CAMELS-based Determinants for the Credit Rating of Turkish Deposit Banks

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Abstract

This paper demonstrates the relationship between CAMELS ratios and credit ratings of deposit banks in Turkey. Annual data was used for the period between 2004 and 2014 in this study. Moreover, 20 deposit banks of Turkey were analyzed and 21 different ratios of CAMELS components were used. In addition to that, credit ratings of these banks were provided from Moody's corporation or annual activity reports of the banks. After that, we created multi nominal logistic regression analysis in order to illustrate the relationship. The major finding in this study is that three components (Asset Quality, Management Quality, and Sensitivity to Market Risk) of CAMELS have effects on credit ratings whereas the ratios related to Capital Adequacy and Earnings are not effective. As a result, it was recommended that Turkish deposit banks should concentrate on the percentage of fixed assets and interest income to have a better rating. Moreover, having high market share with respect to total assets and lower interest expense are also other important points for this purpose. On the other hand, Turkish deposit banks should control the proportion of financial assets and increase the amount of FX liquid assets to prevent credit ratings to decrease. Additionally, market share of banks for loans should not reach at high level for this objective.

Key Words*: Banking; Credit Rating; CAMELS; Analysis; Deposits*

JEL classification*: G18, G28*

Introduction

The volatility and instability in global financial system have dramatically shaped global investment trends and raised concerns on slow economic activity in advanced economies. Fluctuations and risks in capital markets have led to growing attention on empirical studies attached to financial stress, banking performance and risk management applications in banking industry. In addition to these overwhelming conditions in global economic system has reflections on investment decisions. Financial stress which began in the USA and major advanced economies in banking system, transmitted to global economic crisis through investment and trade channels with the effects of globalization. In the last 5 years, investors are occupied with the question of banking performance and accepted that credit rating as important performance indicator of the banks in which they have invested earlier. From investors to manager, it became an important assessment tool as it shows the early warning signals of a bank if there is any problem with respect to its performance.

Globalization refers to removing borders among countries with respect to the trade. In other words, economies of the countries are interconnected with each other. This situation increases opportunities for economies to improve. Hence, world economy is improving especially for the last decades owing to the effects of the globalization. According to data obtained from World Bank, while total export amount in the world was 2.56 trillion $ in 1970, this amount strongly increased to 150.72 trillion $ in 2014. In addition to export amount, there is also significant increase in import amount as well. Total import amounts in 2014 was 100.98 trillion $ whereas this amount was 2.57 trillion $ in 1970.

Banking sector becomes one of the essential sectors that affect the economy of the world. Especially after globalization, its popularity increased so significantly that it started to play a key role for an economy. The main reason for this issue is that it is the strategic sector which has a direct connection with real sector. Therefore, the economic growth in many countries depends on the success of banking sector.

The increasing popularity of the banking sector also increases the risks that should be managed in this sector. Since banking sector plays an important role in an economy, if there is a problem in this sector, there is a risk that this problem may spread to other sectors in that economy. Especially in last 20 years, a lot of banking crises were experienced in many different countries which led to crucial losses for them.

One of the most important examples is that banking sector in the world suffered significantly from global economic crisis occurred in 2008. Although this crisis was started in United States, it also affected Europe harmfully. As a result of this crisis, many banks went bankruptcy and millions of people lost their jobs. After this crisis, the importance of audit and supervision in banking sector increased. It can be seen that many countries started to implement new regulations related to banking sector after this crisis.

Because many banks perform their services in many different countries, the performance of them has an important effect on global economy. Therefore, it can be said that these banks should be controlled and evaluated effectively. Due to this situation, the importance of credit rating increased nowadays. The performance of the banks is rated by credit rating institutes that provide objective views for customers and investors. It shows the early warning signals of a bank if there is any problem with respect to its performance.

In addition to this issue, CAMELS analysis, created by supervisory authorities in United States, is also a method that defines the performance of the banks by analyzing their financial statements. It is commonly used to control the performance of the banks periodically. It is an off-side monitoring method that provides mathematical evaluation for the banks regarding their risk profile and the quality of the balance sheet. CAMELS analysis consists of 6 components which are capital adequacy, asset quality, management, earnings, liquidity and sensitivity to market risk.

There are lots of studies related to CAMELS method and credit rating in the literature. These studies provide information about performance of banking sectors in many different countries. Most of these studies show that CAMELS analysis can explain the performance of the banks. Moreover, many studies also express the importance of credit ratings for the banks. Owing to these types of studies, it can be possible to analyze, follow and compare the economic performance of the banks. Thus, any problems related to banks can be easily defined at an early stage.

The first section of this paper focuses on the details of CAMELS analysis and the importance of credit rating in banking sector. The second section reviews the similar studies in the literature and empirical results of our study. The final section gives information about the conclusion of the study.

Literature Review

CAMELS Method in Performance Analysis and its Components for Banking

CAMELS is a method that is used to analyze performance of the banks. It was generated by regulatory authorities in United States in 1970s. The main purpose of this analysis is to control, supervise and follow performance of the banks. In addition to this situation, this analysis also helps to understand whether banks adopt related laws and regulations and create an effective internal control system. Hence, by using this analysis, it will be possible to define any problems at an early stage (Dinçer, et. al, 2011).

The six components in CAMELS analysis are Capital Adequacy (C); Asset Quality (A); Management Quality (M); Earnings (E); Liquidity (L); and Sensitivity to Market Risk (S)

Capital Adequacy

The capital amount of bank establishes confidence for banks against any kind of risk in extraordinary conditions. Because of this situation, the concept of capital adequacy plays an essential role. It shows whether banks have adequate capital in order to meet the withdrawal demand of a large number of customers in crisis period. In other words, banks that have a strong capital amount will be invulnerable against any kind of problems (Türker Kaya, 2001).

