Research Article

Predicting Bank Failure: Evidence from Turkey and West African Economic and Monetary Union (WAEMU)

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ABSTRACT: The study analyzes the factors that may have an impact on the banking sector, particularly the ones which could be useful to predict the financial failure of banks. The study compares and contrasts the banking systems of Turkey and West African countries where the main actor in financial system occurs to be the banks. First, it has been found that (equity + profit)/total assets, fixed assets/total assets, operating expenses/total assets, (personnel expenses + severance pay)/total assets ratios are effective in estimating of financial failure of banks in Turkey. Second, Net Period profit/Average equity and Interest income/ Average Earning assets ratio are effective in prediction of financial failure of banks in the West African Economic and Monetary Union. The study suggests that to determine financial failure of banks, various financial ratios play a fairly consequential role for a variety of countries.

Key Words: Financial Failure, Banking sector, Discriminant Analysis, Financial ratios

Jel Classification: G21, G30, G32, G33

1.0 Introduction

Financial failure is a significant concept for all the financial actors that have links with companies. The assessment of financial success of organizations is indispensable in terms of the interest of both investors and business stakeholders. In the financial literature, a large number of studies have been done pertaining to the financial failure of companies. While some of these studies try to identify the nature of financial failure, some elaborate on the precautions to be taken, which eventually necessitate predicting financial failure.

Financial failure occurs when companies have an inadequate working capital, when they are not capable of fulfilling their obligations or when they are in situations of finding difficulty to fulfill their obligations (Zeytinoğlu and Akarım 2013). In other words, financial failure can be defined as non-payment of debts to creditors, the non- payment of principal amount and interest of bonds, an unrequited check writing, the company's appointed trustee, the losses of three consecutive years of, etc. (Altas and Giray 2005) In business policies, in financial decisions taken and as a result of the company's failure in other areas, in situation revealing its inability to reach its targets, the expression of financial failure is also defined as bankruptcy, falling into insolvency (Gratzer 2001; Okka 2009). The prediction of financial failure is extremely crucial due to possible problems, both economic and social, which it may likely engender. In this sense, financial failure prediction models highly contribute to the company's management policy. (Akkaya et al, 2009).

When financial institutions located within the financial system are evaluated, it has been noticed that banks capture the largest part. Bank failure as a term refers to a situation in which a bank is unable to service its debts when too many of the bank's loans default or, more rarely, when a bank has too few accounts providing cash flows.

Banking system which is an integral part of the economy performs a major role of financial inter-mediation. The traditional role of banks consists of mobilizing resources from the sectors generating surpluses and channeling them to the sectors that need them. Thus, by meeting the investment requirements of the economy, they facilitate the process of capital formation. When domestic savings fall short for investment requirements of the economy, the gap are closed through net capital inflow i.e. the gap is met by way of borrowing from abroad. Banks play too an important role in this sphere by facilitating international trade and service payments (Ipangelwa 2001). In view of all this, banks health has to be kept in order to continue playing their role in the economy. The financial health of the banking industry is an important prerequisite for economic stability and growth. As a consequence, the assessment of banks' financial condition is a fundamental goal for regulators.

Therefore, this study inquires into which financial ratio considerably impacts the prediction of financial failure of banks and hence two banking sectors have been compared, which are similar to each other. The banks within the scope of this study are chosen among the most influential and well-

established financial institutions within the Turkish and West African banking sectors by discriminant analysis to identify financial ratios to predict bank failures in various countries. The study explores that (equity + profit)/total assets, fixed assets/total assets, operating expenses/total assets, (personnel expenses + severance pay)/total assets ratios are effective in estimating of financial failure of banks in Turkey; Net Period profit/Average equity and Interest income/ Average Earning assets ratio are effective in prediction of financial failure of banks in West African Economic and Monetary Union. According to the results, for Turkey and West African countries, different financial ratios are important to evaluate the financial failure of banks. The study with the aforementioned countries having different characteristics of their banking sectors reveals the presumption of financial failure of the banks through prediction of various financial ratios.

