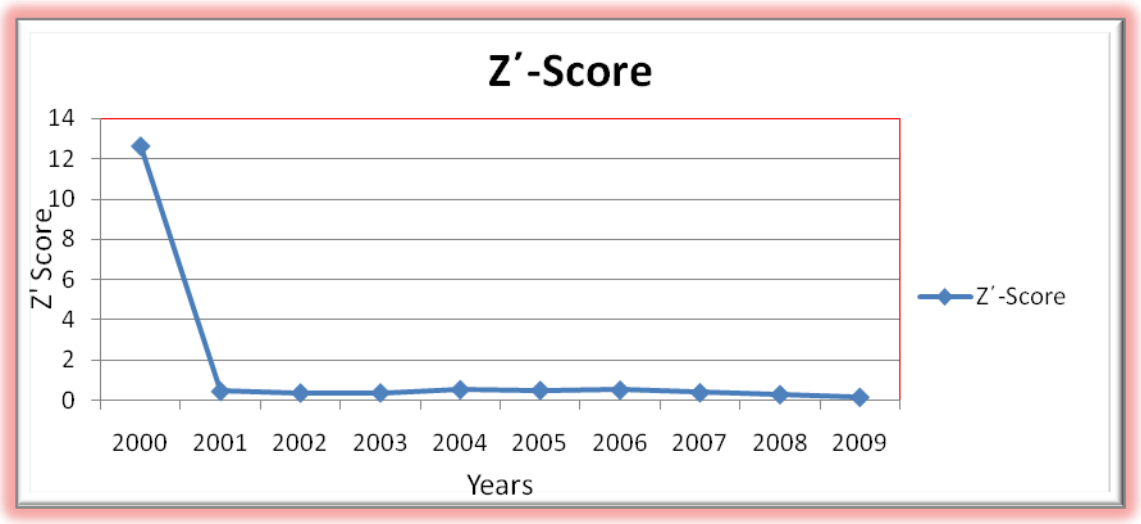

Figure 1: Z-Score of the Cooperative Bank of Western Macedonia Kozani
Source: Table 1

We note that in 2000 the cooperative bank of West Macedonia-Kozani relies more on equity than in having foreign capital, which means working more with the search for new shareholders rather than by borrowing. The Z is greater than 2.90, so the bank is in the safe area. In 2001, however, we observe that the foreign has increased too much in relation to 2000. This was probably because the bank was planning to expand and thus resorted to seeking funds. For this reason Z-score decreased greatly. In 2002, we observe that the bank continues to have increased foreign capital. In 2003, we observe that the bank had losses rather than profits. In 2004 interest rates have fallen so the bank is still in the problem area. In 2005 we see that the bank gave more value to new partners so the bank has a little better score in the Z-score model. Revenues are increased in 2006, but we observe that foreign capital has also increased. In 2007, 2008, and 2009 it is observed that the bank continues to be in the problem area of Z-score model.

Analyzing the Cooperative Bank of Dodecanese

For the Cooperative Bank of Dodecanese we have the above results during the decade 2000-2009.