Asset Quality

The assets in the balance sheets of the banks show how funds, collected from various sources, are used. Therefore, the quality of assets for bank is so significant that it should be evaluated. Loans are the most important component of asset regarding a bank. Because of this issue, following aspects should be considered with respect to analyzing the quality of assets;

 i. The effectiveness of loan providing process,
 ii. Obtaining necessary collaterals for these loans,
 iii. The amount of loan provisions,
 iv. The process to follow non-performing loans,
 v. The concentration ratio for assets (Persons, 1999).

Management Quality

This component explains if top management of the bank is successful so as to define measure and control any risks important for the bank. This is to say, management quality shows whether necessary actions are taken in order to mitigate these risks. As for quality of management, following issues should be considered.

 i. Labor productivity,
 ii. The level of risk perspective in this bank,
 iii. The strategies of top management (Türker Kaya, 2001).

Earnings

It shows the profitability of the banks. By using many ratios, earnings of the banks can be measured. This component of CAMELS gives information about how effective banks used their assets (Roman and Şargu, 2013).

Liquidity

It shows the banks' ability to pay their short term obligations on time. If banks do not have enough liquid assets when there is a need, this can lead to bankruptcy ok these banks. Due to this situation, it is crucial to have necessary liquid assets. Therefore, ratios that show liquidity of the banks should be monitored effectively (Derviz and Podpiera, 2004).

Sensitivity to Market Risk

This component was added to CAMELS method in 1996. Because of the changes in market such as, interest rate and currency ratios, banks are under risk according to the properties of their balance sheets. For example, if a bank's foreign debts are higher than its foreign receivables; it will sustain a loss in case of increase in currency ratio. Thus, controlling the balance sheets of the banks regarding sensitivity to market risks is significant (Çağıl and Mukhtarov, 2014).

In order to form CAMELS method, you evaluate each bank according to each component of CAMELS. The rates should be between 1 and 5 in which "1" refers to the highest rate whereas "5" means the lowest. In addition to this situation, many ratios related to the components of CAMELS are used in this process. In other words, banks are evaluated and getting a point for each components of CAMELS. The weighted average of all these points gives total final point of the bank (Türker Kaya, 2001).

There are many studies in the literature about CAMELS analysis. The studies related to CAMELS analysis were depicted in the following table as a whole.

Empirical Literature on CAMELS Analysis

Scientific studies on performance analysis using CAMELS method in banking spotlighted satisfactory clues linking the bank performance and credit rating. Notwithstanding this poor banking performance has been also attached to lower earnings ratio, capital adequacy problems, poor management systems and unsatisfactory liquidity levels. As a successful and useful way of measuring the bank performance, the CAMELS method becomes a pioneering tool to assess the level of sensitivity to market risk. Moreover, the possible bankruptcies in banking system such as Lehman Brothers could be prevented by using CAMELS method and financial stress in market could be measured in such a satisfactory way. In the last five years, the performance measurement and stress tests practices using CAMELS methods in banking industry in the USA and the other advanced economies became contributory factors for stability and control in banking system.

From 1980s to date, some empirical studies on CAMELS analysis and bank performance have been assessed in this part and illustrated in Table I.

Thomson analyzed bank failures (after 1980) in United States of America. In this study, CAMELS method was used so as to achieve this purpose. According to the result of the study, it was concluded that the model in the study analyzed correctly about 94% of the banks that failed in 1 year period (Thomson, 1991). Persons worked on bank failures during Asian crisis occurred. In this study, it was aimed to predict bank failures while using logit method with the data between 1993 and 1996. The ratios in CAMELS method were also used as independent variables. In conclusion, it was defined that CAMELS ratios can be used as leading indicators (Persons, 1999).

Gilbert, Meyer and Vaughan analyzed the relationship between CAMELS result and estimated ratings of the Federal Reserve's off-site surveillance system. In other words, they were controlled whether CAMELS model can improve off-site surveillance. They tried to achieve this objective by using logit regression. They concluded that CAMELS model adds little value to off-site surveillance (Gilbert, et.al, 2002).

Nimalathasan analyzed the banks of Bangladesh by using CAMELS method. He classified banks into four different classes. According to the results of the study, 3 banks were "strong" and 31 banks were rated as "satisfactory". Moreover, rating of 7 banks was "fair" and 5 banks were rated as "marginal". In addition to them, 2 banks got "unsatisfactory" (Nimalathasan, 2008). Dash and Das made a study related to performance of Indian banking sector by using CAMELS analysis. They used the data for the period between 2003 and 2008. It was concluded that private/foreign banks show better performance than public sector banks (Dash and Das, 2010). Christopoulos, Mylonakis and Diktapanidis tried to analyze whether Lehman Brothers' collapse can be anticipated by using CAMELS method. In order to achieve this objective, data for the period between 2003 and 2007 was used. According to the results of the study, it was determined that CAMELS analysis shows the decline of Lehman Brothers (Christopoulos, et.al, 2011). Roman and Şargu made a study related to the performance of Romanian banks. In order to achieve this aim, they used CAMELS method. It was concluded that all banks are well capitalized. In addition to that, they were defined the weaknesses of Romanian banks with respect to the components of CAMELS (Roman and Şargu, 2013).