2.0 Financial Failure in Literature

The corrupted financial structure of a company, the capacity to fufill its obligations in order to strengthen its weak financial condition; the company have to take the measure as followed: extending the maturity of debts, debts' consolidating or re-configuring, as a result of the creditors agreement relinquishing from one part of its receivables, the reorganization of the companies' capital structure, and strengthening the capital structure, the revaluation of assets, by selling tangible fixed assets, renting for long term, the conversion of financial fixed assets partially or completely into the currency and the conversion of the debt into securities and propose arrangement with creditors (Akgüç 1998).

It has been shown that many studies have been found in the literature concerning the financial failure's prediction and it is necessary needed to choose variables to be used for the prediction of financial failure. Since late 1960s many researches has be concentrated on the financials firms.

The first of the studies concerning the issue of financial failure was the work done by Beaver (1966). In this study, 79 enterprises suffering from financial failure and 79 successful financial companies were assessed using 30 financial ratios. The companies' rate changes in 5 previous years were evaluated. Another study concerning financial failure was Altman's work (1968). In this study companies of financial success and those of financial failure were classified into two groups (Altman 1968). By using 22 financial ratios, discriminant function analysis has been established.

For the purpose of the bankruptcy's prediction, when used logistic regression analysis by going from three years prior to the bankruptcy, Ohlson (1980) developed a bankruptcy prediction model. When Chosen 105 bankrupted companies and 2058 non bankrupted companies' databetween years 1970-1976 logistic regression analysis was applied.From one year prior to bankruptcy, and from two years before the bankrupcy and by combining one and two years before the bankruptcy, 119 different models have been developed.

Keasey and Watson (1987) applied logistic regression model to detect financial failure of the small-scale businesses operating in the UK. In England 73 failed and 73 non-failed smallbusinesses were accounted in the study. While 76.6% of correct classification rate of success wasobtained through the use of financial ratios as independent variables, 75.3% of accurate classification's rate of success was foundwith the use of non-financial information. Financial ratios, as well as non-financial criteria were taken into consideration in predicting financial failure in this study.

Hunter and Isachenkov (1999) used logistic regression model to foresee a year financial failure of Russian and UK companies. In this study, 40 companies from each of the two countries have been taken account into. . Logistic regression model with improved function have shown an accurate classification rate of 95% of the Russian successful companies, and a correct classification rate of 85% of the British successful companies. According to the analysis's results, in the group of companies of unsucceful financial, profitability indicators for British companies were the most distinguishing variables while the company size was the best discriminating variable for the Russian companies.

Benli (2005) developed a financial failure prediction model to predict the financial failure of banks in his study, when based on logistic regression and artificial neural network models. In the financial failure' predicting, the results have shown that the artificial neural network model has been found to be more superior than logistic regression.

When evaluated financial failure related on literature, it is observed that the literature focuses on the failure of a substantial portion of banks. Banking failure means financial illness namely: liquidity problems, non-performing loans, distress, risky speculative activities and even unethical practices. The inadequate insolvency calculation or test robs banks or timely corporations' corrective action. Off-site analysis uses different methods, such as CAMEL-based approaches, statistical techniques and credit risk models. Early warning systems based on statistical techniques reflect the rapidity with which the performance of a bank responds to a changing macroeconomic cycle, the conditions on the monetary and financial markets, and the interventions of the supervisory authority. Therefore, for the time to be, statistical techniques like discriminant analysis and probit/logit regressions play a dominant role in off-site banking supervision (Halling and Hayden 2006)

Bank failure or distress intractability is evidenced by the West African banking past as well as that of some countries like the US, the Continents of Europe, Asia, Turkey etc; the recent global financial melt- down notwithstanding. The non-performing loans mismanagement or impairment of banks portfolio quality and bad corporate governance have reduced or completely eradicated banks confidence (Olaniyi 2007; Amadasu 2011).