Table 2: The Z-Scores of the Cooperative Bank of Dodecanese 2000-2009

Years	Z-Score
2000	0,458
2001	0,335
2002	0,319
2003	0,259
2004	0,238
2005	0,229

2006	0,226
2007	0,182
2008	0,260
2009	0,223

Source: Published financial statement of cooperative bank of Dodecanese

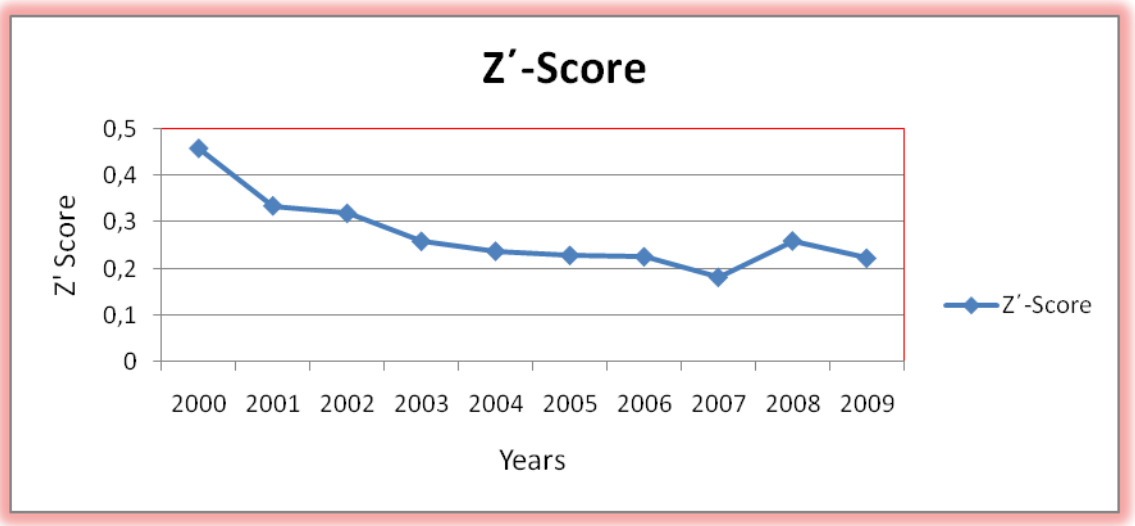

Figure 2: Z-Score of the Cooperative Bank of Dodecanese
Source: Table 2

We observe that the whole decade, Cooperative Bank of Dodecanese is in the problem area of the Z-score model because the revenues of the bank for each year of the decade remain in low levels and the bank is forced to borrow with high interest to meet its obligations. At the same time there is no improvement in equity.

Analyzing the Cooperative Bank of Thessaly

For the Cooperative Bank of Thessaly we have the above results during the decade 2000-2009.

Table 3: The Z-Scores of the Cooperative Bank of Thessaly 2000-2009

Years	Z´-Score
2000	0,643
2001	0,503
2002	0,471
2003	0,420
2004	0,367
2005	0,363
2006	0,402
2007	0,150
2008	0,385