Mekonnen and Kedir tried to analyze whether CAMELS method is effective in order to measure the performance of Ethiopian banks. They used regression analysis so as to achieve this objective. Data for the period between 2003 and 2013 was used in this study. They concluded that CAMELS method is successful to show the performance of Ethiopian banks (Mekonnen and Kedir, 2015). Çinko and Avcı made a study so as to predict the commercial banks which were transferred to SDIF by using CAMELS analysis. In this study, discriminant analysis, logit model and artificial neural networks approach were used to achieve this purpose. They reached a conclusion that it was not possible to predict the transfer of a bank to SDIF by the use of CAMELS ratios (Çinko and Avcı, 2008). Türker Kaya analyzed Turkish banks by using CAMELS method. Data of 1997 and 2000 was used in this analysis. It was concluded that the performance of the banks in 2000 was worse than the performance in 1997. Another conclusion of this study was that when CAMELS ratings of banks increase, the probability of going bankruptcy decreases (Türker Kaya, 2001).

Kandemir and Demirel Arıcı analyzed the performance of deposit banks of Turkey with CAMELS method. They used data between 2001 and 2010 in this study. As a result, it was determined that Turkish banks have higher capital adequacy ratios and liquidity ratios after 2001 crisis. Another conclusion of this study was that foreign-capital deposit banks have higher performance when we compare with others (Kandemir and Demirel Arıcı, 2013). Çağıl and Mukhtarov analyzed the performance of Azerbaijan banks while using CAMELS method. In this study, data between 2007 and 2010 was used to achieve this performance. It was defined that the performance of foreign-capital banks was better than domestic banks in Azerbaijan. On the other hand, it was also determined that domestic banks have higher performance with respect to "asset quality" and "sensitivity to market risk" components (Çağıl and Mukhtarov, 2014).

Ecer compared performance of Turkish private banks by using CAMELS method. 12 different ratios related to CAMELS method were considered in this study. It was concluded that Garanti Bank is the most successful bank of Turkey (Ecer, 2013). Helhel and Varshalomidze evaluated the performance of the banks in Georgia according to CAMELS method. 6 banks were considered for the period between 2007 and 2013 in this study. They concluded that the performance of all 6 banks did not increase in this period. The main reasons behind this situation were economic crisis occurred in 2009 and war against Russia (Helhel and Varshalomidze, 2014). Table I demonstrates some of the studies related to CAMELS Analysis in existing literatures from 1990s to date.

Table 1: Studies Related to CAMELS Analysis

Author	Method	Determinants	Results
Thomson (1991)	Logit	Non-accruing Loans/Total Assets, Net Charge-offs/Total Loans, Total Loans/Total Assets, Non-deposit Liabilities/Cash and Investment Securities, Overhead/Total Assets, ROA, Loans to Insider/Total Assets	Model in the study analyzed correctly about 94% of the banks that failed in 1 year period by using CAMELS method.
Persons (1991)	Logit	ROA, Total Loan/Total Deposits, Operating Expenses/Total Assets, Natural log of Total Assets.	It was determined that CAMELS ratios can be used as leading indicators for banking crisis
Gilbert et.al. (2002)	Logit	Total net worth (equity capital minus goodwill)/Total Assets, ROA, NPL, Commercial Loans/Total Loans, Securities/Total Assets, Deposits (>$100M)/Total Assets, Natural Logarithm of Total Assets, Dummy variable equal to 1 if bank has a CAMELS rating of 2, Dummy variable equal to 1 if the bank's management rating is worse than its composite CAMELS rating.	They concluded that CAMELS model adds little value to off-site surveillance.
Nimalathasan (2008)	Descriptive Statistics	Capital Adequacy Ratio, NPL, Total Expenses/Total Income, ROA, ROE, Net Interest Income.	It was concluded that most of the banks in Bangladesh are satisfactory according to the results of CAMELS analysis.
Dash and Das (2010)	Descriptive Statistics	Capital Adequacy Ratio, Gross Non-performing Assets, Net Non-performing Assets, Net Non-performing Assets to Total Advances Ratio, Total Investments to Total Assets Ratio, Total Advances to Total Deposits Ratio, Sales per Employee, and Profit After Tax per Employee, ROE, ROA, Profit After Tax to Total Assets Ratio, Government Securities to Total Investments Ratio, Government Securities to Total Assets Ratio.	It was concluded that private/foreign banks show better performance than public sector banks.
Christopoulos et.al. (2011)	Descriptive Statistics	Capital Adequacy Ratio, NPL/Total Loans, Management Expenses/Total Sales, ROE, ROA, Total Loans/Total Deposit, Circulating Assets/Total Assets.	It was determined that CAMELS analysis shows the decline of Lehman Brothers.
Roman and Şargu (2013)	Descriptive Statistics	Impaired Loans/Gross Loans, Loan Loss Provisions/Net Interest Revenues, Total Loans/Total Assets, Operating Expenses/Total Assets, Interest Expenses/Total Deposits, ROA, ROE, Total Cost/Total Income, Liquid Assets/Deposits and Short Term Funding, Net Loans/ Deposits and Short Term Funding, Total Assets/Total Sector Assets.	It was concluded that all banks are well capitalized.
Mekonnen and Kedir (2015)	Regression	ROA, ROE, Capital/Risk weighted Assets, Loan Loss Provision/Total Assets, Total non-Interest Income/Total non-Interest Expenses, Net income After Tax &Provision/(Interest Income + Non-Interest Income), Liquid Assets/Total Deposits	CAMELS method can measure Ethiopian banks successfully.
Çinko and Avcı (2008)	Discriminant Analysis, Logit and Neural Networks	Capital Adequacy Ratio, Total Income/Total Assets, FX Position/Capital, Capital/Total Assets, NPL/Total Loans, Fixed Assets/Total Assets, Net Profit per Branch, Operating Revenue/Total Revenue, ROA, ROE, Total Income/Total Assets, Liquid Assets/Total Assets, YP Liquid Assets/YP Liabilities, Securities/Total Assets, Securities/Total Loans, FX Assets/FX Liabilities.	They reached a conclusion that it was not possible to predict the transfer of a bank to SDIF by the use of CAMELS ratios.

