The Weighting of Factors Affecting Credit Risk in Banking

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Abstract

Today’s, the credits are one of most significant activities in banking. Banks examines several criteria while giving the credit. The problems which are met to pay the credits lead to the banks to face with the serious risks. So, the banks implement the risk management effectively. Credit risk is most elementarily identified as the potential that a bank debtor will fail to meet its indispensability in compliance with agreed conditions. The banks which implement the risk management effectively evaluate their risks down to the last detail. The banks need to use the foreign funds efficiency, since banking activities are determined in accordance with foreign funds. The banks give credits to their customers in order to obtain the funds. The banks also undertake the risk while giving the credit. Credit risk is nearly related to the potential return of an investment. The conducted studies revealed that the most important risk for the banks is credit risk. Many techniques are used in the measurement of credit risk. Thus, the banks statistically tend to measure the credit outcomes. In this study, the factors which affecting credit risk in banking are evaluated. Analytical Hierarchy Proses which is one of multiple criteria decision making techniques were applied while assessing these criteria. Accordingly factors were compared by paired comparison. The weight of each criteria were determined as a result of comparisons. The consistency ratio was calculated whether comparisons were consistent or not. At the end of the study, the weight of the factors affecting the credit risk was found. Thus, the factors which must be focussed on clearly demonstrated while managing most significant risk of banking.

Keywords: Analytical Hierarchy Proses, banking, multiple criteria decision making, credit risk, risk management

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1. Introduction

Risk management in Turkish banking system is to identify, assess, measure and monitor risks. Conducted studies illustrate that risk management is not sufficient for the banks. To ensure this, top management should be supported. All staff should be adopted these studies. Modern risk management techniques and applications of the system has been begun by the imposition of legal regulations. In today’s, risk management process in Turkish banking system has been evolved. According to the bank's activities and structure, the attempt is to meet those required after meeting legal requirements.

Today, the banking sector deals with several risks. According to Goyal (2010), the risks which are encountered in the banking sector are credit risk, market risk, operational risk, interest risk, liquidity risk and exchange risk. The concept of credit risk fails to fulfil the borrower’s or signatory person's obligations. More precisely, the banks encounter with the risk as a result of credit quality deterioration. Market risk is defined that the assets held by banks in the market are the risk of loss due to movements in market and alterations in market prices (Goyal, 2010). Operational risks are the deviation of the processes or functions within an organization (Shah, 2003). Interest rate risk, reverse movements which occurs due to changes in interest rates can be defined as the impact which occurs a bank's financial structure (Platt, 1986). Exchange rate risk is insecurity due to changes in exchange rates and parity of banks (Coyle, 2000). Liquidity risk is inability to fund the daily operations of the bank (Heffernan, 1996).

In this study, credit risk is addressed since it is the most significant in the banks. Factors which affect credit risk are examined.

The rest of this paper is structured as follows. Section 2 presents factors which affect credit risk. Section 3 explains analytical hierarchy process. In Section 4, factors are evaluated by analytical hierarchy process. Section 5 discusses the solutions. I conclude the paper in Section 6.

2. Literature Review

Today, the banks spend an intense effort and time to develop credit risk measurement methods since they don’t encounter credit risks. Therefore, they probe into the credit risk. In addition this, they examine the factors which affect credit risk.

The credit collapse is not only due to the contraction of credit supply and thus is a supply-induced problem (Bernanke, 1993). Deposit guarantee has encouraged taking risk for the banks in Turkey. Problems in the financial structure of the company have led to reduction credits. At the same time, foreign currency risk also affect the credit demand. One of the factors affecting the supply of credit in the banking is augmentation in the return of the credit.

Risk measurement and techniques in the banks are vintage analysis, risk plus, scenario analysis, stress tests, integrated risk management, internal rating method, standard method, legal barriers, firm rating, credit policy, credit demand evaluation and retroactive tests (Yariz, 2011).

According to Yilmaz (2011), the factors are determined by the studies which are conducted in the past. These factors are customer increment, firm bankruptcy, credit derivative products, low profit margin and global competitive. These factors are customer increment (23), firm bankruptcy (21), credit derivative products (2), low profit margin (16), global competitive (21).
3. Analytical Hierarchy Proses Method

Analytical Hierarchy Proses (AHP) which was originated in the 1980s by Saaty embraces verbal and numerical techniques (Wind and Saaty, 1980; Saaty and Ozlemir, 2003). It is simple to use and flexible (Mamat and Daniel, 2007; Cheong et al., 2008) AHP determines weight of criteria by pairwise comparison. At the same time, it enables to rank alternatives (Saaty, 1980). This method depends on pairwise comparisons (Chamodrakas et al., 2010; Ecer and Kucur, 2008; Xia and Wu, 2007). Alternatives are created for each criteria (SchoolI et al., 2005).