2009	0,220

Source: Published financial statement of cooperative bank of Thessaly

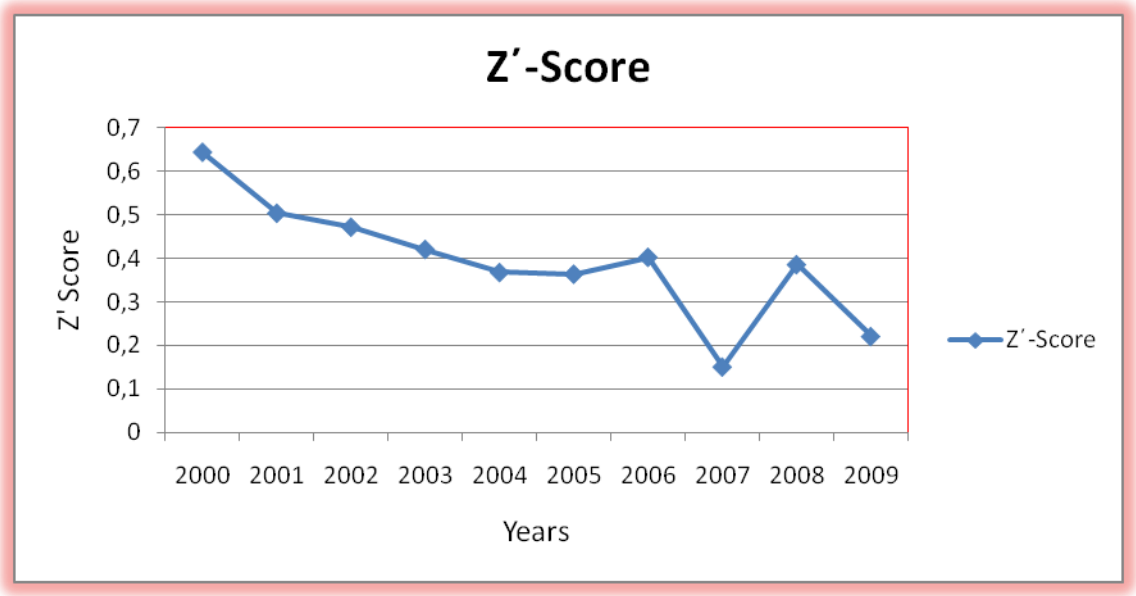

Figure 3: Z-Score of the Cooperative Bank of Thessaly
Source: Table 3

We observe that the Cooperative Bank of Thessaly throughout the decade is in the problem area as it is defined by the Z-score model. The years 2007 and 2008 are the most dangerous. Notice that each time the bank resorts to foreign capital without seeking to keep a balance between equity and foreign capital, interest rates on short-term borrowing are high. But this alone does not cause bankruptcy. However, we observe that the bank chooses to borrow than to increase the participation of the same shareholders.

Analyzing the Pancretan Cooperative Bank

For the Pancretan Cooperative Bank we have the above results during the decade 2000-2009.

Table 4: The Z-Scores of the Pancretan Cooperative Bank 2000-2009

Years	Z´-Score
2000	0,510
2001	0,509
2002	0,373
2003	0,901
2004	0,301
2005	0,263
2006	0,243
2007	0,300

2008	0,500
2009	0,323

Source: Published financial statement of the Pancretan Cooperative Bank 2000-2009

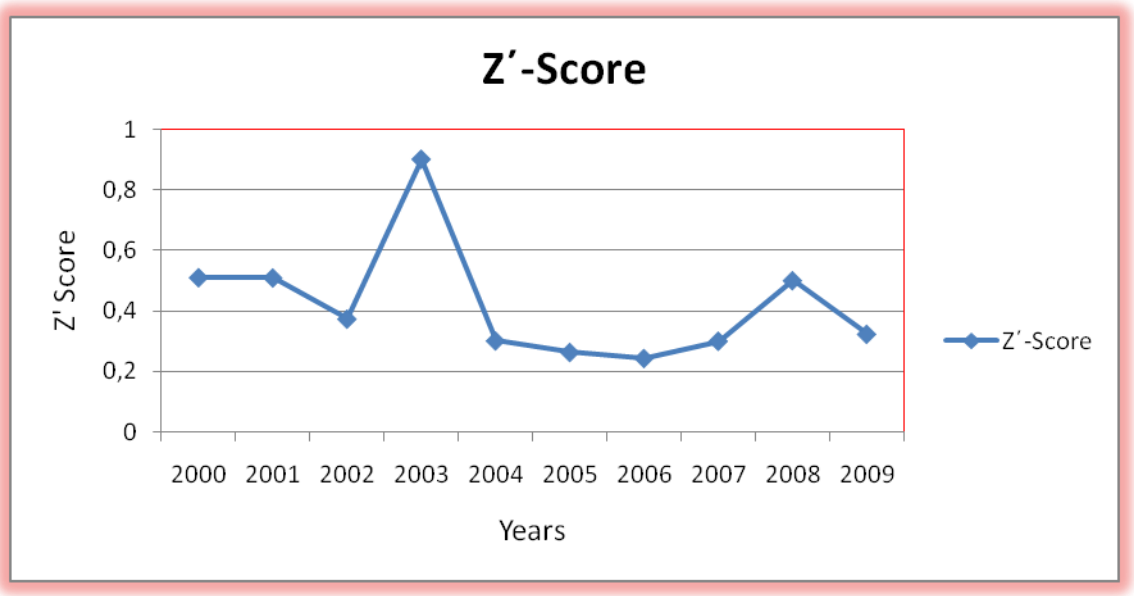

Figure 4: Z-Score of the Pancretan Cooperative Bank
Source: Table 4

We observe that the Pancretan Cooperative Bank also throughout the decade lies in the problem area of Z-score model according to the model of bankruptcy of Altman as all Z scores are less than 1.23.