Table 1 (Cont'd)

Türker Kaya (2001)	Probit	Capital Adequacy Ratio, Currency Position/Capital, Net Profit/Total Asset, (Capital+Profit)/Total Assets, NPL/Total Loans, Fixed Assets/Total Assets, Net Profit per Branch, Operating Expense/Total Expense, ROE, ROA, Total Revenues/Total Expense, Liquid Assets/Total Assets, FX Liquid Assets/FX Total Liabilities, FX Assets/FX Liabilities, Net Interest Income/Total Assets, securities/Total Assets	CAMELS method is useful to analyze performance of Turkish Banks.
Kandemir and Demirel Arıcı (2013)	Descriptive Statistics	Capital Adequacy Ratio, Capital/Total Assets, Total Loans and Receivables/Total Assets, NPL/Total Loans, Fixed Assets/Total Loans, Operating Revenue/Total Revenue, Net Profit per Branch, ROE, ROA, Net Profit/Capital, Liquid Assets/Total Assets, Liquid Assets/Total Liabilities, FX Liquid Assets/FX Total Liabilities	Turkish banks have higher capital adequacy ratios and liquidity ratios after 2001 crisis.
Çağıl and Mukhtarov (2014)	Descriptive Statistics	Capital/Total Assets, Fixed Assets/Total Assets, Loans/Total Assets, Total Loans/Total Deposits, Net Profit per Branch, Non-Interest Revenues/Non-Interest Expenses, Non-Interest Expenses/Total Assets, ROE, ROA, Total Revenues/Total Expenses, Liquid Assets/Total Assets, Capital/Deposits, securities/Total Loans, Securities/Total Assets	The performance of foreign-capital banks was better than domestic banks in Azerbaijan.
Ecer (2013)	Descriptive Statistics	Capital/Total Assets, Capital Adequacy Ratio, (Capital – Fixed Assets)/Total Assets, Total Loans/Total Assets, Total Loans/Total Deposits, ROA, ROE.	Garanti Bank is the most successful bank of Turkey according to CAMELS method.
Helhel and Varshalomidze (2014)	Descriptive Statistics	Capital Adequacy Ratio, ROA, ROE, Total Loans/Total Assets, NPL/Total Assets, Fixed Assets/Total Assets, Non-Interest Income/Non-Interest Expense, Net Profit per Branch, Operating Income/Total Assets, Total Deposits/Total Capital, Liquid Assets/Total Assets, Liquid Assets/Short-term Debt, Interest Income/Total Assets	They concluded that the performance of 6 banks in Georgia did not increase according to CAMELS method.

Source: Authors

Empirical Literature on Credit Rating

In this part of study, the empirical literature related to credit rating in banking system has been assessed to demonstrate its importance in banking system. Credit rating becomes an important tool for investment and control in banking in the last two decades. Credit ratings illustrate the potential risks and opportunities related to individuals, institutions and countries, not only the banks. Investors require clarity and seek more opportunities in financial system. They always prefer to gain more at lowest risk level. Because of this demand, they try to make investment to the most profitable instruments. Due to the effect of globalization, it is possible for investors to reach new markets. Nevertheless, the biggest problem for this situation is asymmetric information. The main reason is that investors want to know political and economic situation of the countries that they will invest in. In other words, they need objective and specialized views for these countries.

Credit rating institutions are aimed to satisfy this need of the investors. They rate countries, banks and other important companies in these countries. In the analysis report of credit rating institutions, potential risks and opportunities related to the country/bank/company are emphasized and financial reports are interpreted. Hence, a detailed objective analysis becomes available for investors.

Credit rating process becomes also very popular tool for banks nowadays. Because banks play a strategic role for an economy, performance of them is essential for stability in financial system and investors. Due to this situation, if banks have any financial problems, this situation will both affect customers who take credits from the banks and also customers who have deposits on the banks. There are a lot of examples that banking crisis led to systematic crisis that affected whole economy in the past.

Owing to the reasons emphasized above, measuring the performance of the banks is very significant. Therefore, credit rating agencies play an important role for this issue. Any problems related to the performance of the banks can be anticipated earlier while controlling their performance periodically. Hence, increasing of these problems can be prevented by defining leading indicators earlier.

There are some major studies related to the importance of credit rating. Elkhoury defined credit rating agencies and analyzed their impact on developing countries. According to the result of this study, the role of credit rating institutions in analyzing risks is increasing (Elkhoury, 2008). White made also a work that explains the roles credit rating agencies. In this work, he emphasizes that they play a key role in many countries so as to attract the attention of many investors (White, 2013). Cantor and Packer made a detailed study related to credit rating industry. They emphasized the importance of credit rating in their study. On the other hand, they pointed out a problem that as the number of credit rating agencies increases, quality of the work will decline. Because of this situation, customers will start to choose the rating agency that provides the most favorable rating (Cantor and Pocker, 1994). Chen and Shih are other authors who analyzed credit rating system. They made a study in which they tried to create a model that provides credit rating by using support vector machine (SVM) method. They compared this model with neural network (BP) method. It was concluded that SVM classification model performs better than the BP model (Chen and Shih, 2006).