Martin (1977) and Ohlson (1980) employed logistic regression

to predict banks and firms failure. Thomson (1991) examined the bank failures that took place in the United States during the 1980s. Gonzalez-Hermosillo (1999) investigated bank failures in the United States, Mexico and Colombia occurred in the 1980s and 1990s. Kolari et al (2002) developed an early warning system based on logit analysis and trait recognition for large US banks. Jones and Hensher (2004) presented mixed logit model for firm distress prediction and compared it with multinominal logit models. Montgomery et al (2005) investigated bank failures in Japan and Indonesia using logit. Canbas et al (2005) proposed an integrated early warning system by combining discriminant analysis, logistic regression, and probit and principal component analysis. Konstandina (2006) used logit analysisto predict Russian bank failures. Doganay et al. (2006) developed an early warning system by combining multiple regression, discriminant analysis, logit and probit.Gunsel (2007) used multivariable logistic regression with Camel approach to predict the probability failure of the North Cyprus Banks. Erdogan (2008) used logistic regression to predict 42 Turkish commercial banks bankruptcy using 20 financial ratios. Boyacıoğlu Acar et al (2009), in their research focused on predicting bank financial failures in the sample of savings deposit insurance fund (SDIF) transferred's banks in Turkey, used 20 financial ratios with six feature groups including capital adequacy, asset quality, management quality, earnings, liquidity and sensitivity to market risk.

Amadasu (2012) has investigated on Nigerian commercial Banks failure using four methods such as Multivariable discriminant analysis, Ordinary least square regression, and logit-logistic regression. Babanskiy (2012) used twelve financial ratios to find out the determinants of bank failures using probit and logit model. These financial ratios are as following: Capital, profitability, liquidity and asset ratio. According to the results of the study, banks need to maintain a level of liquidity sufficient to meet current and future financial obligations. It means that bank has to be able to manage unexpected changes of market conditions that directly affect the liquidity of assets.

When the literature is examined, it is seen that various financial ratios are effective in predicting financial success of banks in general. It is seen that financial actors use financial ratios to assess banks even if the different financial ratios used to predict financial failure. In countries where financial institutions are not sufficiently developed, the banking sector is becoming more important. So in this study , It aims to examine which financial ratios are predominant in determining the financial failure of banks that have an important place in the financial system.

3.0 An overview of Turkey and WAEMU Banking Sector

A company with corrupted financial structure has to take some measures in order to restore its capacity to fulfill its obligations and these can be listed as follows: extending the maturity of debts by consolidating or re-configuring,

relinquishing from one part of its receivables as a result of the creditors agreement, the reorganization of the companies' capital structure, and strengthening the capital structure, the revaluation of assets by selling tangible fixed assets, renting for long term, the conversion of financial fixed assets partially or completely into the currency and the conversion of the debt into securities and propose arrangement with creditors (Akgüç 1998).

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Despite the recent global financial melt-down, bank failure or distress intractability is evidenced by the background of West African banking system as well as of some countries like the US, the continental Europe, Asia, Turkey, and so on. The non-performing loans mismanagement or impairment of banks portfolio quality and bad corporate governance have reduced or completely eradicated banks confidence (Olaniyi 2007; Amadasu 2011).

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When the literature is examined, it is seen that various financial ratios are effective in predicting financial success of banks in general. It is seen that financial actors use financial ratios to assess banks even if the different financial ratios used to predict financial failure. In countries where financial institutions are not sufficiently developed, the banking sector is becoming more important. So in this study, it aims to examine which financial ratios are predominant in determining the financial failure of banks that have an important place in the financial system.

4.0 Evaluation The Financial Failures of Banks: Turkey and WAEMU Banking Sector Valuation

In Turkey and WAEMU banking sector to assess the financial failure of the banks involved in this study, it is intended to determine which financial ratios were set out in the foreground. To achieve this purpose, a multiple statistical methods as the discriminant analysis was used.

4.1. Data and Methods

In our study, the data of the uninterrupted operational banks trading on the stock exchanges of Turkey and WAEMU were taken account. To assess the financial failure of the Turkey banking sector, 13 operational banks that are listed without interruption on Istanbul Stock Exchange (ISE) were selected between the years 2006-2013, whereas 6 operational banks that are listed without interruption in Bourse Régionale des Valeurs Mobilières SA (BRVM- a regional stock exchange) in West African Economic and Monetary Union were selected between the years 2006-2013 in order to evaluate the financial failure of the West African Economic and Monetary Union banking sector.The banks taken account into this assessment are expressed in the Table 1.