Analyzing the Cooperative Bank of Peloponnese

For the Cooperative Bank of Peloponnese we have the above results during the decade 2000-2009.

Table 5: The Z-Scores of the Cooperative Bank of Peloponnese 2000-2009

Years	Z´-Score
2000	1,429
2001	1,206
2002	0,785
2003	0,691
2004	0,669
2005	0,698
2006	0,532
2007	0,522

2008	1,260
2009	0,330

Source: Published financial statement of Cooperative Bank of Peloponnese 2000-2009

Figure 5: Z-Score of the Cooperative Bank of Peloponnese
Source: Table 5

In 2000, we observe that the Cooperative Bank of Peloponnese relies more on equity rather than foreign capital. Interest from borrowing money is low and revenues from lending money and commissions are high. This is the reason they prefer to increase the participation of the same shares than to borrow. That's why the bank is in the "safe area" in 2000 whereas it is in the "grey area" in 2001 according to Altman's bankruptcy Z-score model. From 2002 until 2007 and 2009, however, we see that the bank increases the foreign capital so the bank is in the problem area of the Z-score model. In 2008 the bank achieved to manage the balance of equity and foreign capital better than in the years 2002 to 2007. For this reason the bank improved its place by obtaining a better score and getting back into the grey area of Z-score model.

Analyzing the Cooperative Bank of Pieria

For the Cooperative Bank of Peloponnese we have the above results during the decade 2000-2009.

Table 6: The Z-Scores of the Cooperative Bank of Pieria 2000-2009

Years	Z´-Score
2000	0,570
2001	0,438
2002	0,570

2003	0,533
2004	0,470
2005	0,254
2006	0,340
2007	0,317
2008	0,780
2009	0,300

Source: Published financial statement of Cooperative Bank of Pieria 2000-2009

Figure 6: Z-Score of the Cooperative Bank of Pieria
Source: Table 6

We notice that throughout the decade 2000-2009 the Cooperative Bank of Pieria is in the problem zone of Z-score model. The bank cannot meet the needs despite the fact that it makes an attempt in the year 2008 at the beginning of the financial crisis.

Conclusions

Summing up the study of bankruptcy prediction model, it is concluded that this model is a very useful tool for analysts, credit institutions and administrations of the same companies to assess their performance. For this reason, it is used by international rating agencies. In the Z-score model used by Altman indicators had a sensitivity as to the information of the time course of the business in a depth of 10 years. Another important factor, that is missing from the model is the absence of qualitative data that in our opinion

play an important role in the course of a business. Regarding the Cooperative Banks we noticed that these six banks across 10 years faced liquidity problems and thus resorted to seeking funds so that other banks lend them money at very high interest rates and thus borrowing is not sufficient to meet the needs of the bank. The equity owners are amounts paid to maintain or enhance their property and cost less than foreign, for which the bank is obliged to pay interest. Maintaining the soundness of a bank makes a strong negotiator in seeking low interest rates from lenders.

We observe that in all Cooperative banks in 2006-7 when the financial and economic crisis began to burst out (except Cooperative Bank of Peloponnese in the year 2008), the Z-Score is less than 1.23. The bank with the most and highest Z-Score is the Peloponnese Cooperative Bank because as it was previously mentioned this bank relies more on equity and resorts to borrowing when interest rates are satisfactory in relation to the rest of Cooperative Banks. However, the Cooperative Bank of Western Macedonia has the highest Z-Score in the year 2000 and this equals to 12.610. This is noticeable in the balance sheet as its equity is nearly equal to all liabilities and its obligations are 0. On the contrary, the bank with the lowest Z-Score is the Cooperative Bank of Dodecanese and this is because, as it was mentioned in the previous chapter, its requirements and obligations are increasing without the required revenues for each year and the bank is forced to search for funds with high interest rates. As for the Cooperative Bank of Pieria, Thessaly and Pancretan that throughout the course of the decade, the Z-Score is less than 1.23, according to Altman model they indicate failure to pay debts (insolvency), after showing negative performance as they cannot repay their current obligations.