Credit rating and rating agencies have been also questioned in these studies. Benmelech and Dlugosz examined the role of credit rating agencies in 2008 global crisis. They concluded that rating agencies were ineffective in the period of global crisis. Another conclusion of this study was that rating shopping played an important role in this failure (Benmelech and Dlugosz, 2009). Poon and Firth also made a study related to credit ratings in the banks. In this study, they compared credit ratings that were asked and were not asked. They tried to achieve this purpose by analyzing 1,060 bank ratings. It was concluded that credit ratings, which were not asked from credit rating agencies, tended to be lower than the others (Poon and Firth, 2005). Shen, Huang and Hasan tried to answer the question why bank credit ratings vary among countries even when bank financial ratios remain constant. They analyzed credit ratings issued by Standard and Poor's for 86 countries during the period between 2002 and 2008. They concluded that effects of financial ratios on ratings are affected by information asymmetries. Therefore, they also emphasized that these countries should reduce information asymmetry in order to increase the ratings of their banks (Shen, et. al, 2012). Akkaya and Demirelli tried to create a rating model in order for loan allocation process. Within this scope, 24 different financial ratios were used in this study. It was determined that the ability to pay short term debts and return on equity (ROE) were the most important variables so as to decide to give a loan (Akkaya and Demirelli, 2010). Demir and Eminer made a study related the role of credit rating agencies. They concluded that these agencies lost

confidence especially after 2008 global crisis. Moreover, it was also concluded that these agencies are not fair and objective (Demir and Eminer, 2014).

In addition to them, there are also a few works that analyzes the relationship between the results of CAMELS method and ratings of credit rating agencies. These studies were depicted in the following table.

Table 2: Studies Related to the Relationship between CAMELS Analysis and Credit Rating

Author	Method	Determinants	Results
Derviz and Podpiera (2014)	Logit	Capital Adequacy Ratio, Tier 1/Tangible Total Assets, Tier 1 / Total Revenues, ROA, Total Loans / Total Assets, Total Asset Value at Risk	It was concluded that CAMELS model explains 84% of S&P ratings.
Woo (2011)	Descriptive Statistics	Credit Ratings, CAMELS ratings	CAMELS ratings perform better than credit ratings in terms of timeliness.
Babar (2011)	Descriptive Statistics	Capital Adequacy Ratio, Assets Quality Ratio, ROA, ROE, Total Loans/Total Deposit, Total Securities/Total Assets	Ratings of PACRA are completely different than CAMELS ratings

CAMELS analysis and credit ratings are assessed together in some several studies. Derviz and Podpiera tried to predict ratings of banks in Czech Republic given by Standart & Poors while making calculation with CAMELS ratio. The data between 1998 and 2001 and logit model were used in order to achieve this objective. It was concluded that CAMELS model explains 84% of S&P ratings (Derviz and Podpiera, 2004). Woo made a study in order to show the similarities or differences between CAMELS ratings and credit ratings. She analyzed banks which were defaulted during the period between 2007 and 2010. So as to achieve this purpose, she compared CAMELS ratings and ratings of Standard &Poor's. It was concluded that CAMELS ratings perform better than credit ratings in terms of timeliness (Woo, 2011). Babar analyzed similarities or differences between CAMELS ratings and ratings of credit rating agencies. Within this scope, he used the ratings of PACRA that is the most popular credit rating agency of Pakistan. So as to achieve this objective, 17 commercial banks of Pakistan were analyzed. As a conclusion, it was determined that ratings of PACRA are completely different than CAMELS ratings (Babar, 2011).

Research and Application: Turkish Deposit Banks

The aim of the application is to demonstrate the relationship between the results of CAMELS method and ratings given by credit rating agencies for Turkish deposits banks. By this method, it is intended to analyze all deposit banks of Turkey based on the components of CAMAL Analysis. However, this study covers 20 deposit banks out of 27 banks in Turkey. Bank of Tokyo-Mitsubishi UFJ Turkey, Odea Bank and Rabobank were newly established in Turkey and the rating notes for Turkishbank, Fibabanka and Citibank Turkey have not given yet by credit rating agencies. Moreover, Adabank is not an active deposit bank in Turkey because of the legal problems with its owners.

Because of these constraints, 20 banks, which were analyzed in this study, are depicted in the table 3.

Logit Model

There are 3 popular regression methods when dependent variable takes 2 (or more than 2) different discrete choices, which are: linear probability method, probit and logit. In linear probability method, if the value of dependent variables is more than "1", it takes the value of "1". Similarly, if this value is less than "0", it is accepted as "0".

In logit model, also called as logistic regression, logistic distribution function is used, which is shown below.

$$F(Y_i) = 1 / (1 + e^{-Y_i}) = 1 / (1 + e^{-(B_0 + B_i X_i + \varepsilon_i)})$$

In this equation, "Y" means dependent variable whereas "X" is independent variable. Also, "B" is coefficient and "ε" means error term. Moreover, "e" has a value of 2.72. Because e is greater than "0", dependent variable always takes

the value between 0 and 1. The only difference between probit model and logit model is that logit model uses logistic distribution function while probit model uses normal cumulative distribution function.