Step 1: Creating criteria and scale

Scale values which used for pairwise comparisons are shown in Table 1.

| Verbal Importance                        | Scale Values |
|------------------------------------------|--------------|
| Equally important                        | 1            |
| Intermediate values                      | 2            |
| Moderately important with one over another | 3          |
| Intermediate values                      | 4            |
| Strongly important                       | 5            |
| Intermediate values                      | 6            |
| Very strongly important                  | 7            |
| Intermediate values                      | 8            |
| Extremely important                      | 9            |

Step 2: Implementing pairwise comparisons

According to Table 1, pairwise comparisons are implemented.

Step 3: Gathering the values in each column of the pairwise comparison matrix

Step 4: Dividing each element in the pairwise matrix by its column total

Step 5: Computing the average of the factors in each row of the normalized matrix

Step 6: Calculating Consistency Ratio

Pairwise comparisons are repeated if Consistency Ratio is bigger than 0.1 (Timor, 2011; Yuksel and Akin, 2006). Pairwise comparisons are finished in the matrix, after desired consistency has been obtained (Equation (1) and Equation (2)). (Consistency Index-CI) and Random Index which is enabled in Table 2 are used for calculating Consistency Ratio.

Consistency Index $CI = \frac{\lambda_{max} - n}{n-1}$ (1)

Consistency Ratio $CR = \frac{\text{Consistency Index (CI)}}{\text{Random Index (RI)}}$ (2)
Step 4: Implementing Normalization Weighting Vector \((w_1, w_2, \ldots, w_n)^T\)

4. Practices AHP Method for Factors Affecting Credit Risk In Banking

The risks which are specified in banking consist of four main risks. These are credit risk, foreign currency risk, liquidity risk and interest ratio. The credit risk is most significant risk in all risks of banking. In this study, the viewpoints of six senior managers in Istanbul city of Turkey were firstly applied for determining the weighting of factors affecting credit risk in banking. Then, pairwise comparisons were performed in line with the view of managers. AHP method was practiced to avoid wrong selection based on subjective view. The factors affecting credit risk have six subfactors. These are global competition \((C_1)\), firm bankruptcy \((C_2)\), the increment in credit customer \((C_3)\), the decline in profit margin \((C_4)\), credit derivative products \((C_5)\) and other risks \((C_6)\).

5. Results

Six managers independently evaluated pairwise comparisons. While a manager was evaluating, other managers didn’t affect his decision. All values were obtained within the same day. Consistency ratio was calculated whether pairwise comparisons are coherent or not. When consistency ratio exceeded above 10%, pairwise comparisons were repeated. Since consistency ratio was under 10%, pairwise comparisons were meaningful.

First of all, AHP was implemented for four main risks. According to the results, credit risk is 54.2%, liquidity risk is 24.3%, foreign currency risk is 10.8% and interest ratio risk is 10.7%. It is seen that pairwise comparisons are low consistency ratio which is demanded to be lower than ten percent. Credit risk is far superior to others.

AHP method was practised for credit risks. Credit risk consists of six criteria in this paper. Pairwise comparisons are conducted for six criteria. According to this, global competition is 22.1 %, firm bankruptcy is 21.4%, the increment in credit customer is 25.7%, the decline in profit margin is 14.8%, credit derivative products is 3.2% and other risks are 12.8%.

After evaluating, six managers reviewed existing problem credit in the bank. Therefore, the validity of the evaluation was examined. Bank data concerning the problems which occur the credit risk was validated the results of the paper. It was seen that problem credits took an importance in the credit risk.

6. Conclusion

The results of the paper illustrate that the credit risk is more significant than the other three main risks. The increment in credit customer is the most significant subfactor in credit risk. Global competition follows the increment in credit customer in terms of importance. On the other hand, credit derivative products are the least significant subfactors within credit risks.