It is obvious that banks expect to reduce interest rates and thus choose to borrow than to increase their own contribution to their shareholders. From what we can see Greek banks start to lose their credibility and cannot re-borrow. Among the most common traps in which businesses fall is the short-term loans to cover long-term liabilities and vice versa. The banks have to convince lenders to lend to smaller rates and thus increase liquidity. This can be done by increasing the sales and not the apparent improved financial management.

The reason that foreign banks continue to lend is because banks do not generally borrow for ten years. They borrow for days weeks or even months. In addition, to borrow the money, they pledge something equal or with greater value. Finally, the amounts that the banks lend are specific and they are obtained by the banks that offer the highest interest rate on special auctions that are made. When banks need to raise large funds to cover long-term needs they resort to the issuance of bonds or issue shares like any other business.

The cooperative banks are aware of the problem of insufficient capital adequacy and they should solve it immediately. In the first trimester of the year 2012 three cooperative banks have already bankrupt because of this problem.

References

Aggelopoulos V., (2008), "*The international financial crisis and Greece", 1η Edition Athens Corfu – Economic Publishing 2009*
Aggelopoulos P., (2005), *"Banks and financial system", Publications Stamoulis S.A., Athens 2005*
Allen S., (2003) *«Financial risk management: a practitioner's guide* to *managing market and credit risk» New Jersey: wiley*
Altman, E., and Rijken, H., (2004). *"How Rating Agencies Achieve Rating Stability", Journal of Banking and Finance, No. 28*
Altman, E., Hartzell, J. and Peck, M., (1995), *"A Scoring System for* Emerging *Market Corporate Debt", Salomon Brothers, May 15*
Altman, E.I. and Sabato, G., (2007). "Modelling Credit Risk for SMEs: Evidence *from the U.S. Market", Abacus,* **43**(3), pp. 332-357
Altman, E.I., Sabato, G. and Wilson, N., (2010). *"The value of non-*financial *information in small and medium-sized enterprise risk* management*", Journal of Credit Risk,* **6(**2), pp. 95-127
Altman *E., (1968) «Financial Rations, Discriminate Analysis and the* prediction *of Corporate Bankruptcy», Journal of Finance*
Altman E., R. Haldoman & P. Narayanan, (1977), *"Zeta Analysis: A New Model to Identify Bankruptcy Risk of Corporations" Journal of* Banking *& Finance*
Deakin, Edward B. (1972), *"A discriminate analysis of predictors of business failure", Journal of Accounting Research*
Kotsiris L., (1998), *"Bankruptcy Law", Publications Sakkoula S.A. Athens 1998*
Kyriazopoulos Georgios, Petropoulos D., (2010), *"What are the Advantages and Disadvantages that Lead Banks into Mergers and Acquisitions? Is Altman' s Z-Score Model for Bankruptcy Motivate Banks for Mergers and Acquisitions? Evidence from the* Greek *Banking System", Athens ICOAE (International Conferrence* of *Applied Economics)*
Ledakis G., (2007) *"Analysis and Portfolio Management ", published by the Economic University of Athens, Athens 2007*
Warren Miller., (2009), *"Comparing Models of Corporate Bankruptcy* Prediction*: Distance to Default vs Z-Score", Mornigstar,Inc*
Zopounidis K, Lemonakis X., (2009), *"Credit Risk Management", Klidarithmos, Athens 2009*

Web Sites

http://www.bankofgreece.gr/Pages/default.aspx
www.bankofwesternmacedonia.gr
www.bankdodecanese.gr
www.bankofthessaly.gr
www.pancretabank.gr
www.cbp.gr
www.pieriabank.gr
http://www.este.gr/
http://www.liberalism.gr/
http://www.actuar.aegean.gr/notes/metri_diaxei_kindinou_sim.pdf
http://www.xrima.gr/Lexicon/Lexicon.aspx
http://el.wikipedia.org/