There are a lot of studies in which logit model was used in many different areas. Demirgüç-Kunt and Detragiache used logit model in order to predict financial crisis. In this study, both developing and developed countries were analyzed for the year between 1980 and 1994. They concluded that low growth rate and high inflation rate were the most important reasons for financial crises (Demirgüç-Kunt and Detragiache, 1998)

Gerni, Emsen and Değer also used logistic regression in their study. They tried to analyse financial crisis in Turkey and used the data between the period 1990 and 2004. It was concluded that low reserves and high inflation are important leading indicators for financial crisis occurred in Turkey (Gerni, et. al, 2005)

Dependent Variable: Credit Ratings of the Banks

In order to define whether there is a relationship between CAMELS method and the performance of the banks in Turkey, we will make a regression. In this regression model, ratings of the banks given by credit rating agencies will be dependent variable. In other words, this model shows the relationship between CAMELS ratios and ratings of the banks.

Within this scope, if the rating of a bank increases in a year, dependent variable will be "1" for this year. On the other hand, any decrease in rating means that this variable will be "2". Furthermore, dependent variable takes the value of "0" if there is not a change in the rating of the bank in that year.

So as to decide the value of dependent variable, we used the website of Moody's corporation. Nevertheless, annual activity reports were used for Alternatifbank and Tekstilbank because Moody's corporation has not rated these banks so far. Similar to this situation, Moody's started to rate Halkbank in 2009 and Şekerbank in 2010. Before these years, we used activity reports for these banks in order to define their ratings.

Independent Variables: CAMELS Ratios

After analyzing most of the related studies in the literature, we decided to use 21 different ratios of CAMELS 5 components. These ratios are independent variables in our regression analysis.

Table3: List of Banks Analyzed in this Study

Bank Name	Asset Size (% of deposit banks)	Asset Size (% of total banks)
Türkiye Cumhuriyeti Ziraat Bankası	13.7	13.1
Türkiye Halk Bankası	8.6	8.2
Türkiye Vakıflar Bankası	8.8	8.4
Akbank	11.4	10.9
Anadolubank	0.52	0.5
Şekerbank	1.15	1.1
Tekstil Bankası	0.21	0.2
Türk Ekonomi Bankası	3.5	3.3
Türkiye Garanti Bankası	12.1	11.6
Türkiye İş Bankası	13.1	12.6
Yapı ve Kredi Bankası	10.1	9.6
Alternatifbank	0.63	0.6
Arap Türk Bankası	0.21	0.2
Burgan Bank	0.52	0.5
Denizbank	3.8	3.7
Deutsche Bank	0.21	0.2
Finans Bank	4.2	4.0
HSBC Bank	1.9	1.8
ING Bank	2.1	2.0
Turkland Bank	0.31	0.3
Total	**97.06**	**92.8**

Source: Authors

Table 4: Lists of Ratios Used in this Study

CAMELS Components	Ratios	The Studies Used This Ratio
Capital Adequacy	Capital Adequacy Ratio	(Dincer, et. al, 2011), (Türker Kaya, 2001), (Nimalathasan, 2008), (Dash and Das, 2010), (Christopoulos, et.al, 2011), (Çinko and Avcı, 2008), (Kandemir and Demirel Arıcı, 2013), (Ecer, 2013), (Helhel and Varshalomidze, 2014)
	Shareholders' Equity/Total Assets	(Dincer, et. al, 2011)
	(Shareholders' Equity-Fixed Assets)/Total Assets	(Kandemir and Demirel Arıcı, 2013), (Ecer, 2013)
Asset Quality	Net Financial Assets/Total Assets	(Dincer, et. al, 2011)
	Total Loans and Receivables/Total Assets	(Dincer, et. al, 2011), (Roman and Şargu, 2013), (Çağıl and Mukhtarov, 2014), (Helhel and Varshalomidze, 2014)
	Fixed Assets/Total Assets	(Türker Kaya, 2001), (Çinko and Avcı, 2008), (Kandemir and Demirel Arıcı, 2013), (Çağıl and Mukhtarov, 2014), (Ecer, 2013)
Management Quality	Interest Expenses/Total Expenses	(Dincer, et. al, 2011)
	Interest Income/Total Income	(Dincer, et. al, 2011)
	Total Income/Total Expenses	(Dincer, et. al, 2011), (Nimalathasan, 2008), (Kandemir and Demirel Arıcı, 2013), (Çağıl and Mukhtarov, 2014)
Earnings	ROA	(Dincer, et. al, 2011), (Türker Kaya, 2001), (Persons, 1999), (Nimalathasan, 2008), (Christopoulos, et.al, 2011), (Roman and Şargu, 2013), (Mekonnen and Kedir, 2015), (Çinko and Avcı, 2008), (Kandemir and Demirel Arıcı, 2013), (Çağıl and Mukhtarov, 2014), (Helhel and Varshalomidze, 2014)
	ROE	(Dincer, et. al, 2011), (Türker Kaya, 2001), (Gilbert, et.al, 2002), (Nimalathasan, 2008), (Christopoulos, et.al, 2011), (Roman and Şargu, 2013), (Mekonnen and Kedir, 2015), (Çinko and Avcı, 2008), (Kandemir and Demirel Arıcı, 2013), (Çağıl and Mukhtarov, 2014), (Helhel and Varshalomidze, 2014)
Liquidity	Liquid Assets/Total Assets	(Dincer, et. al, 2011), (Türker Kaya, 2001), (Çinko and Avcı, 2008), (Kandemir and Demirel Arıcı, 2013), (Çağıl and Mukhtarov, 2014), (Ecer, 2013), (Helhel and Varshalomidze, 2014)
	Liquid Assets/Short Term Liabilities	(Dincer, et. al, 2011), (Roman and Şargu, 2013), (Mekonnen and Kedir, 2015), (Ecer, 2013), (Helhel and Varshalomidze, 2014)
	Liquid Assets/(Deposit and Non-deposit Liabilities)	(Dincer, et. al, 2011)
Sensitivity to Market Risk	FX Assets/Total Assets	(Türker Kaya, 2001),
	FX Liquid Assets/FX Liabilities	(Çinko and Avcı, 2008), (Kandemir and Demirel Arıcı, 2013)
	FX Position (On-balance sheet)/Shareholders' Equity	(Çinko and Avcı, 2008),
	Net Balance Sheet Position/Shareholders' Equity	(Türker Kaya, 2001)
	Total Assets/Total Sector Assets	(Dincer, et. al, 2011), (Roman and Şargu, 2013)
	Total Loans and Receivables/Total Sector Loans and Receivables	(Dincer, et. al, 2011)
	Total Deposits/Total Sector Deposits	(Dincer, et. al, 2011)