Table 01. The Examined Banks in The Study

The Turkish Banks	The WAEMU Banks
Akbank T.A.Ş.	BOA Benin
Alternatifbank A.Ş.	BOA Burkina Faso
Denizbank A.Ş.	BOA Ivory Cost
Finans Bank A.Ş.	BOA Senegal
Şekerbank T.A.Ş.	Ecobank (Group)
Tekstil Bankası A.Ş.	BOA Niger
Türk Ekonomi Bankası A.Ş.	
Türkiye Garanti Bankası A.Ş.	
Türkiye İş Bankası A.Ş.	
Türkiye Kalkınma Bankası A.Ş.	
Türkiye Sınai Kalkınma Bankası A.Ş.	
Türkiye Vakıflar Bankası T.A.O.	
Yapı ve Kredi Bankası A.Ş.	

The independent variables used to access the financial failure in this study are shown in the Table 2.

Table 02. Financial Ratio Used in The Study

Variables	Calculation
ROA	(Equity + Profit) / Total Assets
EDEP	(Equity + Total Profit) / (Deposits + Non-Deposit Resources)
LOA	Total Loans / Total Assets
FLOA	Followed-Up Loans / Total Loans
FA	Fixed Assets / Total Assets
LA	Liquid Assets / Total Assets
LDEP	Liquid Assets / (Deposits + Non-Deposit Resources.)
PA	Net Period Profit / Average Total Assets
PE	Net Period Profit / Average Equity
PBT	Profit Before Tax / Average Total Assets
IIIE	Interest Income / Interest Expense
IE	Total Income / Total Expenses
IIEA	Interest Income / Average Earning Assets
IEEA	Interest Expense / Average Earning Assets
OEA	Operating Expenses / Total Assets
PSA	(Personnel Expenses + Severance Pay) /Total Asset
PSE	(Personnel Expenses + Severance Pay) / Number Of Employees
SEVP	Severance Pay / Personnel Number

The independent variables taken account into this study when based in the literature review contituted the most financial ratios used in the literature review. The criterea used to classify financial failure of the stock markets listing banks is identified as the condition of that bank's return is below to the sector average return or above.

According to this, for example when examining the year 2006's return of banks, when the return is below or under the sector average yield or return of the banks, it is expressed as unsuccessful, but when the return is above of it, it is expressed as successful. The periodical failed banks are encoded 1 and the periodical successful ones are encoded 2 . In this study using discriminant analysis when based on the determination of companies' failure, which financial indicators came to theforegrond are being examined.

Discriminant analysis bytaking account into the large number property of units, is applied for purpose's assignments of the optimal level of real classes to the natural environment of the units. In addition, which ones are the most associated variables with the groups and howtheir group membership can be well predicted are detrmined. The findings and comments concerning the discriminant analysis are as following. As results from the separated analysis, one discrminant analysis function was found for every country.

In Table 3, for Turkey sample, the discriminant analysis shows how important the eigenvalue (0.677) is, and so is the explained variance ratio (100%). Whereas when based on WAEMU sample, the Eigenvalue is 0,436 and with an explained variance ratio of 100%. The coefficient of correlation of the canonical function is 0.635 for Turkey and 0.537 for WAEMU.

Table 03. Results of the discriminant analysis

Results of the discriminant analysis				
Eigenvalue, Canonical correlation, Wilk's Lambda Value				
	Function	Eigenvalue	Variance %	Cumulatif %	Canonical correlation
Turkey	1	0,677	100,0	100,0	0,635
	Tested Function	Wilks' Lambda	Chi-Square	Degree of Freedom	Significance
	1	0,596	51,720	4	0,000
	Function	Eigenvalue	Variance %	Cumulative %	Canonical correlation
WAEMU	1	0,436	100,0	100,0	0,537
	Tested Function	Wilks' Lambda	Chi-Square	Degree of Freedom	Significance
	1	0,809	9,527	2	0,009

According to results shown in table 4,   Pearson's correlation coefficients are expressed between the structural matrice and discriminant function with discriminant variables .