It is thought that credit risk can face with bank bankruptcy if credit derivative products are rised. It is difficult to these risk type. It has been observed that AHP is a method which is utilized to specify the importance weight of the criteria. AHP is one of multi criteria decision making (MCDM) techniques. Different MCDM techniques can be implemented to weight the criteria. In addition this, fuzzy logic can be preferred. Fuzzy logic enables to prevent vagueness. Fuzzy AHP produces more reliable results rather than AHP. Additionally, a number of managers which conduct pairwise comparisons can be increased.

| n  | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  | 12  | 13  | 14  | 15  |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| RI | 0   | 0   | 0.58| 0.9 | 1.12| 1.24| 1.32| 1.41| 1.45| 1.49| 1.51| 1.48| 1.56| 1.57| 1.59|

Table 2. Random Index (Saaty, 1980)
What’s more, it can also sort the alternatives. The outcomes illustrate that credit risk increases as long as the customer gets credit. For this, credit scoring systems are a good method in order to evaluate credit which gives to the customers. We can say that risk scoring is a tool in order to manage risks. Risk in customer credit decreases when scoring the risk. For this, customer data must be reliable for data mining. Otherwise, model leads to wrong results in terms of scoring. Risks can be conducted with program tools. Out risks should be taken into consideration for designing credit risks. All probabilities should be reckoned by managers.

References

Bernanke, B. S. "Credit in the Macroeconomy", Quarterly Review, Federal Reserve Bank of New York, Spring, (1993): 50-70.

Chamodrakas, I., Batís, D., Martakos, D. "Supplier Selection in Electronic Marketplaces Using Satisficing and Fuzzy AHP", Expert Systems with Applications, 37, (2010): 490-498.

Cheong, C. W., Jie, L. H., Meng, M. C., Lan, A. L. H. "Design and Development of Decision Making System Using Fuzzy Analytic Hierarchy Process", American Journal of Applied Sciences, 5(7), (2008): 783-787.

Civcir, İ. 2003. Credit Collapse of the Post-Crisis Period in Turkey, Ankara University Faculty of Political Sciences, Turkey’s Economy Institution, İmaj Publications: Ankara.

Coyle, B. 2000. Introduction to Currency Risk, Financial World Publishing, United Kingdom.

Ceric, F., Kucuk, O. "Analytic Hierarchy Process and An Application", Atatürk University Journal of Social Science Institute, 11(1), (2008): 355-369.

Goyal, K. A. “Risk Management in Indian Banks: Some Emerging Issues”, International Journal of Environment Research, 1(1), (2010): 102-109.

Heffernan, S. 1996. Modern Banking in Theory and Practice, John Wiley&Sons, U.S.A..

Mamat, N. J. Z., Daniel, J. K. “Statistical Analyses on Time Complexity and Rank Consistency Between Singular Value Decomposition and The Duality Approach in AHP: a Case Study of Faculty Member Selection”, Mathematical and Computer Modeling, 46(7-8), (2007): 1099-1106.

Platt, R. B. 1986, Controlling Interest Rate Risk, John Wiley&Sons, New York.

Saaty, T. L., “Relative Measurement and Its Generalization in Decision Making Why Pairwise Comparisons are Central in Mathematics for the Measurement of Intangible Factor the Analytic Hierarchy/Network Process”, Review of the Royal Spanish Academy of Sciences Series A Mathematics (RACSAM), 102(2), (2008): 251-318.

Saaty, T. L., Ozdemir, M. S. “Negative Priorities in the Analytic Hierarchy Process”, Mathematical and Computer Modelling, 37(9-10), (2003): 1063-1075.

Saaty, T. L. 1980. The analytic hierarchy process, New York: McGraw-Hill.

Schooll, A., Manthey, L., Roland, H., Michael, S. “Solving Multi Attribute Design Problems With Analytic Hierarchy Process And Conjoint Analysis: An Empirical Comparison”. European Journal of Operational Research, 164(3), (2005): 760-777.

Shah, S. 2003, Advanced Risk Management Seminar, Risk and Rewards, July, New York.

Timor, M. 2011. Analytic Hierarchy Process, Turkmen Publications, Istanbul.

Wind, Y., Saaty, T. L. “Marketing Application of the Analytic Hierarchy Process”, Management Science, 26(7), (1980): 641-658.

Xia, W., Wu Z. “Supplier Selection with Multiple Criteria in Volume Discount Environments”, Omega, The International Journal of Management Science, 35, (2007): 494-504.

Yarız, A. “Risk Management in the Banking: Application of Risk Matrix”, E-Journal of Marmara University Institute of Banking and Insurance, 1(1), (2011): 1-33.

Yılmaz, S. 2011. Credit Portfolio and Credit Risk Management in the Commercial Banks, Unpublished Master's Thesis, Kadir Has University.

Yuksel, İ., Akin, A. “Determination Strategy In Business With Analytic Hierarchy Process”, Journal of Dogus University, 7(2), (2006): 254-268.