As it can be seen from the table above, our scope covers 97.6% of total deposit banks and 92.8% of all banks in Turkey according to the size of assets in 2014. In our study, annual data for the period between 2004 and 2014 was used. The data was provided from the Banks Association of Turkey, Moody's corporation and annual activity reports of the banks.

Results and Findings

In order to define the relationship between ratings and CAMELS ratios of 20 deposit banks of Turkey, we made a logit analysis. Because our dependent variable has 3 different values (0, 1, 2), our analysis is multi nominal logit analysis. SPSS 17 program was used so as to achieve this objective.

First of all, we made stationary analysis to the variables in the model. We used EViews 7.1 program for this issue. It was seen that all 21 variables were stationary. Therefore, it was concluded there is no risk of spurious regression.

After that, we also made multicollinearity analysis of significant variables. In order to prevent this problem, we were forced into eliminate some variables from the regression analysis. It was seen that, regarding collinearity statistics, VIF value of all variables are less than "10". Moreover, as it can be seen from collinearity diagnostics table, the ratio of highest eigenvalue and lowest eigenvalue is less than "1,000". In addition to eigenvalues, it was also defined that all conditional index values were less than "30". Therefore, second condition of multicollinearity analysis was also satisfied. It was concluded that there is no multicollinearity problem in our models.

Model Results for Increasing Performance of the Banks

First of all, we analyzed the variables which increase the performance of the banks. The results of logit analysis were depicted on the following table.

Table 5: Logit Results of First Analysis

Parameter Estimates									
Ratings		**B**	**Std. Error**	**Wald**	**df**	**Sig.**	**Exp(B)**	**95% Confidence Interval for Exp(B)**	
								Lower Bound	**Upper Bound**
1,00	Fixed Assets/Total Assets	.012	.006	3.959	1	.047	1.012	1.000	1.023
	Interest Expenses/Total Expenses	-.003	.002	4.536	1	.033	.997	.994	1.000
	Interest Income/Total Income	.002	.001	3.707	1	.054	1.002	1.000	1.005
	FX Assets/Total Assets	-.004	.002	6.826	1	.009	.996	.993	.999
	Net Balance Sheet Position/Shareholders' Equity	.001	.000	2.794	1	.095	1.001	1.000	1.001
	Total Assets/Total Sector Assets	.020	.005	19.220	1	.000	1.020	1.011	1.030
a. The reference category is: 0,00.									

As it can be seen from the table, the reference category is "0" and the consideration point is "1". This means that this table shows the results when dependent variable changes from "0" to "1". In other words, it gives the results in which there is an increase in the ratings of the banks.

First of all, while considering significance values, it was seen that these values are less than 0.05 for 4 different independent variables. This means that these 4 variables are statistically significant at 5% level. Moreover, it was determined significance values of other 2 independent variables are less than 0.1. This means that these variables are statistically significant at 10% level. However, because they are greater than 0.05, they are not statistically significant at 5% level.

The coefficient of the variable Fixed Assets/Total Assets is greater than "0". This situation refers that when the ratio of fixed assets in total assets rises, it leads to performance of the banks to increase. Increasing fixed assets is thought positively for banks because they make investment to increase their capacity. This is a significant opportunity for banks to increase its profitability if this investment can be used in a correct way.

In addition to that, the coefficient of the variable Interest Expenses/Total Expenses is less than "0". This shows that the proportion of interest expense out of total expense is inversely related to the performance of the banks. Similar to

this situation, the coefficient of the variable Interest Income/Total Income is positive which means that having high percentage interest income increases the credit ratings of the banks. The reason for this issue is that the main area of activity for banks is gaining/paying interest. Therefore, interest income shows how successful this bank is managed by top management with respect to its interest rate policy.

Furthermore, the coefficient related to variable FX Assets/Total Assets is negative. This implies that when the percentage of FX assets goes up, rating of this bank decreases. When banks have high amount of FX assets, they become more sensitive to currency risk. In case of any increase in foreign currency rate, this bank will suffer from this situation.

Finally, the coefficient of the variable Total Assets/Total Sector Assets is positive. This is to say, the market share of a bank regarding assets shows the importance and superiority of this bank. Thus, having high amount of loans in the sector is a factor for a bank to increase its credit rating.

Table 6: R-Square Results of First Analysis

Pseudo R-Square	
Cox and Snell	.275
Nagelkerke	.309
McFadden	.146

As it can be seen from the table above, the value of Nagelkerke R^2 is 0.309. This means that independent variables can explain 30.9% of the dependent variable.

Model Results for Decreasing Performance of the Banks

Additionally, we analyzed the variables that decrease the performance of the banks. The results of logit analysis were depicted on the following table.