Table 04. Structural Matrix Table for Turkey and WAEMU Sample Group

Turkey	Structural Matrix	WAEMU	Structural Matrix
Independent Variables	Function	Independent Variables	Function
PST	-,509	IEEA	,626
PE	,291	PE	-,521
EDEP	-,274	LOA	,376
FA	-,255	OA	,366
FLOA	-,251	PA	-,299
LDEP	,189	FLOA	-,291
OA	-,188	IIEA	-,254
LOA	-,170	LDEP	,224
ROA	-,168	SEVP	,222
LA	,152	LA	,216
IIEA	-,146	PSE	,199
SEVP	-,093	ROA	,190
PSE	-,038	EDEP	,189
IE	-,035	FA	-,170
PA	,031	PST	,162
PBT	,029	PBT	-,116
IIIE	,024	IE	-,114
IEEA	,012	IIIE	,102

In table 5, when examined the coefficients of standardized discriminant function for Turkish sample, the variables ROA, FA, OA, PST are the factors that mostly contributed to the discriminant function model. Concerning WAEMU sample, the variables IEEA, PE are the most contributors to the discriminant function model. By using standardized values the generated discriminant function equations are as following:

$$DF = 1,079 ROA - 3,045 PST + 2,466 OA - 0,375 FA$$

(Turkish Banking sector) Eq. (01)

$$DF = 0,907 IEEA - 0,828 PE$$

(WAEMU Banking sector) Eq. (02)

Table 05. Coefficients' function for Turkish and WAEMU Sample Group

	Standardized Canonical Discriminant Function's Coefficients		Classification Function's Coefficients (Fisher's Linear Discriminant Function's Coefficients)	
	Independent Variables	Function	Independent Variables	Banks with failed Financial	Banks with non-failed Financial
TURKEY *	ROA	1,079	ROA	14,142	28,514
	FA	-,375	FA	101,098	59,767
	PST	-3,045	PST	-341,492	-1094,511
	OA	2,466	OA	328,183	679,002
	Constant			-6,603	-7,680
WAEMU **	PE	-,828	PE	44,143	32,717
	IEEA	0,907	IEEA	-1,37E10	4.404 E9
	Constant			-4,977	-3,491

* The correct classification rate %79 ** The correct classification rate %67

5.0 Findings

The financial system can operate efficiently and there to depending on efficiency of the banking sector and in terms of this way, it is important to continue the activities of the national economy. Therefore, detecting the banking sector performance' assessment as the most immediately affected sector through different factors is an important issue. For this reason, in this study, various financial ratios that could predict the financial failure of banks have been determined. Turkey and West African Banking sector have been investigated by discriminant analysis   to identify financial ratios to predict bank failures of different countries. Banks are so important financial companies in finansal system for Turkey and West African Banking sector so these countries are investigated.

According to the results, ROA, FA, OA and PST are effective in estimating of financial failure of banks in Turkey Banking sector; PE and IEEA are effective in prediction of financial failure of banks in West African Economic and Monetary Union (WAEMU)'s Banking sector. Countries have different characteristics of the banking sector, reveals the conclusion of the financial failure of the bank through various financial ratios to predict. To ascertain the financial failure of banks, different financial ratios play important role for different countries.

The financial ratios resulting from the analysis of this study have the aim to seek for the ones that discriminate the Bank's financial failure. when considered the Turkish banking sector

in therms of banks financial accessment, variables like ROA, FA, OA and PST are variables that influently discriminate the financial failure of banks. Whereas variables like EDEP, LOA, FLOA, LA, LDEP, PA, PE, PBT, IIIE, IE, IIEA, IEEA, PSE and SEVP are ratios shown have no effect in discriminating the financial failure.

One of the distinguishing power ratios is the capital structure information's expressed ratios. Capital ratios are generally the financial power's measure ratios of companies.Unpredictable or unexpected losses of enterprises or an indication of the ability to meet future crises. It is an indicator for companies unprediction or unexpectation of losses or their ability to encounter future crises.

Moreover, it permits to awaken banks from their impression of having strong and adequate financial structure and so that can provide adequate capital ratio. According to the results, one of these ratios that discriminates the financial failure valuation of Turkish banking sector is the ROA ratio.

In situation of need, banks of sufficient amount of capital can be protected against unexpected risks. This ratio is an important indicator of the financial health and low leverage levels as it has be shown in the study conducted by Alman (1968). It is assumed that the ratio ROA had negatively affected banks that fail (Babanskiy, 2012).When evaluated banks' financial failure,one of the another Ratio that has effect on it, is fixed assets / total assets ratio. From Total assets, the amount allocated to fixed-assets is seen as crucial in the financial failure determination.In failure valuation in regards to banks operating expenses, operating expenses / total assets and (personnel expenses + severance pay)/ total assets ratios constitute thediscrimating power ratios.

When based on West African Economic and Monetary Union (WAEMU)'s banking sector in evaluating banks' financial aspects, PE and IEEA are identified to be the influential variables to discriminate the financial failure. The variabes which have no effects in discriminating financial failure, are ratios, ROA,EDEP, LOA, FLOA, FA, LA, LDEP, PA, PBT, IIIE, IE, IIEA,OA, PST, PSE and SEVP. One of the distinguishing power ratios that facilitates making accessment of bank are profitability ratios. Profitability ratios may be decisive in the evaluation ofthe sustainability income of banks. Fundamentally, the negative impact encountered over profitability is excessive credit risk.To accommodate losses that resulted from these risks, new additional capital is needed. Market risk is also one of the risks affecting the profitability.Due to these factors, the forcast of the bank' cash flows and the determination of factors that affect the profitability is very capital.

When assessing the financial failure of West African Economic and Monetary Union's (WAEMU) banking sector, PE is seen to be the distinguishing variable that contributes to detect this failure. PE as an indicator of profitability, provides information regarding the bank's profitability. In Montgomery et al's study (2005) in valuating cash flows

resulted from return on capital's (ROC) invested capital and to detect a unit of invested capital, bank's effeciency is used to determine how contribution it has been provided.Due to the low probability ratio of banks failure with a high ROC, it can be said that the bank has a strong structure.When valuating the banks failure in WAEMU banking sector, the other discraminating influential variableis the variable IEEA. From banks' income and expense values structure, the ratio interest expenses/ average earning assets is one of the forefront failure prediction ratios.

6.0 Conclusion

In the financial system, it is crucial that Banks which are one of the financial intermediaries, operate predominantly in the continuity of their healthy's activities in terms of the financial stability. The disruption of financial stability in terms of financial actors is not a desired situation. Therefore, in banks, any financial failure that can be experienced in the financial system may create contagiousness effect.Therefore, financial actors have the possibility in advance to identify or predict potential financial failures that can be experienced in the banks with various methods.

In our study, the accessment of banks' financial failure is aimed to determine distinguishing financial ratios. Primarily to reach this purpose, literature valuation was made in relating with the financial failure issues.For banking sector's assessment, in Turkey and West African Economic and Monetary Union banking sector, operating active banks were considered. Turkey and West African Economic and Monetary Union banking sector investigate because banks are important financial companies in the financial system for both of economies of countries. The measure of the financial failure of the banks taken account into this study was performed with discriminant analysis.

According to the results obtained in determining the failure of the banks operating in the Turkish banking sector, (equity + profit) / total assets, fixed assets / total assets, operating expenses / total assets and (personnel expenses + severance pay) / total assets ratios came in the foreground.When determined the failure of banks operating in the WAEMU banking sector period, net profit / average equity and interest expenses / average earning assets ratio have come into prominence. In our study, the valuation of banks' financial success revealing the significance help to be to the financial ratios, the valuation of the bank regarding financial actors is intended to shed light.

Banks within the financial sector are among the most important institutions. Therefore, the financial difficulties experienced in the banks will negatively affect both the financial sector and the economy. In terms of financial actors, it is important to determine which financial ratios should be paid attention to without evaluating the success and failure of banks

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