Table 7: Logit Results of the Second Analysis

Parameter Estimates									
Ratings		B	Std. Error	Wald	df	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
								Lower Bound	Upper Bound
2,00	Financial Assets/Total Assets	-.012	.003	14.826	1	.000	.988	.982	.994
	FX Assets/Total Assets	-.007	.003	6.668	1	.010	.993	.988	.998
	FX Liquid Assets/Total Liabilities	-.004	.002	3.812	1	.051	.996	.993	1.000
	In-balance Sheet FX Position/Shareholders' Equity	-.002	.000	9.806	1	.002	.998	.998	.999
	Total Loans/Total Sector Loans	.029	.007	18.238	1	.000	1.029	1.016	1.043
	Interest Income/Total Income	.004	.001	7.997	1	.005	1.004	1.001	1.006
	Liquid Assets/Total Deposits	.005	.001	10.264	1	.001	1.005	1.002	1.007
a. The reference category is: 0,00.									

The reference category of this table is "0" and the consideration point is "2". This refers to the situation that this table shows the results when dependent variable changes from "0" to "2". This is to say, it explains the condition in which there is a decrease in the ratings of the banks.

Firstly, as for significance values, for 6 explanatory variables, these values are less than 0.05. This means that these variables are statistically significant at 5% level. Furthermore, it was defined that significance value of other independent variable is less than 0.1. This means that this variable is statistically significant at 10% level. However, because it is greater than 0.05, it is not statistically significant at 5% level.

Financial assets are the assets that can be converted into cash easily. Thus, they are very important especially in short term. The coefficient of Financial Assets/Total Assets is negative. This shows that when the proportion of financial assets is lower, this leads to decrease the rating of the bank.

The coefficient of the variable FX Liquid Assets/Total Liabilities is less than "0" whereas the coefficient of Liquid Assets/Total Deposits is positive. This situation shows that if liquid assets are mostly comprised of FX assets, this causes the ratings of the banks to increase. On the other hand, the proportion of TL liquid assets leads to lower rating for that bank.

The final important variable is Total Loans/Total Sector Loans of which coefficient is greater than "0". This refers that if market share of a bank with respect to loans is higher, this results in lower credit rating. In other words, high percentage of total loans is thought as high risk for that bank. The reason is that high amount of loans has a higher risk of default risk.

Table 8: R-Square Results of the Second Analysis

Pseudo R-Square	
Cox and Snell	.306
Nagelkerke	.344
McFadden	.166

The table above shows that the value of Nagelkerke R^2 is 0.344. This means that independent variables can explain 34.4% of the dependent variable.

Relationship between CAMELS Components and Credit Ratings

We created 2 different logit regression models in order to see whether there is a relationship between the ratios of CAMELS components and credit ratings given by rating agencies. First model shows the situation in which credit rating of the banks increases. On the other hand, second model gives information about credit rating decrease.

The following table shows which components of CAMELS have an effect on credit ratings.

Table 9: List of CAMELS Components Affect Credit Rating

CAMELS Components	Significant Ratios that Affect Credit Ratings
Capital Adequacy	-
Asset Quality	Financial Assets/Total Assets, Fixed Assets/Total Assets
Management Quality	Interest Income/Total Income, Interest Expenses/Total Expenses
Earnings	-
Liquidity	Liquid Assets/Total Deposits
Sensitivity to Market Risk	FX Assets/Total Assets, FX Liquid Assets/Total Liabilities, In-balance Sheet FX Position/Shareholders' Equity, Net Balance Sheet Position/Shareholders' Equity, Total Loans/Total Sector Loans, Total Assets/Total Sector Assets

As it can be seen from the table below, 3 components (Asset Quality, Management Quality, Sensitivity to Market Risk) of CAMELS have an effect on credit ratings whereas the ratios related to Capital Adequacy and Earnings are not effective. Another important point of this table is that all ratios of Sensitivity to Market Risk have an effect on credit ratings of Turkish banks.

Conclusions

In this study, the relationship between ratios of CAMELS components and credit ratings of the Turkish banks given by credit rating agencies has been analyzed. In order to demonstrate the relationship, the multi nominal logistic regression method has been conducted. Within this scope, 20 different deposit banks of Turkey have been analyzed. Additionally, 21 ratios related to CAMELS components for the period between 2004 and 2014 have been analyzed.

In the research model, 2 different regression analyses have been selected. One of them is related to the situation in which credit ratings of the banks rise. Moreover, second model illustrates the condition of decreasing credit ratings. It was concluded that in order for credit ratings to increase, the proportion of fixed assets in total assets, interest income, market share of total assets and should increase. In addition to that, interest expenses and the percentage of FX assets should decrease for the same purpose.

With respect to the second model, it was seen that the ratings of the banks tend to be decreasing in case of lower proportion of financial assets. Furthermore, FX liquid assets cause the ratings of the banks to increase whereas ratings tend to be lower in case of high percentage TL liquid assets. In addition to them, high market share of loans is thought such a risky situation that it leads to lower credit ratings.

It was concluded that CAMELS model cannot completely explain the changes in credit rating for deposit banks of Turkey. Nevertheless, 3 components (Asset Quality, Management Quality, and Sensitivity to Market Risk) of CAMELS have an effect on credit ratings of the banks. However, it was determined that the components of Capital Adequacy and Earnings do not explain the changes of credit ratings.

Finally, it was recommended that deposit banks of Turkey should focus on the proportion of fixed assets and interest income in order to have a better rating. Having high market share regarding total assets and lower interest expense percentage are also other important points for these banks. On the other hand, Turkish banks should consider financial assets' percentage so as to prevent credit ratings to decrease. Also, liquid assets should be mostly comprised of FX for the same purpose. Additionally, banks should consider their market share as for loans. It should not be increasing dramatically.

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